CAPSTONE PROJECT PROPOSAL FOR BUSINESS DATA MANAGEMENT

A CASE STUDY

OF

BISHNUPUR ROWTARA

PRIMARY AGRICULTURAL CO-OPERATIVE SOCIETY LIMITED

FERTILISER OUTLET TO ASSIST IN

OPTIMISING OUTLET LOCATION FOR EFFICIENT CUSTOMER DELIVERY

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1. Executive Summary

The issue of finding a category of outlet to be opened in the particular area with the limited human resource available is the primary problem for BRPACS. To understand the trend of customer footfall and the volume of sales, a monthly analysis was done with respect to the locations. Through this method some areas were identified where they can open outlets to tackle the problem.

With the sales data from January to May, it is apparent that we can find patterns of customer behaviour. Customers in a fertiliser shop usually do not follow the pareto principle as the demands are mainly based on the cropping patterns of the place. Sometimes farmers experiment with the cropping patterns and cultivate different crops with the hope of earning a higher revenue and profit for that agricultural season. Therefore BRPACS keeps a variety of stocks to cater to the changing demands of the farmers.

The potential solutions to the problem statement has been made keeping in mind the objectives which were : analysing the seasonality of the demand, analysing the location of the customers, offering a potential solution of location of outlets and estimation of the potential outlets and the type of outlet. In the mid-term analysis as stated we tried finding an intersection among the three factors dominating the problem statement - Seasonality of Demand, Volume of Sales and the Number of Customers. In this report we aim to have a holistic view of the analysis process and the results.

2. Data Analysis Process Explanation

The basic tool of analysis of this project is Google Sheets and an understanding of the trends in data of a blooming data scientist. Certain types of classification were made within the google sheets to solve the two different arenas of the problem statements.

- ### Addressing the Seasonality of Demand

To address the seasonality of demand, the data was processed into monthly sheets consisting of the customers and their volume of purchase. The monthly sheets showed us the percent contribution of each month. There it was a clear indication that the first three months of the year is the time when the sales peaks whereas March and April there is a dip in sales across all the Zones. The reason behind this is the cropping pattern of the area and therefore we do not have any possible ways to curb the seasonality of demand. As per the fertiliser associate it is also helpful because the supply of certain fertilisers are also seasonal, therefore this helps in maintaining the demand and supply process.

- ### Volume of Sales vs Number of Customers

Besides the seasonality of demand, the next aspect that we need to focus on is the volume of sales and the number of customers. Higher the volume per customer higher is the transportation cost, therefore we needed to analyse the trend of Number of Customers to Volume of Fertiliser Sold. Instinctively this seemed as a good idea to anchor on but later it seemed more tricky as we see trends where there is a less number of customers but that does not affect the volume of sales of that particular location. When consulted,the fertiliser associate, it was found that some locations have farmers with larger areas of land compared to the area of farmers at the other locations. Therefore the Number of Customers vs Volume of Sales graph, which might look like it serves the purpose, instinctively, somehow misses this aspect.

Considering the above aspects, the following analysis processes were used to come to the recommendations :

a. Monthly Sales Analysis

The monthly sales data helps us determine the contribution of each location to the total sales volume of BRPACS. This tool enables the identification of demand seasonality patterns and fluctuations in sales volume across various locations and months.

Purpose: Monthly sales data analysis is pivotal for assessing individual location contributions to BRPACS' total sales volume. Delving into this data unveils locations excelling in specific periods, vital for strategic decisions, resource allocation, and efficient inventory management. This scrutiny facilitates adaptation to market dynamics and consumer trends. Recognizing performance patterns enables timely shifts in marketing and operations, enhancing customer satisfaction and sustainability. The data-driven insights foster a nuanced understanding of regional dynamics, empowering well-informed decisions that maximise profitability and operational efficiency. BRPACS' capacity to harness these insights underscores its resilience and responsiveness in a competitive agricultural landscape, ensuring enduring success.

