INDIAN INSTITUTE OF TECHNOLOGY, MADRAS

BUSINESS DATA MANAGEMENT PROJECT

MID TERM REPORT

Enhancing Mill Efficiency through Data-Driven Insights

Submitted by:
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November 9, 2023

Declaration Statement

I am working on a Project titled “Enhancing Mill Efficiency through Data Driven Insights”. I extend my appreciation to **Subha Sree Rice Mill,** for providing the necessary resources that enabled me to conduct my project.

I hereby assert that the data presented and assessed in this project report is genuine and precise to the utmost extent of my knowledge and capabilities. The data has been gathered from primary sources and carefully analyzed to assure its reliability.

Additionally, I affirm that all procedures employed for the purpose of data collection and analysis have been duly explained in this report. The outcomes and inferences derived from the data are an accurate depiction of the findings acquired through thorough analytical procedures.

I am dedicated to adhering to the information of academic honesty and integrity, and I am receptive to any additional examination or validation of the data contained in this project report.

I understand that the execution of this project is intended for individual completion and is not to be undertaken collectively. I thus affirm that I am not engaged in any form of collaboration with other individuals, and that all the work undertaken has been solely conducted by me. In the event that plagiarism is detected in the report at any stage of the project’s completion, I am fully aware and prepared to accept disciplinary measures imposed by the relevant authority.

I understand that all recommendations made in this project report are within the context of the academic project taken up towards course fulfillment in the BS Degree Program offered by IIT Madras. The institution does not endorse any of the claims or comments.

Signature of Candidate: **(Digital Signature)**

Name: K R NIJANDHAN

Date: 09-11-2023

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1 Executive Summary

This comprehensive document conducts an exhaustive examination of a dataset, encompassing proof of originality, descriptive statistics, analytical methodology, and crucial findings. The dataset, carefully curated by the mill owner, spans supplier and production data from February 2022 to February 2023, offering a detailed account of rice and dal production. Leveraging MS Excel for in-depth analysis, the primary focus centers on evaluating the efficacy of the supplier chain and identifying potential improvements in production planning. The outcomes spotlight challenges inherent in the rice production process. By refining production planning and optimizing the supplier chain, the mill not only addresses production delays but also maximizes profits and ensures punctual deliveries, establishing a robust operational foundation for sustained success.

2 Proof of Originality of Data

After concluding initial discussions with the company owner's son, I engaged in a comprehensive exploration of the project with the proprietor of Subha Sree Rice Mill. During this collaborative effort, we identified challenges in production planning that contributed to noticeable delays in deliveries. Crucial data, encompassing both supplier and production metrics, was meticulously documented in a dedicated notebook. Subsequently, this valuable information underwent a systematic transition, meticulously organized into Excel sheets. It is noteworthy that the company strictly adheres to a no-inventory policy, initiating the procurement and processing of paddy and pulses exclusively upon the receipt of new orders.

Name	Type	Link
Official Documents		
A Letter bearing the company’s letterhead permitting the use of the data	PDF	Link
Pictures of the Company	Images	Link
A Video capturing a brief discussion of the problem statement with the owner of the company	Video	Link
After Data Collection		
Supplier data maintained by the company	Excel Sheet	Link
Production Data maintained by the company	Excel Sheet	Link
Inventory data maintained by the company	Excel Sheet	Link
Combined data for analysis	Excel Sheet	Link

Table 1: Documents to show the originality of the data

3 Metadata and Descriptive Statistics

After a detailed discussion with the mill's owner, Mr. Purushothaman, a comprehensive Excel sheet compilation has been carefully carried out. These sheets capture the finer aspects of supplier information, production parameters, and the company's financial results, including earnings. The presentation that follows in Table 2 provides a detailed overview, providing a detailed analysis of every attribute in this unique dataset.

