

Ministry of Agriculture Fisheries and Mining

COST OF PRODUCTION APPLICATION VERSION 1

User Manual

Prepared By

Minerals Policy and
Development Division

September 2023

138H Maxfield Avenue
Kingston 10

Understanding the Dash Board

1. Introduction	2
2. Cost of Production Methodology.....	3
Production Cost.....	3
Total Revenue, Total Cost and Profit	4
Production and Costs	5
Fixed Costs and Variable Costs	5
Average Cost	5
3. Installation and Setup	5
4. User Interface	7
General Information	7
Quarry COP Data Requirement.....	8
1. Quarry Type :.....	8
2. Fuel Calculation Cost :.....	9
3. Processing Equipment Cost (Crushers):.....	10
4. Direct Production Cost: Daily Maintenance.....	10
5. Direct Production Cost - Wages	10
6. Routine Production Cost Lump Sum or Detail-Mobil Equipment Maintenance:.....	12
7. Routine Production Cost – Crushing Equipment	12
8. Other Routine Monthly Production Cost.....	12
9. Periodic Maintenance Tyres and Batteries	12
10. Other Periodic Cost.....	12

1. Introduction

The production of industrial minerals is widely exploited in Jamaica and is mainly used to produce aggregates for the construction Industry. On an annual basis Jamaica produces industrial minerals valuing between J\$5-7billion. This subsector generates approximately US\$3.5million in terms of export earnings. It also employs some 1,800 persons directly and it is estimated that another 7,000 jobs are created indirectly.

In addition to the construction industry the industrial minerals sub-sector has strong linkages with the local manufacturing sector. It provides a wide range of intermediate material for the production of paint, thin-set cement, cement, fertilizer, animal feed and lime which is used in the manufacturing of alumina and sugar.

Despite the economic importance of this industry, within in most quarry operations no structured mechanism is in place to monitor and determine actual production cost. **The main purpose of the application is to calculate the daily cost of production to produce a tonne or a yard of material.**

This will assists quarry operator to determine the economic viability of his or her operation and importantly the benefits of developing a robust cost of production model will:

- Assist in evaluating and monitoring the profitability of individual operations
- Assist in providing more accurate information to lending institution in accessing loans for the sector
- Determine the economic feasibility of purchasing a significant piece of equipment
- Enable operators to more accurately determine the impact of changes in operating costs on profit.
- Able to develop efficiency parameters.
 - $COP < \text{Selling Price of Product}$: Profitable
 - $COP = \text{Selling Price of Product}$: Breakeven
 - $COP > \text{Selling Price of Product}$: Making a Loss

2. Cost of Production Methodology

Production Cost

This section presents the methodology for calculating the cost of production. A company's expenses from manufacturing a product or providing a service are called production costs. This is the cost of producing the good or service before any profits are added. Companies make decisions about prices and quantities based on the market conditions that they face.

Production costs are all expenses incurred by the company that is directly associated with manufacturing the goods. The total cost of a job includes costs for raw materials, direct labor, and overhead. For this application, production cost includes all the expenses incurred by a Quarry that is associated with the extraction and production of industrial materials.

Calculating the cost of production is very important because it helps to set the product's retail price and estimate the net profit on sales.

For this application, the process costing methodology was utilized. This method involves the accumulation of all cost (Total Cost) divided by total output over a given period (*a day in the case of this application*).

The total product cost formula is *Total Product Cost = Cost of Raw Materials + Cost of Direct Labor + Cost of Overhead*.

- Cost of Raw Materials = expense paid to extract or purchase raw materials needed to manufacture a product.
- Cost of Direct Labor = salary or wages paid to workers who are directly associated with the extraction and production process, such as the quarry workers.
- Cost of Overhead = other expenses that are paid for office space and equipment maintenance, repairs, insurance, taxes, utility bills, and salary of office workers and management.

Costs are sometimes represented in terms of fixed costs and variable costs. Overhead expenses are mostly fixed, while raw materials and labor costs are variable. Fixed costs are constant, while variable costs are dependent on work hours or the number of units produced. The total cost of the product is determined by adding these costs together.