ADDRESS	VOL. of SALES(JAN)	VOL. of SALES(FEB)	VOL. of SALES(MAR)	VOL. of SALES(APR)	VOL. of SALES(MAY)
Amghata	3524.00	2202.00	904.75	52.50	4.00
Bamanpur	168.00	1366.00	1450.70	180.25	666.00
Bhramhanagar	50.00	35.00	3763.50	7.80	48.35
Bishnupur	2398.00	1084.00	6255.00	13.00	1789.00
Churnipota	208.70	3108.00	943.20	603.30	881.70
Gangabas	3793.00	2926.00	1756.81	15.00	31.10
Gournagar	1384.10	3597.25	1990.60	450.00	455.00
Jahangirpur	909.50	2320.50	32.15	4051.00	1361.20
Kundapara	561.05	4487.00	997.40	6.00	731.00

Monipota	4135.10	2458.20	2390.00	0.00	1230.70
Nijampur	2774.00	5648.00	17.95	5.51	1070.85
Raotara	3891.00	9.25	2488.55	450.00	170.00
Sebagram	1608.75	3315.20	4764.70	0.00	1777.00
Shyampur	280.50	1466.35	610.00	7.00	429.00
Simultala	1812.50	3362.00	6.37	8.00	1188.25
Subarnabehar	1910.30	3347.00	29430.43	726.50	0.50

b. Normalised Volume of Sales

The graph 2.1 (below) illustrates the consistent demand for January and February across all locations, reinforcing the pattern observed earlier. These months stand out as periods of heightened sales volume. This consistency underscores the importance of the sowing and growth seasons in driving fertiliser demand, validating the significance of the observed trend in the sales data.

Purpose : The concept of Normalised Volume of Sales serves as an indispensable tool for comprehending the diverse contributions of various locations to the overall sales volume across different months. This normalisation is pivotal for impartial comparisons spanning products, regions, and time periods. By facilitating equitable evaluations, it underpins precise trend analysis, performance appraisal, and effective sales projections. This data-centric strategy not only bolsters decision-making but also fosters a deeper grasp of market dynamics and prudent risk management. In the context of financial reporting, it presents a more faithful representation of a company's performance, thereby supporting investor relations.

Disregarding the outlier behaviour in Jahangipur's sales volume for April, a clear trend emerges wherein April and May consistently exhibit the lowest shares across all locations. This observation underscores the significance of seasonal variation in sales patterns, informing strategies that can be adapted to optimise resources and capitalise on higher-demand periods.
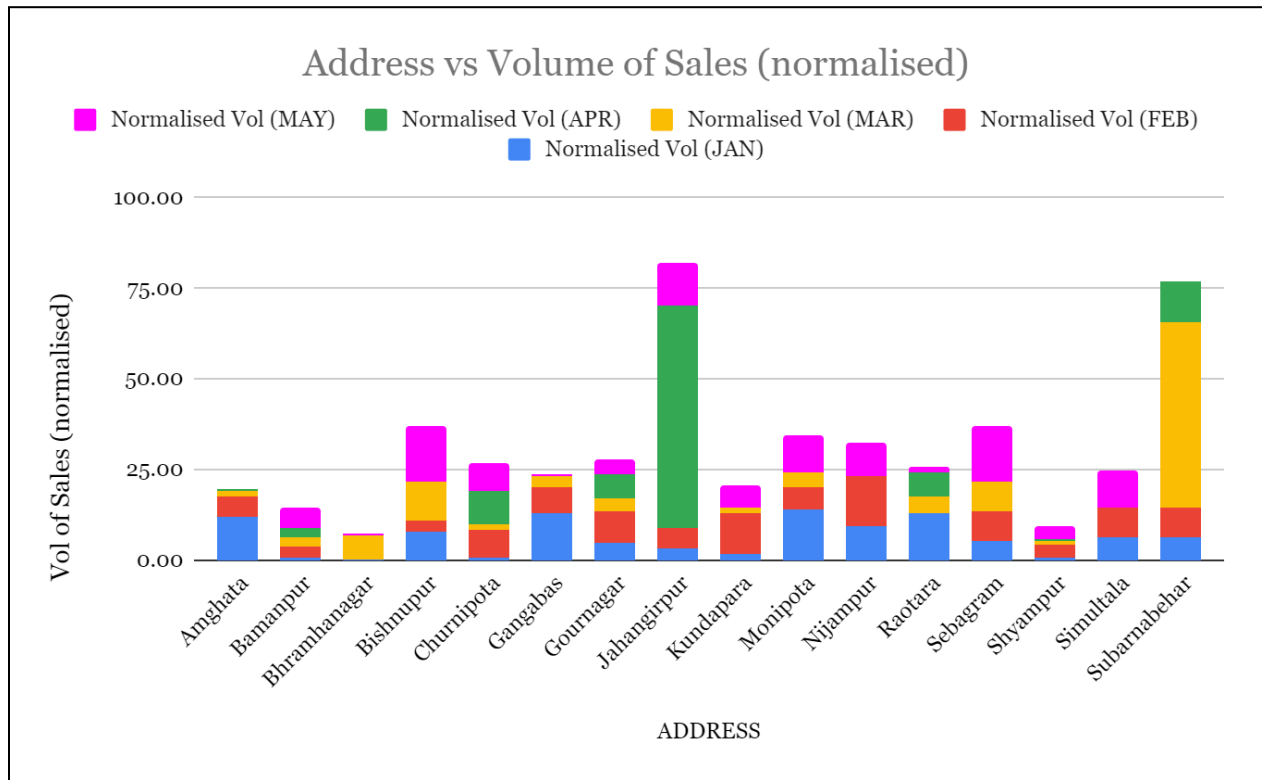
Graph 2.1 - Address vs Monthly Volume of Sales (Normalised)