Column Name	Datatype	Description
Supplier Data		
Supplier	Categorical	The name of the Supplier
Purchase Date	Date	The date when a purchase was made from the supplier.
Variety	Categorical	The variety of dal or rice purchased
Purchase Quantity	Numerical	The quantity of the variety in kilograms purchased.
Delivery Time	Numerical	The number of days it took for the supplier to deliver the order
Deadline	Date	The date where the company has to deliver the order
Delivery Date	Date	The date on which the supplier acknowledges the order for the delivery
Production Data		
Date	Date	Date of the Production of that particular variety
Variety	Categorical	The variety of dal or Rice being produced
Planned Production	Numerical	The planned quantity in Kilograms for that day
Actual Production	Numerical	The actual quantity produced in Kilograms on that day
Earnings	Numerical	The revenue generated by the company in rupees for processing that particular variety

Table 2: Description of columns in the dataset

As per the problem statement, in depth analysis of Supplier and Production data is essential to evaluate the Supplier evaluation and Production Planning.

3.1 Descriptive Analysis of *Date*

In the company's meticulously maintained record notebook, the term *DATE* corresponds to the production initiation date for specific varieties, such as the production of rice or dal from paddy or pulses. On the other hand, *PURCHASE DATE* signifies the date of procurement for the respective variety from the supplier. There exists a direct relationship between *DATE* and *PURCHASE DATE* as evident in the supplier data table. Notably, the *DATE* in the production data table represents the initiation of production for the acquired variety, typically occurring within one, two, or three days from the purchase date. These distinctions are crucial in understanding the chronological flow of production events. The subsequent observations, grounded in the gathered data, have been meticulously documented for analysis and reference

Key Points

- In the entire dataset, the date is of the format dd-mm-yyyy.
- The dataset covers a duration of one year, precisely from February 2022 to February 2023. During this period, a total of 395 purchases were made from various suppliers, complemented by 450 production entries.
- In Table 2, details regarding dates in both supplier and production data are provided. It's noteworthy that the dataset may display repeated dates, reflecting instances where different varieties were supplied on the same date and various rice and dal varieties were produced on identical dates.

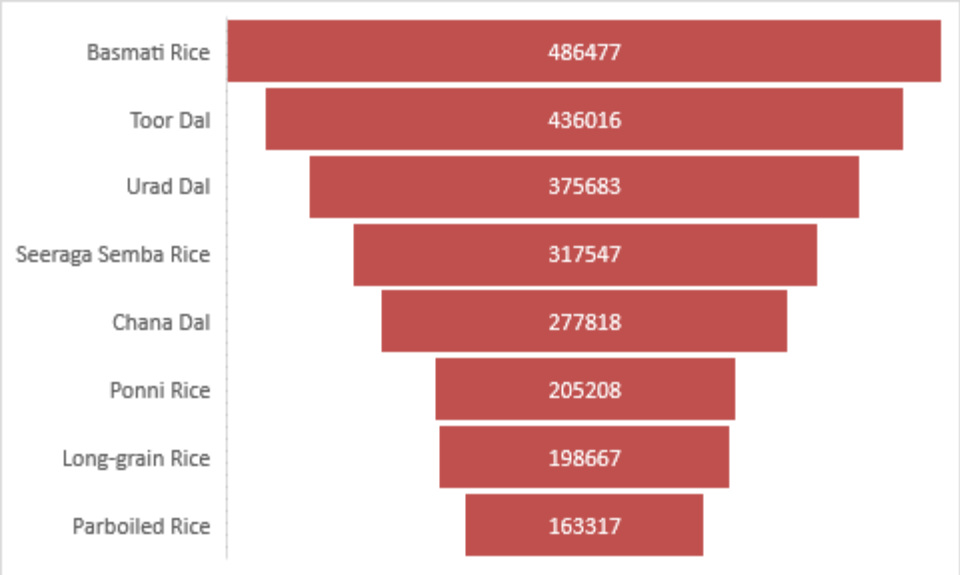
3.2 Descriptive Analysis of Supplier

There are five distinct suppliers categorized as Supplier 1, Supplier 2, and Supplier 3, specializing in rice varieties, while Supplier 4 and Supplier 5 specialize in dal varieties. Supplier 1 offers Basmati rice and Ponni rice, Supplier 2 provides a range including Basmati rice, Seeraga Samba rice, and parboiled rice, and Supplier 3 focuses on long-grain rice. In the dal category, Supplier 4 supplies Urad dal and Toor dal, whereas Supplier 5 offers a selection including Urad dal, Toor dal, and Chana dal.

