International Journal of Social Sciences and Management Review

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

STATISTICAL MODELING OF WOMEN COUNT AND QUARRYMEN'S WAGE IN BURUNDI

DIDACE NTIRAMPEBA[1], OSUALD NGENDAKUMANA[2], ETIENNE BARAHINDUKA[3], JEAN DE DIEU NKURUNZIZA[3], FLEURY HABONIMANA[2]

[1]Gold Slag Processing Company in Burundi, [2]Institute of Applied Statistics of University of Burundi

[3]Higher Normal School of Burundi

https://doi.org/10.37602/IJSSMR.2024.7618

ABSTRACT

Introduction

For many years, the quarries have begun to be extracted in the world [1]. Humans have used stone for building, whether it was for monuments, religious buildings or houses [2]. In Burundi, quarrying began even before the era of colonization [3]. Until this time, the quarries are still being mined. From 2016, Burundian government has created an office called Burundian Office of Mine and Quarries (Acronym OBM) whose target was to control the quarries' extraction and till this time it's still working. However, eventhougth the quarrying work seems to be underestimated, it feeds a portion of Burundian population [4]. Indeed, this investigation have been conducted in order to compare the living standard of the artisans in quarrying, realize what proportion of women working in quarries, its causes and at the end evaluate the quarries' wage.

Methodology

This investigation involved nineteen sites and eighty six artisans in quarrying from two regions including west and north. A quastionnaire was used in order to determine the satisfaction of the quarries' living standard, their wage and the number of women artisans in quarrying. We have used a non-probability sampling method due to the lack of the current database. Indeed, the artisans in quarrying surveyed, were found by using the volunteer sampling method. A count and ordered logistic model was built in order to modelize the number of women artisans in quarrying and also the quarrymen's wage respectively.

Results

After data collection, we have found that men are very numerous in quarry mining. Of eighty six artisans in quarrying surveyed, they fill eighty four percent (84%). The number of women is statistically lower than the number of men extracting quarries. Eighty two percent (82%) manage to meet their basic needs from income from quarrying, sixty-six percent (66%) are satisfied by their job. Indeed, a site manager' gender, total number of artisans and shareholders influence positively the number of women in quarrying but the quarrymen's age influence it negatively. A quarryman's wage increase with his age.

Conclusion

 Copyright © The Author, 2024

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

Through this study, it was found that quarrying has become a source of income for many. Although this profession requires a lot of physical strength, quarry workers are generally satisfied with it and with the income received, they manage to meet their basic needs in addition to income from agriculture. They claim that the income from this sector does not allow them to have a high standard of living than farmers and civil servants because of the lack of advanced technology for quarrying, they still exploit it manually. Thus, this lack deprives them of a significant production from which they cannot have a high standard of living.

1.0 INTRODUCTION

A quarry is defined as a space where are extracted rubble, sand, clay, gravels But otherwise, it's a kind of mine used for building houses which is open to the Earth's surface [1].

Quarries have been extracted many years ago in the purpose of pyramids construction by the Egyptians elders using the limestone and granite blocks [5]. The Romans also often forced their slaves and criminals to do the extremely difficult work of extracting quarries [6].

Even the country that did not use quarries for building, they used to create them. For example, the Lakota culture of the Midwest region of the U.S and Canada did not use stone for building monuments or houses. But a site in Pipestone National Monument, in the U.S. state of Minnesota, used to quarry stone for making calumets, or ceremonial smoking pipes[1]. Rubbles had to be carried or dragged out of quarries manually. Stones could also be hauled with pulley systems involving ropes and moveable wooden tracks or sleds. This process often involved thousands of workers [7].

Sand mining took off only decades ago. The method of extraction depends on where the sand is located. On land or along rivers, it is often dug up with backhoes, shovels or bare hands. Along coastlines, miners use dredging boats or suction pumps [8].

Nowadays, people use many developed technics to extract quarries, including drilling equipment, blasting equipment, and hauling equipment. Industrial drills with diamond tips are another technic for cutting into hard rock. After quarry extraction, the extracted quarries have to be transported by enormous mining trucks to the place of use.