c. Zonal Analysis

BRPACS draws farmers from surrounding villages within a 5 km radius for fertiliser purchases. This results in a dataset encompassing 16 locations. The widespread customer base highlights the regional influence and market reach of BRPACS in catering to agricultural needs.

Purpose : Calculating the contribution of zones to the overall outcome is a crucial step. The settlements' division into four zones based on location offers resilience against outlier sales behaviour. By grouping settlements, the impact of unusual sales performance in one location is tempered by the performance of other zones. This normalisation effectively balances the influence of outliers, providing a more accurate representation of each zone's significance to the final outcome. Such an approach enhances the reliability of recommendations by ensuring that a single exceptional or underperforming location does not unduly skew the analysis, leading to well-informed and balanced decisions based on a broader perspective of sales data.

| ZONE	VOLUME of SALES JAN	VOLUME of SALES FEB	VOLUME of SALES MAR	VOLUME of SALES APR	VOLUME of SALES APR
NORTH	9507.80	9941.35	32701.99	801.00	464.60
EAST	4539.45	12105.70	5746.42	4662.30	5208.15
SOUTH	10985.15	8038.45	12130.95	469.00	3920.70
WEST	4376.10	10646.25	7222.75	643.56	2240.20

d. Mapping the Area

Google Maps was a prominent tool to map farmers' origins, but its effectiveness was hindered in the rural context due to inaccurate calibrations. Given the rural nature of the area, precision was crucial. To ensure accurate analysis, an alternative solution was sought. This underscores the necessity of tailored approaches for rural settings where standard tools may fall short in providing reliable data, thereby enhancing the overall accuracy of the analysis.

While our project commenced with Google Maps, the pursuit of accuracy led us to rely on a more credible source—the Topographical maps provided by the Government of India. Recognizing that the rural landscape posed calibration challenges for Google Maps, we sought a solution that could offer authentic insights. By categorising localities into North, South, East, and West zones, we turned to topographic maps for precise localization. This shift imbued our analysis with the highest level of authenticity.

Topographical maps not only pinpointed settlements but also illuminated crucial factors such as settlement type, population density, and farming land area. This wealth of contextual information enhances our data interpretations. This approach aligns with the project's objectives, where fertiliser sales volumes correlate with the expanse of cultivated or cultivable land. By leveraging government-issued topographical maps, we ensure an accurate, context-rich analysis, elevating the quality of insights and enabling better-informed decisions.