3.3 Descriptive Analysis of Variety

The *VARIETY* column consists of diverse rice and dal varieties. In the rice category, the mill meticulously processes Basmati rice, Seeraga Samba rice, Ponni rice, long-grain rice, and parboiled rice. Concurrently, the processing of dal varieties includes Toor dal, Urad dal, and Chana dal. The daily processing volumes vary, with rice varieties ranging from a minimum of 0.71 tons to a maximum of 1.2 tons, and dal varieties from a minimum of 0.69 to 1.1 tons. The processing charges per kilogram are systematically set at Rs. 9 for Basmati rice and Seeraga Samba rice, Rs. 8 for Ponni rice, Rs. 7 for long-grain rice and parboiled rice, Rs. 8 for Toor dal, Rs. 7 for Urad dal, and Rs. 6 for Chana dal. The Figure 1 shows varieties of rice and dal with respect to the earnings made annually.

Figure 1: Varietal Revenue Funnel



Key Points

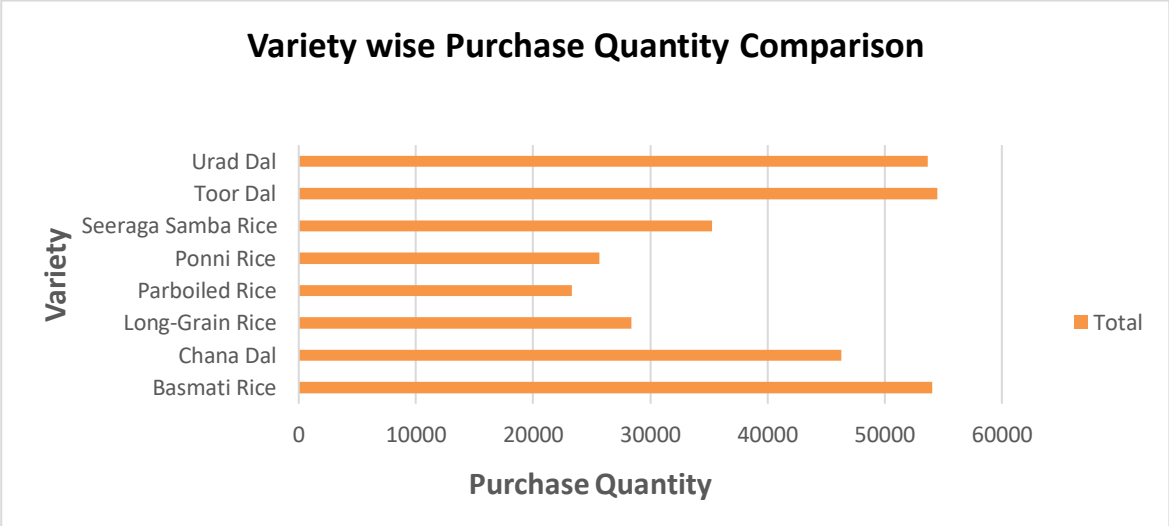
- The Rice Mill processes five different Rice varieties and three different dal varieties.
- Among the Rice varieties Basmati Rice gives highest earnings and among the Dal varieties Toor Dal gives highest earnings.
- The processing charge per kilogram is maximum for Basmati and Seeraga Semba Rice in Rice variety and for dal variety it is Toor dal.