After calculating the total cost of the product, this value is then divided by the number of units produced to get the production cost per unit. This measure is used to determining the break-even sales price or the minimum price that the company should sell its product.

- *Production Cost per Unit = Total Production Cost/Total Number of Units Produced*

Production cost per unit is the value at which the industrial material's price setting should be based. If the industrial material's sales price is set higher than this price value, the company will generate profits. The company will incur losses if the sales price is set below this price value.

For this application, costs are divided into three main categories, namely:

- 1) Direct Cost
- 2) Routine Cost
- 3) Periodic Cost

Direct Costs are costs incurred on a daily basis. These include daily wages paid to workers, fuel costs for mobile equipment, haul trucks and crushing plant costs.

Daily use of lubricants and engine oil top up for all equipment

Routine Maintenance Costs are costs incurred over a period of 3 - 6 months. These include the maintenance costs for all equipment.

Routine Monthly Cost: Rent, Loans, Electricity, Security, Water, Office Expense, Salaries

Periodic Costs are costs incurred 6 months and over. These include maintenance cost for changing tyres for the trucks and front-end loaders, and the cost of changing batteries quarry tax, blasting and depreciation.

$$\text{Total Cost} = \text{Direct Cost} + \text{Routine Maintenance Cost} + \text{Routine Monthly Cost} + \text{Periodic Costs}$$

$$\text{Cost of Production per tonne} = \text{Total Cost per day} / \text{Total Unit Produce per day}$$

$$\text{Profit per tonne of material} = \text{Selling price per tonne} - \text{Cost of Production per tonne}$$

Total Revenue, Total Cost and Profit

Total Revenue is the total income that is obtained from selling goods or services to a buyer. This is the total income a quarry operator receives for the sale of its industrial material.

Total Cost is the total expense incurred by the quarry operators in reaching a particular level of output, which is the sum of fixed and variable costs. For the purpose of this survey, this is the total of Direct Cost, Routine Cost and Periodic Costs.

Profit is total revenue minus total cost.

Production and Costs

The production function is the relationship between quantity of inputs used to make a good and the quantity of output of that good.

Fixed Costs and Variable Costs

Fixed costs are costs that do not vary with the quantity of output produced. These include security, salary, loan payment, building and land maintenance, rent/lease and quarry license renewal.

Variable costs are costs that do vary with the quantity of output produced. Fixed costs are often unavoidable in the quarry operations, while variable costs are avoidable. These include labour wages, energy cost-fuel usage, power supply, maintenance cost (spares and labour), government taxes and royalty, drilling and blasting, other miscellaneous cost and asset usage.

Average Cost

Average total cost is total cost divided by the quantity of output.

Average fixed cost is fixed costs divided by the quantity of output.

Average variable cost is variable costs divided by the quantity of output.

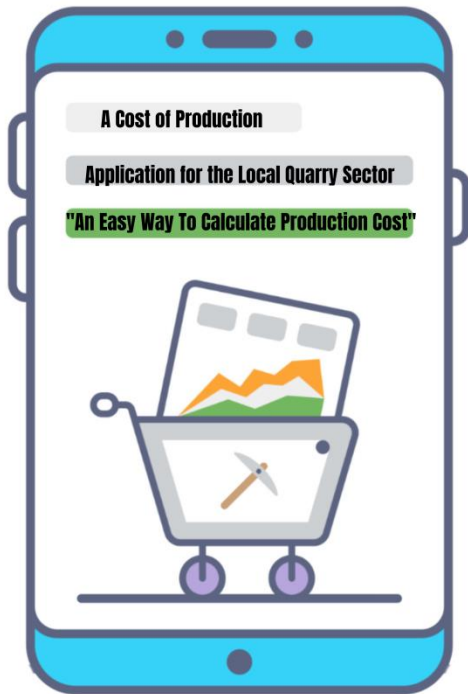
3. Installation and Setup

Step-by-step guide for installing the app

Installing the QuarryCOP app from the Google Play Store (Android):

- On your Android device, open the Google Play Store app.
- Tap the search bar at the top of the screen and type "QuarryCOP" to find the app.
- From the search results, select the QuarryCOP app with the appropriate logo and developer

QUARRYCOP



- On the app's page, review the app's description, screenshots, reviews, and ratings to ensure it's the desired app.
- Tap the "Install" button. You may be prompted to grant permissions to the app, such as accessing your device's camera or location.
- Once the installation is complete, the "Install" button will change to an "Open" button. Tap it to launch the QuarryCOP app, or find the app's icon on your home screen or app drawer.