3. Results and Findings :

Figure 2.1 - Location wise Contribution of Volume of Sales (Normalised)
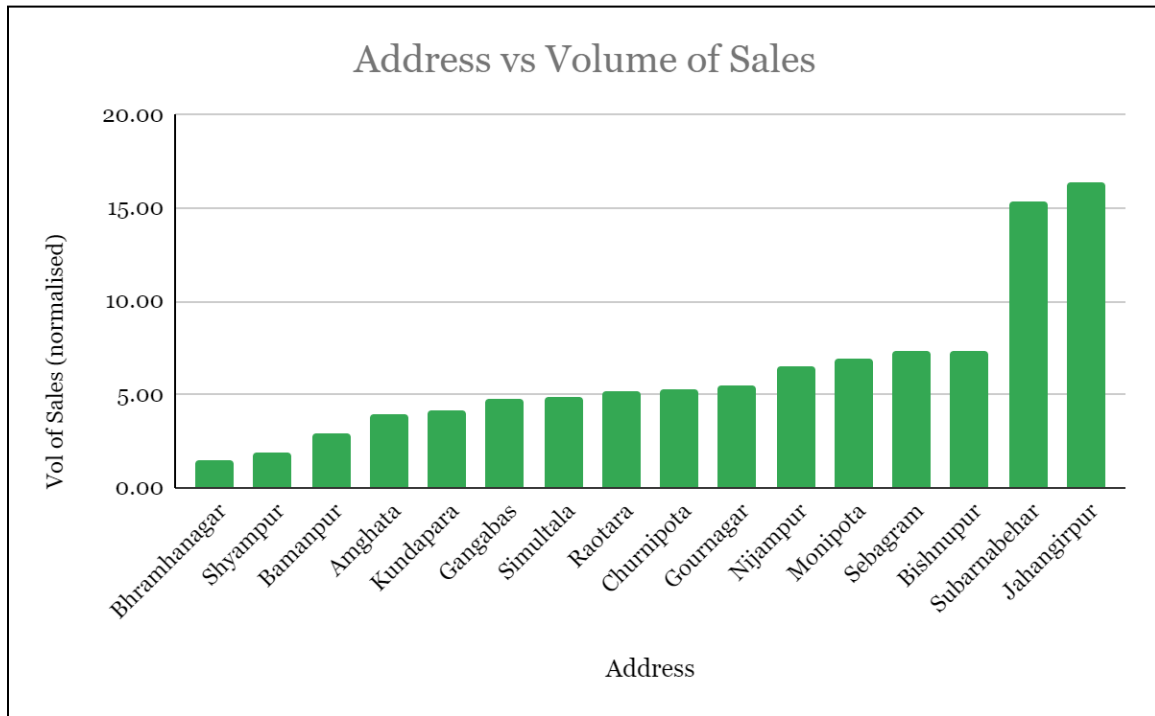
The normalised volume of sales serves as a pivotal tool for comprehending location shares within the broader context of zone-wide sales. Notably, Subarnabehar and Jahangirpur exhibit the highest contributions, while Bhramhanagar and Shyampur report the lowest involvement in total sales. These individual figures, while not captivating in isolation, gain significance when amalgamated into larger Zones alongside factors like customer count, demography, and settlement patterns. This holistic approach unveils insights that guide potential solutions for addressing existing challenges. By considering these interrelated elements, the company can strategize effectively, offering a comprehensive response to the identified problem statements. This multifaceted analysis underscores the intrinsic value of a holistic perspective in crafting solutions that resonate with the intricate dynamics of each Zone.