4 Detailed Explanation of Analysis Process

4.1 Variety wise Analysis

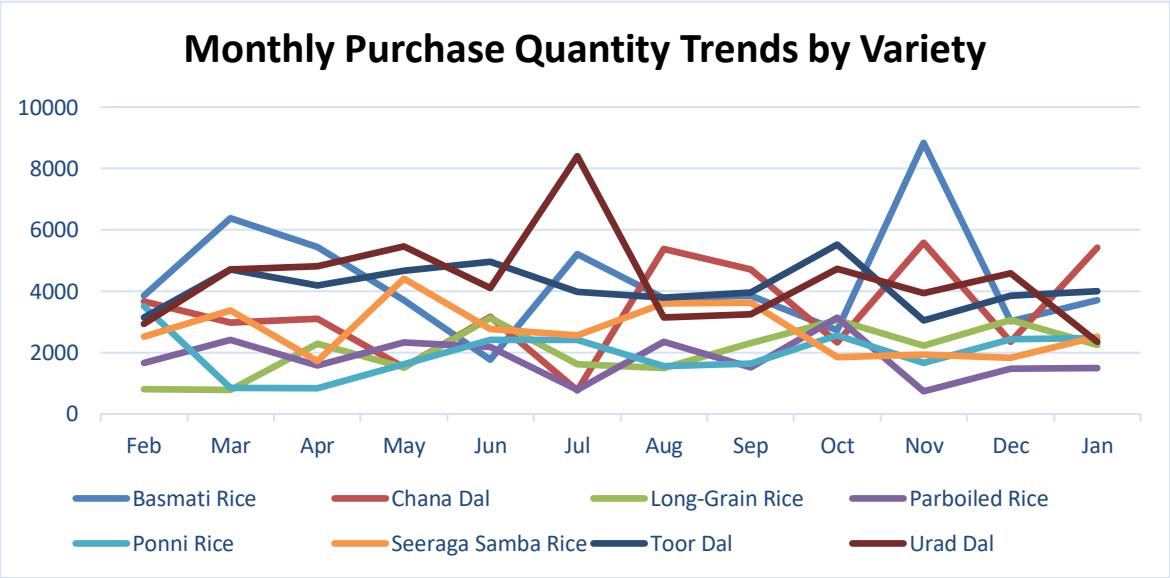
It is evident that, of the rice types, Basmati rice has the biggest procurement quantity; on the other hand, Toor and Urad dal are the most prominent varieties of dal. Even though Chana Dal is purchased in larger quantities than Seeraga Samba Rice, its processing cost per kilogram is less than thirty-three percent. Notably, because of the comparatively reduced market demand, long-grain rice, parboiled rice, and Ponni rice register limited buy volumes. A comparison of purchasing volumes for various dal and rice types is shown variation by variety in Figure 2

Figure 2: Variety-Wise Purchase Quantity Comparison



In Figure 3 , the monthly purchase quantities for different varieties of Rice and Dal are detailed. Notably, the procurement of Basmati Rice witnesses an initial increase in the first two months, gradually declining to its lowest point till June. Subsequently, there are fluctuating patterns with peaks observed in November, attributed to the high demand for Basmati rice during the frequent marriage ceremonies in Tamil Nadu. Other rice varieties exhibit noticeable fluctuations. In the realm of dal varieties, Urad dal experiences a substantial peak in July due to market demand, while Chana dal undergoes a decline in the same month. The remaining dal varieties display typical fluctuations throughout the observed period.

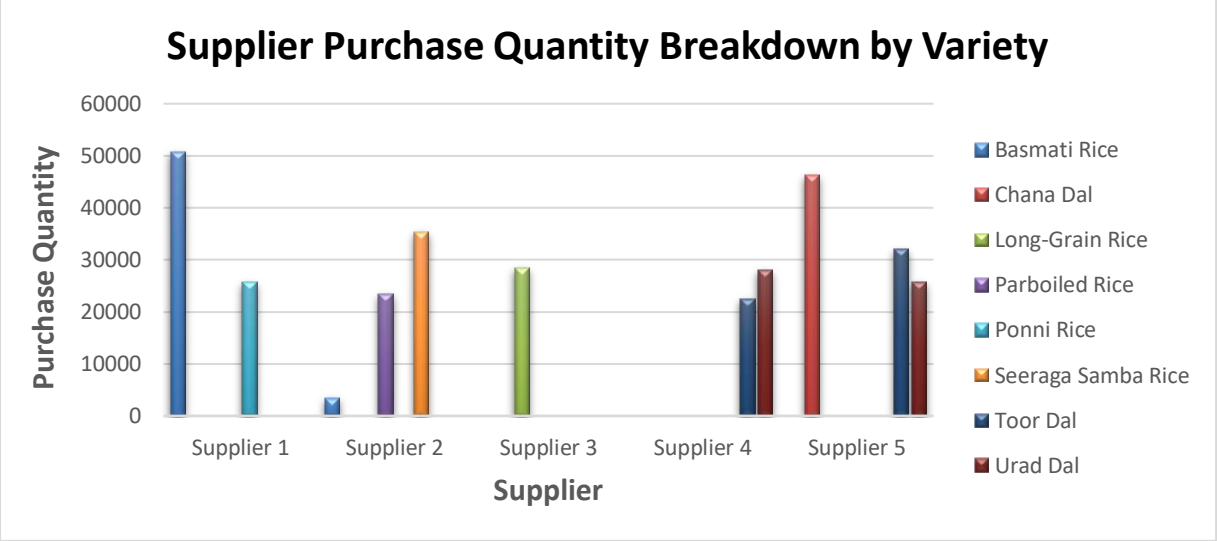
Figure 3: Monthly Purchase Quantity Trends by Variety