In Burundi, longtime ago when the quarries started to be exploited. Before the era of colinization, our elders used to extract the clay to make the pots for cooking their foods but not for making the bricks as it is done nowadays. But today, quarries are more important in constructing houses. From 2016, Burundian government have set up an office named Burundian Office of Mine and Quarries (acronym: OBM) and inserted it to the ministry of hydraulics, mine and quarries in order to manage the exploitation of natural ressources such quarries, mines, Eventhough this activity is known as very simple, it feeds some of Burundian population but many of them are men. This investigation was carried to know how the quarries artisans esteem their living standard and how are they satisfied by their work. The main purpose is to evaluate the women proportion and identify its causes but also evaluate the factors which influence the quarrymen's wage in general. Although the gouvernment wanted to raise up this sector, nevertheless, it still remains to the older mining technology than other countries but we

[1] Calumets, made of a type of metamorphic rock called catlinite or pipestone

 Copyright © The Author, 2024

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

expect that in the future it will be developped so that it will contribute to the growth of the Burundian economy.

2.0 METHODOLOGY

As it is noticed in the introduction, we'd like to know how the quarries artisans appreciate their job and how do they estimate their living standards by comparing themselves to employees who do other jobs. Indeed, we have chosen only two regions including North and west as target population[2]. However, as we want that our main purpose would be achieved, we needed quantitative[3] and qualitative[4] data. Also, we have gathered experimental data by controlling and manipulating variables in the quastionnaire so that the surveys might understand very well the questions and give the answers comfortably.

Likewise, a non-probability sampling method have been used due to the lack of current database[5]. Then our target population was the quarries artisans who deal into north and west regions. In order to calculate a sample size[6], we employed the following formula:

$$n \geqslant \left(\frac{z}{m}\right)^2 p(1-p)$$

where:

- n = sample size

- z = critical z score for $\alpha = 0.05$

- m = error rate (0.1)

- p = esteemed proportion that presents studied caracteristic. Here it's still not known then we have used p = 0.5

With that formula, the sample of nineteen sites and eighty six quarriers was found. In order to find the quarrymen to be surveyed, not having a database, the volunteer sampling method was used and the judgemental sampling have been used in the choice of sites. We have designed the questionnaire using Cspro and some of the questions were direct others indirect, some categorical others numerical. This survey was conducted using smartphone and in average one participent took five up seven minutes to answer all questions. As it is mentionned above, we have used the categorical and numerical variables, the numerical variables have been measured referring to the sellinghood of quarries, for example as the rubble are sold by skip, a measurement unit used was skip. This investigation consisted of seventy one variables in which four was multiple-choice variables and it was conducted by two invistigators in collaboration with OBM. The focus group was formed in order to understand the reason why there are fewer

[2] In statistics, a population is the pool of individuals from which a statistical sample is drawn for a study. Thus, any selection of individuals grouped together by a common feature can be said to be a population.

[3] expressed in numbers

[4] expressed in words

[5] the list of all the quarries artisans of the sites which are in north and west

[6] A sample is a statistically significant portion of a population, not an entire population

 Copyright © The Author, 2024

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

women in this profession of quarry' extraction and the main problem which they meet several times. In average, an interview took five to seven minutes.

However, after data collection, the third stage of data purification was started. As we had quantitative and qualitative data, we have begun to checking the missing data and the purification methods were used trying to juggle with them. After we had to remove the outliers and transform some variables. The fourth stage of actuel analysis was followed, we have used stata in data processing; one, two tailed t-test and logistic regression have been used to quantitative data processing. For qualitative data, the specific methods was used including:

- Content analysis: categorizing and discussing the meaning of words, phrases and sentences.
- Thematic analysis: coding and closely examining the data to identify broad themes and patterns.
- Discourse analysis: studying communication and meaning in relation to their social context.

In order to achieve our goals, the following statistical modeling have been used:

- Count logistic regression in order to model the number of women artisans in quarrying;
- Ordered logistic regression in order to model the quarry artisans' wage.

For modeling the number of women artisans in quarries, the following variables have been used: Type of quarry which is exploited, the province where the site is located, its enveronment, gender of the site manager, total number of shareholders, number of women shareholders, and number of young and old shareholders.

For modeling the quarry artisans's wage, the following variables have been used:

young quarrier or not, gender of the quarrier, his age, his marital status, his educational level, his status in the site, his category and type of quarry operated.