Figure 2.2 - Mapping the area using Google Map :
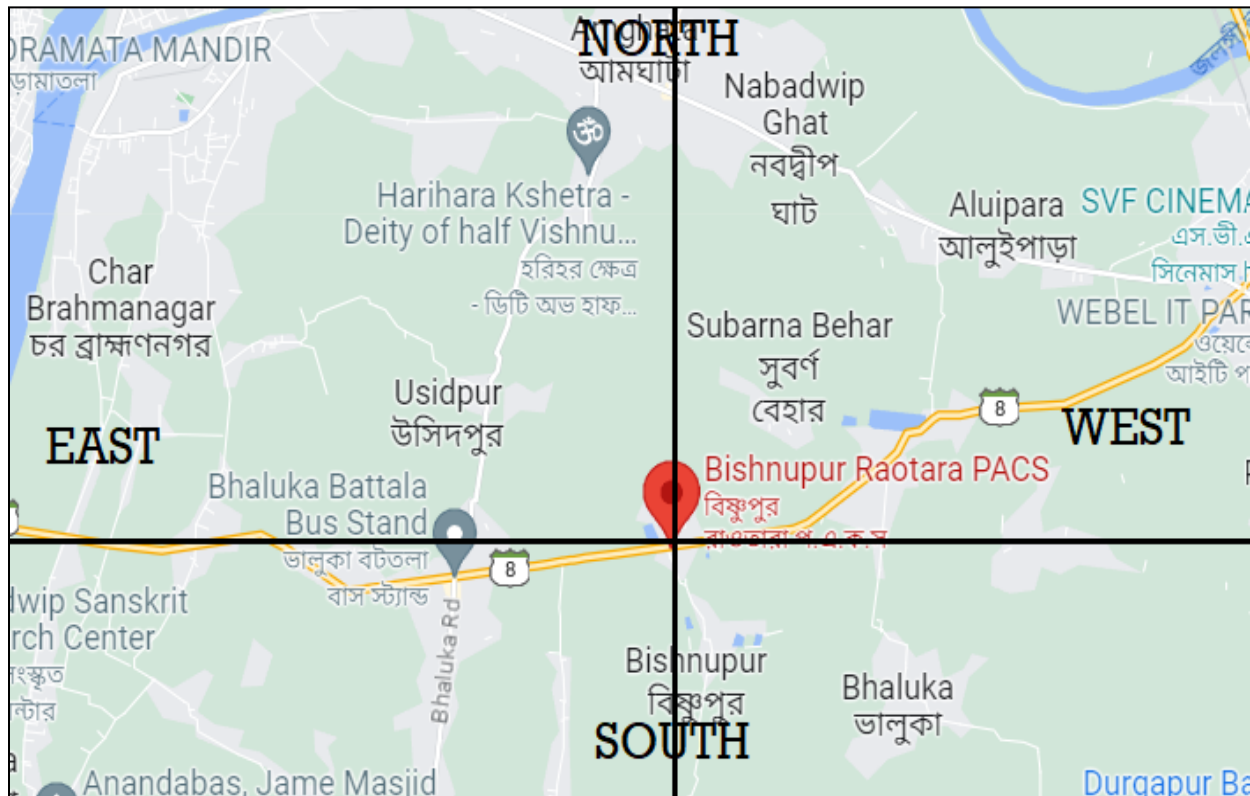
Leveraging Google Maps, we accurately pinpointed the geographical coordinates of BRPACS (as illustrated in Figure 2.2) and intricately defined four core operational zones. This meticulous process hinged on a comprehensive evaluation of customer density across various regions, enabling us to establish these zones with precision. Zoning holds paramount importance as it optimises the allocation of resources, tailors marketing strategies to local preferences, and streamlines logistics based on specific demands in each zone. This segmentation underpins efficient service delivery, facilitates strategic decision-making, and cultivates a responsive approach that accounts for unique geographical nuances. By embracing this strategic approach, the organisation enhances its operational efficacy by aligning its activities with the distinctive characteristics of each zone, ultimately leading to a more streamlined and effective operational framework.

