

# IS GOLD VALUE ADDITION POSSIBLE IN MADAGASCAR?

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## ABSTRACT

Gold is a precious metal of great economic value. This has prompted our research to reflect on the exploitation and valorization of this resource in Madagascar, which continue to grow and takes an important place in the world economy.

In Madagascar, the gold marketed is greater than or equal to 18 Karat (Kt) of purity. This threshold is the basis for calculating the fees withheld by the Administration. Whereas, according to the gold regime, gold can only be exported at 24Kt of purity.

In order for gold production in Madagascar to be appreciated in both quantity and quality in the years to come, value addition based on gold refining method represents an additional process to be brought to the product for a better contribution to the State's coffer.

The objective of this paper is to study the possibility of gold's added value considering its quality as main parameter. The study consists of determining the gap in the mining royalties of gold export (2016-2020), taking into account the price of gold by different purity rate.

The main results concluded that taking into account the quality (24Kt of purity) of gold would contribute to an increase of around 25% of mining royalties. Conversely, this proportion constitutes the gap in mining revenue, which corresponds to an amount of approximately 1.36 million US Dollars (USD)<sup>1</sup> during the period from 2016 to 2020.

**Keyword:** Gold, quality, value addition, Mining Royalties, purity.

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## 1. INTRODUCTION

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<sup>1</sup> 1 US Dollars = 4 289,95 Ariary (08/02/2023)

Historically, Madagascar has been one of the most geologically studied countries in Africa, but political instability over the past 40 years has discouraged mining exploration. The freeze upon mining permits, imposed for nearly ten (10) years, has marked a significant halt to the development of the Malagasy mining sector, both for mining companies and for local employment and activities related to the mining trade [19]. Since September 2020, the Government has also decided to suspend gold exports [7]. These decisions have had serious consequences for the national economy. Indeed, the active participation of the mining and oil sectors in the Gross Domestic Product (GDP) had fallen from 4.41% in 2018 to 4.86% in 2019 (Central Bank of Madagascar, 2020). It has regressed to -2.80% in 2020 (Estimated by the Chamber of Mines of Madagascar, 2020).

The contribution of the mining sector from royalties had reached 6.18 million USD out of 29.23 million USD of non-tax revenues (NTR) collected in 2020, representing 21.15% of the total NTR of the General State Budget [14]. Mining activity and products constitute a considerable added value for Madagascar's economy.

Export earnings from mining products in 2020 were 439.71 million USD, of which 92.13 million USD came from gold [14]. By the end of 2020, the Malagasy State had set up the national gold reserves in the Central Bank, which was able to acquire 1,003 tons of gold of purity greater than 950 thousandths. The monetary convertibility remains to be achieved. During this period, the technical capacity of the Madagascar Mining Laboratory (L2M) was limited to the certification of 18Kt for the export and domestic sale of gold products [11].

However, Madagascar is a country where the exploitation of the gold sector requires further investment in its organization. Gold refinery in Madagascar remains problematic, although it could be an attractive incentive for a gold mining operation and would contribute to the traceability of the quality monitoring of gold products called "tracing" [17] and to the development of the Malagasy label as a producer as well. Apart from the formalization of artisanal and small-scale gold mining (EMAPE), the valorization of gold product constitutes a good management of resources for the benefit of State's revenues. The objective of this article is to study the possibility of the added value of malagasy gold considering quality as central parameter.

## 2. MATERIALS AND METHODS

The Study was framed for the period from 2016 to 2020. The statistical data base included gold production and prices as well as mining royalties on gold exported from Madagascar.

These data were collected from internet [20], articles and graduation thesis [1] [13] [16], the mining Administration [14], documents and reports from existing mining projects to analyze the price and seasonal production of gold in Madagascar [7] [11] [12]. The legal and regulatory texts of the mining sector in Madagascar were used to define the method for calculating the mining royalties in gold. These texts were: the mining Code [8] and its implementing decree [5], the gold regime [6], the decision setting the market value of gold [2], the decision setting the export price of gold [4], the minute setting the reference price of gold for export and the market value [10].