3.0 RESULTS

We have summarized the sociodemographic characteristics of surveyed craftsmen in Table 1. Of 86 craftsmen surveyed, 74.42% were young(Less than 35 years old), 59.30 % had primary or basic level, 25.58% had secondary or post-basic level; Women occupied a portion of 16.28%. Using a variance ratio test, the number of women artisans in the quarries varies from one site to another than the number of men. However, in order to know that the number of women artisans in quarrying is actually lower than the number of men artisans in quarries which was our null hypothesis, we carried out the two sample t test with unequal variances and we found the following results:

$Pr(T < t) = 0.0345$.

Indeed, we can affirm that the number of women is lower than the number of men artisans in quarries by that test above. A large portion of men(42.25%) earn a wage varying between 5000

 Copyright © The Author, 2024

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

and 10000 Burundian francs while a large portion of women(50%) earn a wage of less than 5000 Burundian francs. A large portion of kids under 18 mine clay (58.33%).

Table 1: Sociodemographic determinents

Determinant	n	Frequancy
Age		
Less than 18 years old	12	13.95%
Between 18 and 35 years old	52	60.47%
More than 35 years old	22	25.58%
Gender		
Male	72	83.72%
Female	14	16.28%
Level of education		
Primary	51	59.30%
Secondary	22	25.58%
University	1	1.16%
No level	12	13.95%

Table 2 summarizes the level of satisfaction of quarrymen, indeed, 82.56% manage to satisfy their basic needs using the quarry income, 66.28% are satisfied by their job, 41.86% esteem that they have a better standard of living compared to farmers, 15.12% esteem that they have a better standard of living compared to civil servants.

Table 2: Quarrymen satisfaction

Determinant	n	Frequancy
Quarrymen satisfaction of their basic needs		
Yes	74	82.56%
No	15	17.44%
Quarrymen satisfaction of their profession		
Yes	57	66.28%
No	29	38.72%
Quarrymen satisfaction compared to farmers		
Yes	36	41.86%
No	50	58.14%
Quarrymen satisfaction compared to civil servants		
Yes	13	15.12%
No	73	84.88%

We have tested the relationship using the pearson test with which we have found the results below:

There is a link between a quarry artisan's wage and his gender, his age (kid or not), his level of education and his category at work but no relationship between the quarry artisan's wage and whether he is young (less than 35 years old) or not, his status and the quarry exploited.

3.1 Econometric modeling

 Copyright © The Author, 2024

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

As it is noticed into the methodology, we have modelized the number of women mining in the quarries by a count logistic regression so that we could know the main reasons which influence its weakness. Also the quarries craftemen's wage was modelized in order to understand the factors which influence it and we have used an ordered logistic regression. However, in this section, we have done the actual medelization with wich we have begun to modelize the number of women operating in the quarries and after the quarries craftemen's wage.

3.2 Modelization of the number of women mining in the quarries

Table 3: Count logistic model's coefficients

Explanatory variables	Coef.	P> |Z|
Type of quarry exploited	-.0480	0.531
Gender	.7045	0.055***
Region	-.0794	0.827
Environment	.0289	0.870
Total number of shareholders	.1317	0.000*
Number of women shareholders	-.0776	0.204
Total number of quarries artisans	.0199	0.000*
Number of young shareholders	-.1795	0.000*
Number of old shareholders	-.0463	0.068***
_cons	.2111	0.736

* mean that the coefficient is sagnificant at one percent
** mean that the coefficient is sagnificant at five percent
*** mean that the coefficient is sagnificant at ten percent

The model shows that a site that has a woman manager is probably to have 70.45 percent more women count, An increase of one shareholder over the total number of shareholders increases the average number of women quarriers by 13.17 percent, an increase of one quarrier out of the total number of quarriers increases the average number of women quarrier by 1.99 percent, an increase of a young shareholder over the total number of shareholders decreases the average number of women quarriers by 17.95 percent,an increase of one old shareholder over the total number of shareholders decreases the average number of women quarrier by 4.63 percent.