Installing the QuarryCOP app from the Apple App Store (iOS):

- On your iOS device, open the App Store app.
- Tap the search icon at the bottom of the screen and enter "QuarryCOP" in the search bar.

- From the search results, select the QuarryCOP app with the appropriate logo and developer.
- On the app's page, review the app's description, screenshots, reviews, and ratings to ensure it's the desired app.
- Tap the "Get" or "Download" button. If prompted, authenticate using Face ID, Touch ID, or your Apple ID password.
- The QuarryCOP app will start downloading and installing on your device. Once the installation is complete, the "Get" or "Download" button will change to an "Open" button.
- Tap the "Open" button to launch the QuarryCOP app, or find the app's icon on your home screen or in the App Library.

Please note that the steps provided above may vary slightly depending on the specific version of the operating system or the device you're using.

4. User Interface

Sign in Page : Provide an email address and a password







General Information

This is the first screen that is shown from the application and will be requesting some basic contact and location information and the major challenges facing sector.


All information provided will be confidential and only be accessible to the relevant Ministry Staff.

Quarry COP Data Requirement

1. Quarry Type :

11:10    •    59%

← Ministry Of Transport and ...

 1. Quarry Type


Choose a unit type ▾


How many days per week is your plant in operation? ▾


Please Choose Type of Processing System ▾


Please Choose a Mineral ▾

Next

 2. Fuel Calculation

 3. Processing Equipment Cost

 4. Direct Production Cost - Maintenance

 5. Direct Production Cost - Wages

Submit

||| ○ <

- **Chose a Unit Type:** this refers to the unit of measurement the product is sold either **tonnes or Yards**
- How many days per week is your plant in operation : This information is required for the calculation of daily cost of production; Chose number of days per week your plant is usually in operation
- Please select the type of processing system used :Chose one from the generated list-
 - Multiple Crushing Plants
 - No Processing or Simple A Frame
 - Mechanical Sieve
 - Single Crushing Plant
- Main Type of Mineral produce : Chose one from the generated list-
 - Silica Sand
 - Marble
 - Gypsum
 - Marl and Fill
 - Pozzolan
 - Skid Resistance Aggregate
 - River Sand and Gravel
 - Shale
 - Clay
- Tonne or Yard per day : This is the amount of material your plant produce on a typical day. **This information is mandatory.** After the data is entered you can select **done.**

After selecting done two options will be available **Next or Submit**

If **submit** is chosen a **Quarry Summary** page will come up showing the overall total cost of production as well as the individual cost of production for a particular item.

Do not save the data until you complete inputting all the information. Once the data is saved it cannot be edited.

Press the back arrow key at the top of the page to continue your data entry

Next will carry you to the following cost item to be completed.

2. Fuel Calculation Cost :

- Chose Unit of measurement either Gallon or Liter
- The price per unit of measurement chosen

- Lump Sum : This option allows for the input of the total amount of fuel used by all the mobile equipment combine on a typical day
- The detail option allows for the input of fuel usage by individual equipment.

3. Processing Equipment Cost (Crushers):

- The selection allow to choose between diesel or electrical crushing equipment
- If the selection is diesel you are required to input the fuel usage for the day.
- If the selection is electric you are required to input the electricity cost to operate the crusher for the day

4. Direct Production Cost: Daily Maintenance

- Lump Sum; Lump sum cost for daily maintenance of all mobile and crushing equipment or
- Detail- Daily maintenance cost would include:
 - lubricants for mobile equipment
 - Engine oil top-up
 - Crushing Plant
 - Other daily cost

5. Direct Production Cost - Wages

- Monthly : The wage bill for monthly paid workers for the month
- Fortnightly : The wage bill for fortnightly paid workers per fortnight
- Weekly : The wage bill for weekly paid works per week
- Daily : The wage bill for daily paid workers per day

← Ministry Of Transport and ...