4.2 Analysis of Supplier Evaluation

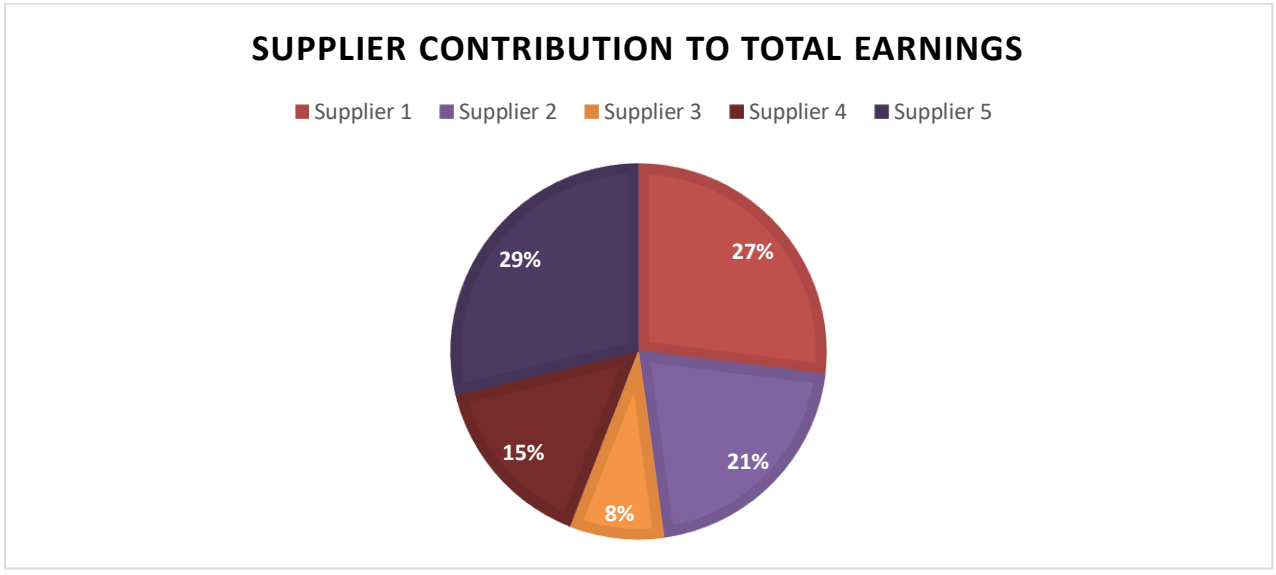
Based on Figure 4 , it is clear that Supplier 1, Supplier 2, and Supplier 3 supply Rice varieties, while Supplier 4 and Supplier 5 focus on Dal Varieties. Supplier 1 demonstrates strong performance in supplying Rice varieties, and Supplier 5 excels in providing Dal varieties. Supplier 2 consistently maintains a stable performance. However, Supplier 3 is limited to supplying only one variety, Long-grain rice, which is considered as a less favorable performance. In the domain of Dal varieties, Supplier 4's performance is moderate as they supply only two types, while Supplier 5 stands out with excellent performance by supplying all three varieties.