Figure 2.3 - Mapping the customer location using Toposheet :
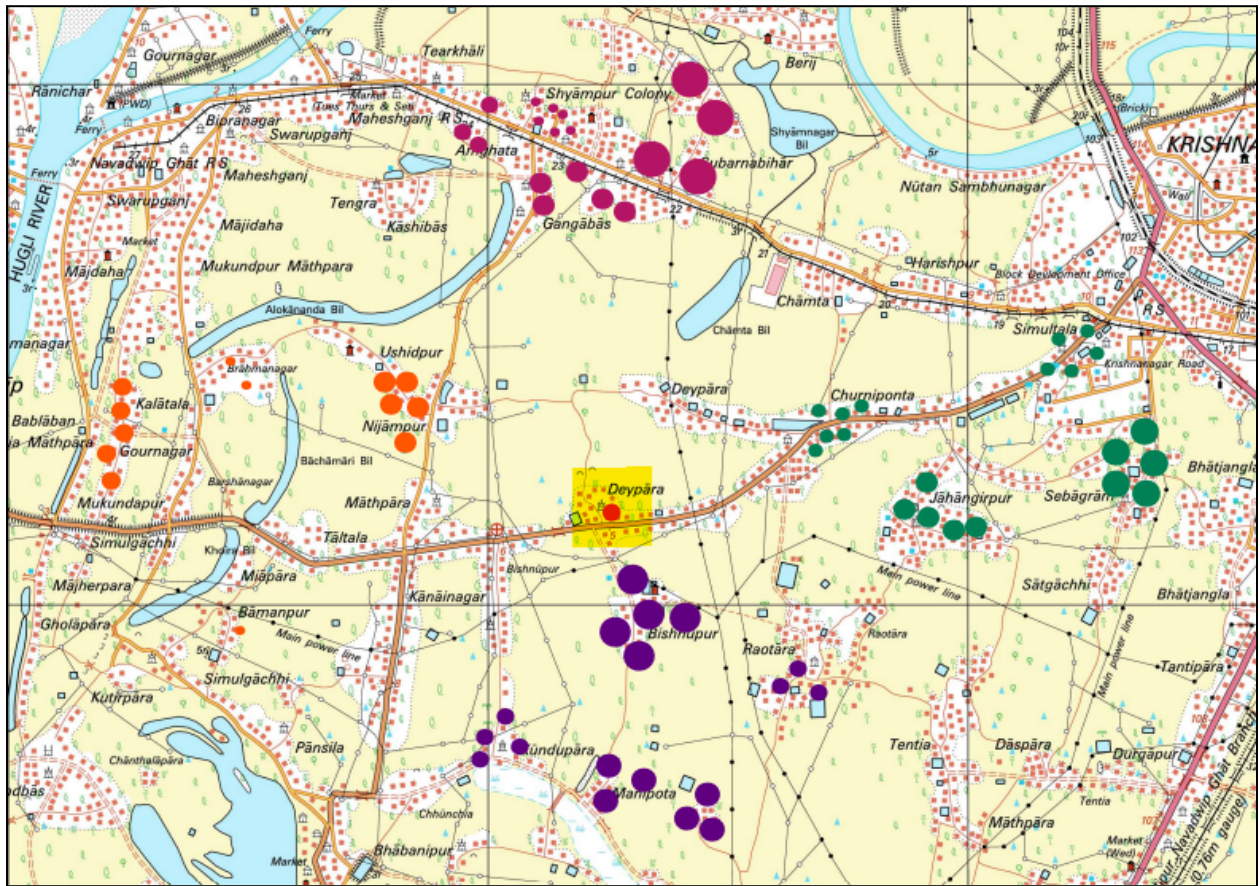
The topographical map features a prominent yellow marker denoting BRPACS, (as shown above in Figure 2.3) surrounded by a spectrum of coloured dots representing customers in distinct areas. Dot sizes correlate with sales volume, emphasising larger dots for higher sales. Orange and Green dots signify the East and West Zones, while Magenta and Purple dots represent the North and South zones, respectively. This visual arrangement offers a succinct depiction of customer distribution and sales intensity across various zones. The map serves as an informative tool to quickly grasp spatial relationships, aiding in strategic decision-making, resource allocation, and sales analysis.

This topographical overview unveils distinct demographic and economic patterns among the Eastern, Northern, Western, and Southern Zones. The disparities are evident through population distribution, water accessibility, and resultant sales volumes. The Eastern Zone hosts new

settlements predominantly comprising office workers, leading to a reduced emphasis on farming activities. Although we can see most of the customers from the Eastern Zone, the volume of sales is comparatively quite low. This can be attributed to the zone being in close proximity to the city with minimal land to agriculture and more to housing settlements or shops. Conversely, the densely populated Northern and Western Zones stand out. The Northern Zone's high sales volume correlates with its abundant water bodies, suggesting a concentration of larger-scale farmers who benefit from ample irrigation resources. The Western Zone reports moderate sales, implying a mix of agricultural endeavours. Here, a sizable number of settlements contrast with proportional sales, which can be potentially attributed to transportation challenges that hinder large volume orders. Instead, smaller orders prevail due to these logistical complexities.