Value addition is possible if the mining royalties in exported gold increases by considering the quality of the gold. The method consisted of:

- comparison of profitability between the calculation of the withholding of mining royalties of gold 18Kt, referring as market value of gold, either the international market price of gold, or the value of the base fixed by the mining Administration and/or on the declaration of the invoice of the first sale.
- Simulation of profitability taking into account the different gold purity (18Kt, 20Kt, 22Kt, 24K) when calculating the withholding of the mining royalties.

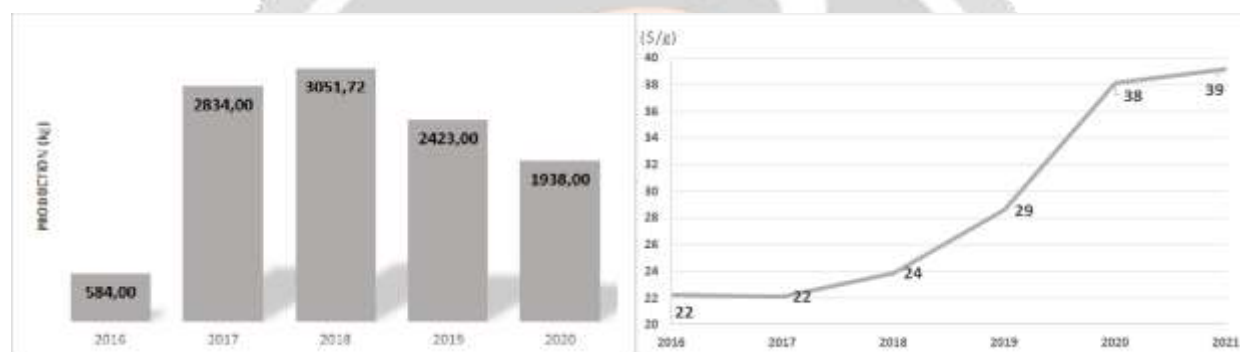
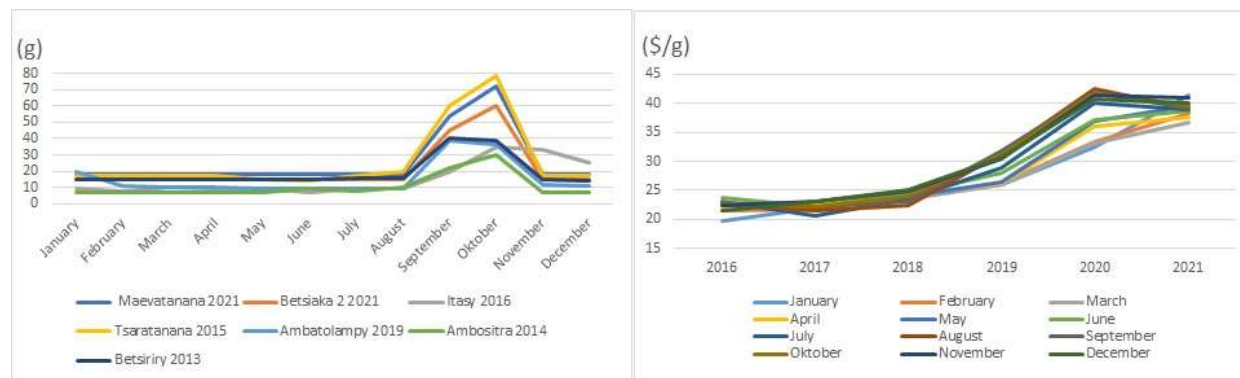
## 3. RESULTS AND DISCUSSIONS

### 3.1 Seasonality of gold production

Monthly production (cf. Chart -1) varied from 15g to 72g from one operator to another in one area, with the price of gold ranging from 21USD to 42 USD per gram on the international gold market (cf. Chart -2). Gold also has a distinct seasonal character. Traditionally, gold prices tend to be higher between August and February. This period of increase begins with the start of the festival season in India which is held in August. This is followed by the country's wedding season (which runs between September and January) and then the Chinese New Year celebrations (between January and February). These events are recurrent and explain, in large part, the traditional rise in the price of gold during these different periods [3].