Figure 4: Supplier Purchase Quantity Breakdown by Variety



Observing Figure 5 , it is notable that Supplier 5 and Supplier 1 collectively contribute to over 50 percent of the company's earnings. Supplier 2 and Supplier 4 make moderate contributions, while Supplier 3's performance in contribution is deemed very poor.

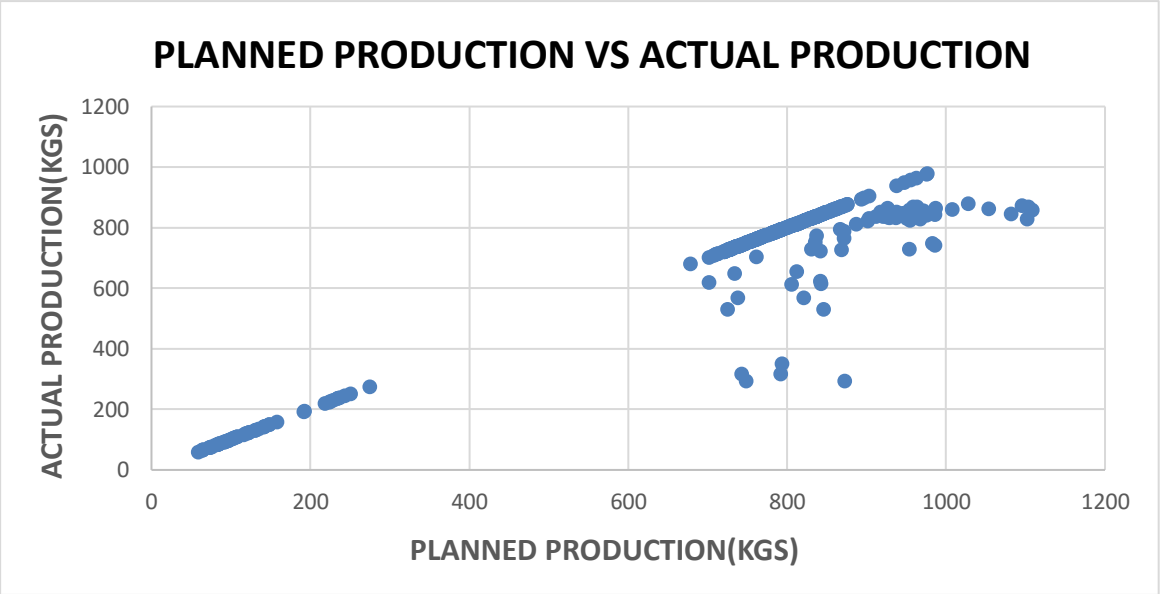
Figure 5: Supplier Contribution to Total Earnings



4.3 Analysis of Production

From Figure 6 , where planned and actual production are compared, distinct clusters of points deviate notably from the anticipated linear trend. These outliers correspond to days when operational challenges prompted the rescheduling of rice production to the following day. This observation underscores the critical need to address operational disruptions for a more seamless and efficient production process. It highlights the importance of adaptability in navigating unforeseen challenges to ensure a consistent and reliable production schedule.

Figure 6: Planned Production vs Actual Production



5 Results and Findings

5.1 Supplier Evaluation

It is clear from the analysis shown in Figure 4 and Figure 5 , that Supplier 5 and Supplier 1 contribute towards 56% of the revenue generated by the mill. Therefore it is necessary to purchase more varieties of rice and dal from these suppliers to maximize profit.

1. Basmati Rice - [redacted]
2. Toor Dal - [redacted]
3. Urad Dal - [redacted]

The mill can maximize their profit by frequently processing these varieties on a larger scale as their processing charge per kilogram is high compared to other varieties.

5.2 Production Efficiency

Analysis of Figure 6 indicates a notable challenge for the mill when processing Rice varieties, particularly evident when production exceeds 0.9 tons. The current operational sequence involves processing dal varieties first, followed by packaging, and subsequently initiating Rice variety processing. This sequence poses difficulties, particularly with Basmati Rice. To enhance efficiency, it is recommended that the mill adopts a simultaneous processing approach for both Rice and Dal varieties, thereby avoiding the need to carry over the processing of any variety to the next day.