-  2. Fuel Calculation
-  3. Processing Equipment Cost
-  4. Direct Production Cost - Maintenance
-  5. Direct Production Cost - Wages
-  6. Routine Production Lump Sum Cost - Mobile Equipment Maintenance
-  7. Routine Production Cost - Crushing Equipment Maintenance
-  8. Other Routine Monthly Production Cost
-  9. Periodic Maintenance : Tyres and Batteries
-  10. Other Periodic Cost

Submit

6. Routine Production Cost Lump Sum or Detail-Mobil Equipment Maintenance:

- This cost refers to your routine maintenance cost for the servicing of mobile equipment. The frequency of maintenance would be determined by operating hours.
- For simplicity in utilizing this application the operating schedule consists of two time periods 3 month and 6 month respectively.
- The 3 months would capture basic routine maintenance
- The 6 months schedule would include the 3 month maintenance cost plus the additional servicing cost that is required at six months intervals.
- The Lump Sum option will allow you to put the total maintenance cost for all the mobile equipment
- The detail option will allow you to put the maintenance cost for each piece of mobile equipment.

7. Routine Production Cost – Crushing Equipment

- To model this cost in the application you are required firstly to choose the service interval for the crushing equipment in terms of months and secondly the cost to carry out this service.

8. Other Routine Monthly Production Cost

- These costs would include general monthly expenses such as electricity bill to run the office and general compound, loans, rent etc.
- Equipment Rental
- Other Routine expenses for every 3 or 6 months

9. Periodic Maintenance Tyres and Batteries

- You are required give your annual expenditure on tyres and batteries

10. Other Periodic Cost

- Will include other infrequent expenses which you might incur once or twice year such as blasting , quarry license renewal, deprecation and any other such related expenses.

After the completion of the data entry, the information is then submitted and the **Quarry Summary Page** will show the total cost of production per unit of material produce and you can chose to save this information.

← Quarry Summary

Total Cost Per Yard

Total Cost \$646.5769675492731

Quarry Data

Volume 600
Mineral Limestone & Whiting
Type of Quarry Single Crushing Plant
Unit Yard

Fuel Data

Gallon Per Day 235
Fuel Cost \$140
Unit Gallon

Cost Per Yard \$54.833333333333336

Crushing Data

Equipment Electric equipment
Energy Cost 35000

Cost Per Yard \$58.333333333333336



← Quarry Summary

Maintenance Data

Lubricant For Mobile Equipment	5000
Engine Oil	10000
Crushing Equipment Maintenance (Daily)	10000
Other Maintenance (Daily)	15000
<hr/>	
Cost Per Yard	\$66.66666666666667

Wage Data

Monthly	\$700000.0
Fortnightly	\$250000.0
Weekly	\$100000.0
Daily	\$30000.0
<hr/>	
Cost Per Yard	\$150.7513661202186

Other Routine Monthly

Loans	\$200000
Office Rental	\$100000
Equipment Rental	\$100000
Office	\$25000
Security	\$150000
Electricity Bill	\$75000



← Quarry Summary

Routine Maintenance - Mobile Equipment

Three Months	\$500000.0
Six Months	\$800000.0
<hr/>	
Cost Per Yard	\$16.666666666666668

Routine Maintenance Crusher

Cost	\$300000
Months	3.0
<hr/>	
Cost Per Yard	\$5.555555555555556

Battery Data

Machinery	Frontend loader
Cost	\$100000
Years	2.0
<hr/>	
Cost Per Yard	\$0.17757483510908167
Machinery	Haul Trucks
Cost	\$75000
Years	2.5
<hr/>	
Cost Per Yard	\$0.17757483510908167