Similarly, mining extraction was a seasonal activity from August to January (cf. Chart -1). However, CSA Group Ltd [15] reported that despite the extremely difficult logistical conditions caused by the rainy season, especially in the northern region of Madagascar, seasonal and spatial variations in certain parameters had to be taken into account when estimating production rates. Namely, seasonal variations in mining are a function of the gold-bearing rock, but

activity generally stops during the rainy season. During the rainy season, activity is concentrated on alluvial and eluvial mining.



Madagascar's annual gold production increased from 2016 to 2018 and decreased from 2019 to 2020. Gold production had a minimum quantity of 584kg in 2016 and reached its maximum of 3000kg in 2018 (cf. Chart -3). Note that gold exports have been suspended since September 2020.

From the year 2016 to 2020, gold kept increasing in value except in 2017. The price had risen from 22 USD to 39 USD, an increase of about 75% (cf. Chart -4). The price of gold in the local market varied from one locality to another. Generally, it was mainly the collectors who set the price, and they aligned the national market price with the world price of gold. The domestic market price for gold was very high indeed. Several factors influenced the behavior of the market, which is governed by the law of supply and demand. This price could also fluctuate due to lack of investment, production costs at the mining sites, the quality (carat) and quantity available at the time of the transaction, the region, the season, and the timing of farming activities. The sector is also highly mobile and elastic, sensitive to various changes following the moods of the market price. The comparison of gold prices and production shows no consistency of practice in Madagascar. Thus, supply and demand are in an unstable equilibrium situation without remarkable twists or spirals in price qualities [13].

### 3.2 Gold quality and price ratio

Table 1. presents the quantity of gold exported annually by Madagascar (ANOR, 2022) and gold prices according to goldrate24 [20] data corresponding to 18Kt, 20Kt, 22Kt and 24Kt gold purity from 2016 to 2020. The price of gold is a function of its purity.

**Table -1 :** International gold prices of gold 18Kt, 20Kt, 22Kt and 24Kt from 2016 to 2020  
 (Source: based on goldrate24 database [20])

Year	Gold production per annum ( Kg)	International gold prices (\$ US)			
		18Kt	20Kt	22Kt	24Kt
2016	584,00	13 007 656	14 447 170	15 904 027	17 326 197
2017	2 834,00	62 675 257	69 611 319	76 630 947	83 483 442
2018	3 051,72	72 931 375	81 002 448	89 170 762	97 144 592
2019	2 423,00	69 351 517	77 026 418	84 793 788	92 376 221
2020	1 938,00	73 962 260	82 147 417	90 431 190	98 517 730
<b>Total</b>	<b>10 830,72</b>	<b>291 928 065</b>	<b>324 234 771</b>	<b>356 930 714</b>	<b>388 848 183</b>

### 3.3 Contribution of gold quality to mining royalties

We note that the first sale of mined products gives rise to the collection of mining royalties, the amounts of which are equivalent to 2% of their value [5]. The reference market value of gold [2] is used as the basis for determining the mining royalties base. Before 2019, the market value was based on the declaration of the invoice of the first sale. The mining Administration in 2019 set the gold market value base at 30.40 USD per gram with a 30% margin [4] [5] [8] [10]. The following table (cf. Table 2) presents the mining royalties from gold exports reported to the Ministry of Mines.

**Table -2** : Mining royalties from gold of Madagascar from 2016 to 2020

(Source: based on ANOR estimate)

Year	2016	2017	2018	2019	2020	Total
Mining royalties 18Kt Gold (\$ US)	802 121	994 639	984 265	831 788	3 777 082	<b>7 389 894</b>

Taking into consideration the different gold purity, the State should collect the amounts of mining royalties presented in the following table (cf. Table 3) from 2016 to 2020. Our method of calculating the withholding of mining royalties referred to the international market price of gold at the time of the study as the market value (cf. Table 1) with a margin reduced by 30%.

For 18Kt gold:

- If the market value is based on the declaration of the invoice of the first sale or on the amount of the base fixed by the administration, the State collects lesser mining royalties amount (cf. table 2)
- If the market value is based on the international market price of the gold, the state receives a higher mining royalties amount (cf. table 3).