Table 4 summarizes the marginal effects of our model, it shows that a site that has a woman manager is probably to have 3.9657 more women count, an increase of one shareholder over the total number of shareholders increases the average number of women artisans in quarries by 0.7417, an increase of one quarrier over the total number of quarries artisans increases the average number of women artisans in quarries by 0.1124, an increase of a young shareholder over the total number of shareholders decreases the average number of women artisans in quarries by 1.0104, an increase of one adult shareholder over the total number of shareholders decreases the average number of women artisans in quarries by 0.0463.

Table 4: Count logistic model's marginal effects

Explanatory variables	dy/dx	P> |Z|

 Copyright © The Author, 2024

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

Type of quarry exploited	-.2705	0.534
Region	-.4473	0.827
Environment	.1627	0.870
Gender	3.9657	0.055***
Total number of shareholders	.7417	0.000*
Number of women shareholders	-.4371	0.205
Total number of quarries artisans	.1124	0.000*
Young shareholders	-1.0104	0.000*
Old shareholders	-.2610	0.065***

3.3 Modelization of the quarrmen's wage

Table 5: Results of ordered logistic model 1

Base outcome: model's coefficients		
*Explanatory variables	Sample (86)	
	Coef.	P> |t|
Age (Reference: <18 years)		
Under 35 years	1.713	0.055***
Older than 35 years	2.428	0.011**
Gender (Reference: Male)		
Female	-.133	0.842
Educationnal level (Reference: Primary)		
Secondary level	.555	0.351
University level	1.962	0.303
No level	-.511	0.468
Status (Reference: Monthly)		
Daily	-1.345	0.466

 Copyright © The Author, 2024

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

By production	-1.097	0.159
Quarry exploited (Reference: Sand)		
Ruble	.849	0.375
Gravel	.849	0.420
Clay	-.554	0.467

These found results mean that:

Being between 18 and 35 years old increase the probability of having a very high daily wage than being under 18 years old, likewise, being older than 35 years increase the probability of having a very high daily wage than being under 18 years old.

Table 6: Results of ordered logistic model 2

Model's Marginal effects		
*Explanatory variables	Sample (86)	
	Coef.	P> |t|
wage of less than 5,000 per day		
Gender	.013	0.928
Age	-.241	0.008***
Educational level	-.004	0.937
Status	.154	0.060***
Quarry exploited	.070	0.148
wage between 5,000 and 10,000 per day		
Gender	-.005	0.928
Age	0.091	0.077***
Educational level	.001	0.937
Status	.058	0.139
Quarry exploited	0.026	0.216
wage between 11,000 and 20,000 per day		
Gender	-.007	0.928

 Copyright © The Author, 2024

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

Age	.0180	0.091***
Educational level	.002	0.937
Status	-.079	0.069***
Quarry exploited	-.036	0.153

More the age of a quarrymen increases, more he has 24.1% chance of having a daily wage of less than 5,000 Burundian Francs. A quarryman's status increases 15.4% chance of having a daily wage of less than 5,000 Burundian Francs. More the age of a quarrymen increases, more he has 9.1% chance of having a daily wage between 5,000 and 10,000 Burundian Francs.

More the age of a quarrymen increases, more he has 1.8% chance of having a daily wage between 11,000 and 20,000 Burundian Francs. A quarryman's status increases 27.19% chance of having a daily wage between 11,000 and 20,000 Burundian Francs.

4.0 DISCUSSION

In general, the craftspeople in the context of this investigation are satisfied with their work. Significant satisfaction can be observed in the artisanal quarry workers exploiting the sand. No woman earns a salary of more than 10,000 Burundian Francs; men have relatively higher wages than women. This difference is observed above all by the fact that artisanal quarrymen are paid by production and that this work requires a lot of physical strength with wich women have not.

Another category that has a low salary is the category of kids. Indeed, kid labor is observed in the quarrying sector and, the greatest number is noticed in the exploitation of clay with the manufacture of bricks. The main cause of this large number is that with the dry season, a period of heavy exploitation of clay, which coincides with the holidays, most children resort to this work to afford school materials or for occupy themeselves during the holidays. Likewise, the greatest number of the women artisans in quarrying is noticed in the exploitation of clay with the manufacture of bricks than other quarries. This is explained by the fact that the clay mining takes place during the dry season (June, July, August), when there is not much work in the households so the women used to transport the bricks from where they were made towards the ovens.