**Table -3:** Mining royalties estimate per gold 18Kt, 20Kt, 22Kt and 24Kt from 2016 to 2020

Year	Gold production per annum ( kg)	Mining royalties per Gold Karat (\$ US)						
		18Kt	20Kt	Gap 20Kt- 18Kt	22Kt	Gap 22Kt-18Kt	24Kt	Gap 24Kt-18kt
2016	584,00	182 107	202 260	20 153	222 656	40 549	242 567	60 460
2017	2 834,00	877 454	974 558	97 105	1 072 833	195 380	1 168 768	291 315
2018	3 051,72	1 021 039	1 134 034	112 995	1 248 391	227 351	1 360 024	338 985
2019	2 423,00	970 921	1 078 370	107 449	1 187 113	216 192	1 293 267	322 346
2020	1 938,00	1 035 472	1 150 064	114 592	1 266 037	230 565	1 379 248	343 777
<b>Total</b>	<b>10 830,72</b>	<b>4 086 993</b>	<b>4 539 287</b>	<b>452 294</b>	<b>4 997 030</b>	<b>910 037</b>	<b>5 443 875</b>	<b>1 356 882</b>

On the respective annual gold quantities (see Table 3), the mining royalties amounts differ according to the percentage of gold purity. The mining royalties value increases with the gold purity from 18Kt to 24Kt.

To use an example, in 2016, for 584 kg of gold, the estimated mining royalties for 18Kt purity gold gives a value of 182 107USD. Gold of 20Kt purity, the amount of mining royalties is 202 260 USD while for 22Kt gold purity, the value of mining royalties is estimated at 222 656 USD. And for 24Kt gold, the amount is up to 242 567 USD. A price increase of 25% of mining royalties is noted for export of 24Kt titled gold compared to the price of 18Kt,

which is the equivalent of 60 460 USD. For the year 2016 to 2020, the 25% mining royalties is estimated approximately to 1.36 million USD.

**Table -4** : 18Kt gold royalty gap based on market values (2016-2020)

Year 2016-2020	Mining royalties 18Kt Gold (\$ US) (cf.tab 2)	Mining royalties 18Kt Gold (\$ US) (cf.tab 3)	Gap (\$ US)
<b>Total</b>	3 777 082	4 086 993	<b>309 911</b>

The table 4 presents the difference of amount between two market values for gold 18Kt which is evaluated at 309 911 USD.

#### 4. CONCLUSIONS

First, despite artisanal mining and seasonal gold activity in Madagascar, which generally stop during the rainy season, the annual export statistics of gold declared at the State's service reveal still a significant boost in gold production of 580 kg and 3 000 kg during the period 2016 to 2020.

Moreover, the study showed that the national gold market price is steered by the world market since they are continuously aligned. Although the world economy was affected by the health crisis, gold remains a safe haven. From the year 2016 to 2020, gold has been increasing in value from 22USD to 39USD per gram, an increase of about 75%.

Also, our work has allowed us to specify multiple factors, such as spatial and temporal, the operating costs/production which are pressuring national prices to fluctuate. However, in order for Malagasy gold to be fairly valued and competitive on the world market, the factors that would give it a decisive push in value are identified as the quantity and the quality of gold produced.

Additionally, this study permitted to verify that the selling price of gold varies according to its purity. At the same time, we could state a direct proportion between the value of mining royalties and the purity of gold from 18Kt to 24kt. An increase in mining royalties amount that could go up to 25% is estimated for an export of gold of 24Kt purity, which is approximately 1.36 million USD.

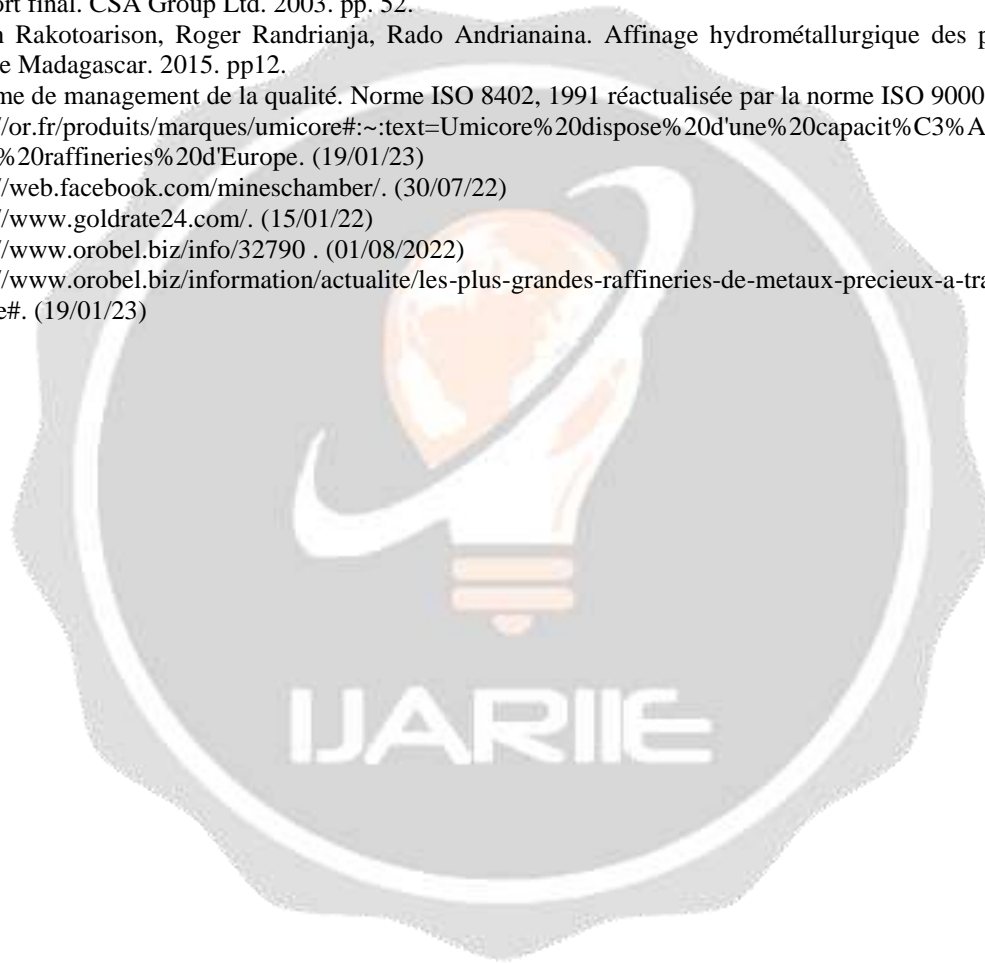
Finally, mining royalties depend on the market value of gold which is the basis for withholding mining royalties. From 2016-2020, a gap of 309 911USD is found in our study between the method of calculating the market value based on the declaration of the invoice of the first sale or the market value set by the Administration, and the one based on the international market price of gold. Following our comparative approach, we could confirm that calculating mining royalties based on the market value in reference with the international market price of gold is economically more profitable.

From a national perspective, as often observed in other gold producers countries, enhancement of the quality of gold production would be conditioned by the existence of a refinery which including the level of technology available, the capacity of local gold miners and the legal framework regulating the mining sector implemented in Madagascar.

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**BIOGRAPHIES (Not Essential)**

	<p>Ramefivololona Hanitra Lalaina is currently a 3rd year PhD student. Her academic background is specialized in Earth Sciences. Currently, she is continuing her research of thesis in the gold sector.</p>
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	<p>Dr. Razanakoto Thierry is economic Researcher and disaster Risk Reduction &amp; Climate Change Adaptation Specialist. Among his fields of competences are small scale fisheries, marine and coastal resources, resilience, vulnerability, rural development-environment, migration.</p>
	<p>Dr. Rakotomalala Herindrainy Olivier is a lecturer researcher at Polytechnic School. He has more than 20 years of experience in the mining sector and was Public Relation Director at Pan African Mining Corp. Currently, he is the Minister in charge of mining in Madagascar.</p>