We also note that most of the artisans are young people under 35 years old. This is explained by the fact that this profession requires a lot of strength and that it is the young people who are much stronger physically.

Also, many of the artisans have the primary or fundamental level. This follows from the fact that, the craft of an artisan in quarrying does not require having a high level of study only physical strength and experience is the most valued.

Among the factors of the number of women on a career site, we note that the environment, the number of adult and young shareholders influence it. Indeed, in rural areas, due to low job diversity, women are most interested in the quarry sector to supplement income from

 Copyright © The Author, 2024

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

agriculture. Among the declared causes of women's disinterest in working in the quarry sector, the strength required in this sector comes first. Indeed, women sometimes underestimate themselves and also because of the Burundian culture which wants women to do the household works such as cultivating the fields, raising children and doing other simple housework. These are other reason of women's disinterest in working in the quarry sector.

5.0 CONCLUSION

Recently, the government of Burundi has been carrying out activities aimed at developing the quarry sector. From these activities, the added value that the artisan carrier draws from them seems to be a framework for reflection. The present investigation therefore wanted to inquire about the impact of these noble activities of the state on the artisan quarry. The main objective was to find out whether the quarry artisans are satisfied with the income that they derive in this sector and to assess the level of production and the prices of quarries. It was also to know the place of women and young people in the sector.

Through this study, it was observed that the quarry sector constitutes for many a source of income. Artisans are generally satisfied with their work and with the income received, they manage to meet their basic needs in addition to the income from agriculture.

They claim that the income from this sector doesn't allow them to have a higher standard of living than farmers or than civil servants.

In the pricing of the payments to be made (royalty area, grant or renewal of the exploitation permit), the taking into account of the type of quarry to be exploited would be necessary as it is applied for minerals. As it has been noticed by a low number of women artisanal quarrymen, we recommend encouraging women who exploit the quarries to finally attract other women to work in this sector, to civilize them, not to be attached much to customs, sensitize families not to deprive them of going to exploit quarries; Improve the quarry sector in order to raise production. Since clay can be mined for only three months, we recommend increasing its mining space so that the production would be as best as possible and that the income would increase at the same time because it is mined only in dry season. We recommend that in these types of study, probability sampling methods would be favored and that it covers a large number of sites and quarry workers.

REFERENCES

Barber, M., Field, D., Topping, P., 1999. The Neolithic Flint Mines of England. Englishà¸ Heritage,Swindon.

Quarrying and mineral extraction, charitable Trusts climate change for parents young, yeovil innovation centre, barracks close, copse road, yeovil, BA22 8RN.

Bonvin, Jean. Social Attitudes and Agricultural Productivity in Central Africa, 1986, Daniels, Morna, compiler. Burundi, 1992. https://www.everyculture.com/Bo-Co/Burundi.html ixzz7IKID3VA6

 Copyright © The Author, 2024

Volume: 07, Issue: 06 November - December 2024

ISSN 2582-0176

Review of the Burundian Artisanal Gold Mining Sector, the International Peace Information Service (IPIS), April 2015.

Curran, Brian A., Anthony Grafton, Pamela O. Long et Benjamin Weiss, Obelisque: une histoire. Cambridge, Massachusetts: MIT Press, 2009. ISBN 978 0 262 51270 1.

Michael D. Gunther, Glossaire et index de (principalement) l'art asiatique, vieilles pierres: les monuments de l'histoire de l'art archive de l'orginal le 5 avril 2007.

Quarry Nationnal Geographic Society,National Geographic Headquarters 1145 17th Street NW Washington, DC 20036, https://www.nationalgeographic.org/encyclopedia/quarry.

Marco Hernandez, Simon Scarr and Katy Daigle, Earthrise, The messy busness of sand mining explained, Maxar Technologies, Airbus, Landsat, NASA.

Barkai,R.,2002.Towards a methodology of Neolithic and Chalcolithic bifacial tool analysis. NeoLithics 1/02, 3.

Barkai,R.,2005.Flint and Stone Axes as Cultural Markers: Socio-Economic Changes as Reflected in Holocene Flint Tool Industries of the Southern Levant. Studies in Early Near Eastern Production, Subsistence, and Environment 11, Ex Oriente, Berlin.

 Copyright © The Author, 2024