Further the Southern Zone reveals a distinct landscape, it displays medium to large scale farmers, highlighted by their substantial contribution to sales. Good connectivity with BRPACS aids this zones' participation in the sales network. The demographics reflect a comparatively older farming population, likely experienced and established in their agricultural pursuits. This age group actively engages with bi-weekly sessions conducted by BRPACS, demonstrating a keen interest in learning about fertiliser usage and advanced farming techniques. Their enthusiasm extends to embracing emerging agricultural technologies.

In the context of the Western Zone, the population dynamics contrast the Northern and Southern counterparts. With an average age below 40, the farmers are characterised by youthful vigour and a profound dedication to agriculture. This demographic actively participates in bi-weekly BRPACS sessions, showcasing their eagerness to enhance their agricultural practices. Their willingness to experiment with new farming technologies signals a forward-thinking approach, despite the challenges posed by transportation issues.

In essence, this topographical analysis unveils a rich tapestry of regional differences, where population distribution, water access, transportation, and age demographics synergize to influence agricultural practices and sales dynamics. Such comprehensive insights offer BRPACS a nuanced perspective for tailored strategies that cater to the unique needs and aspirations of each zone.

Below is a graphical representation of the above data :

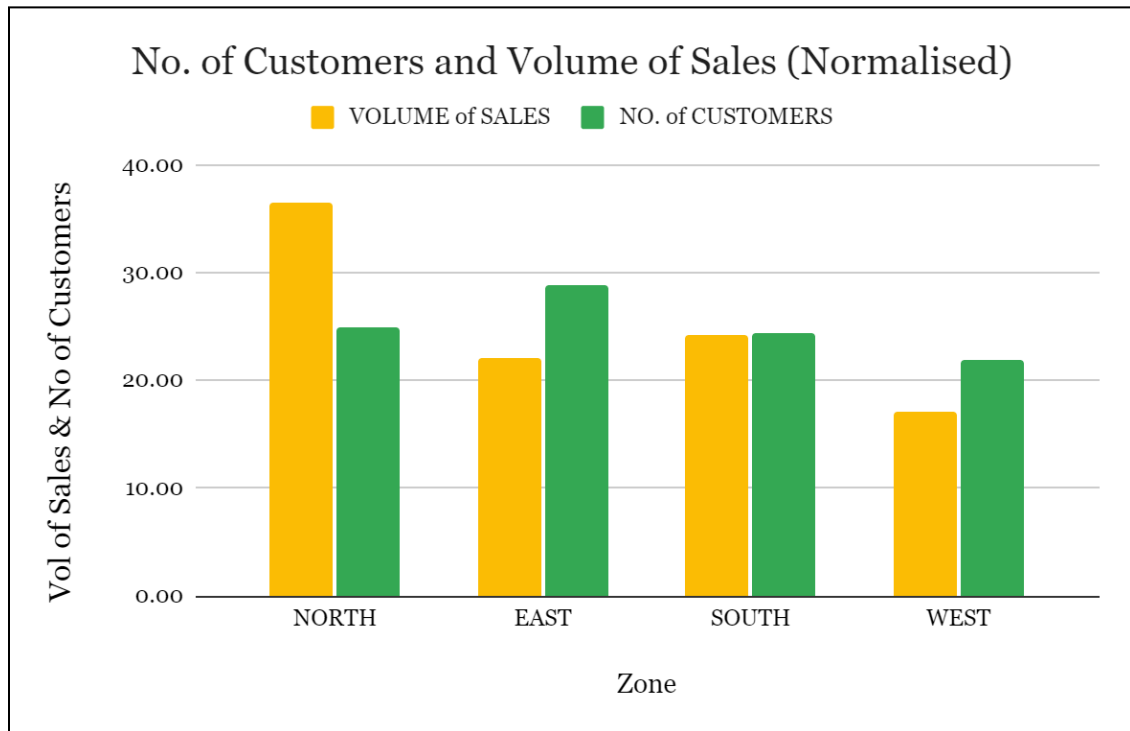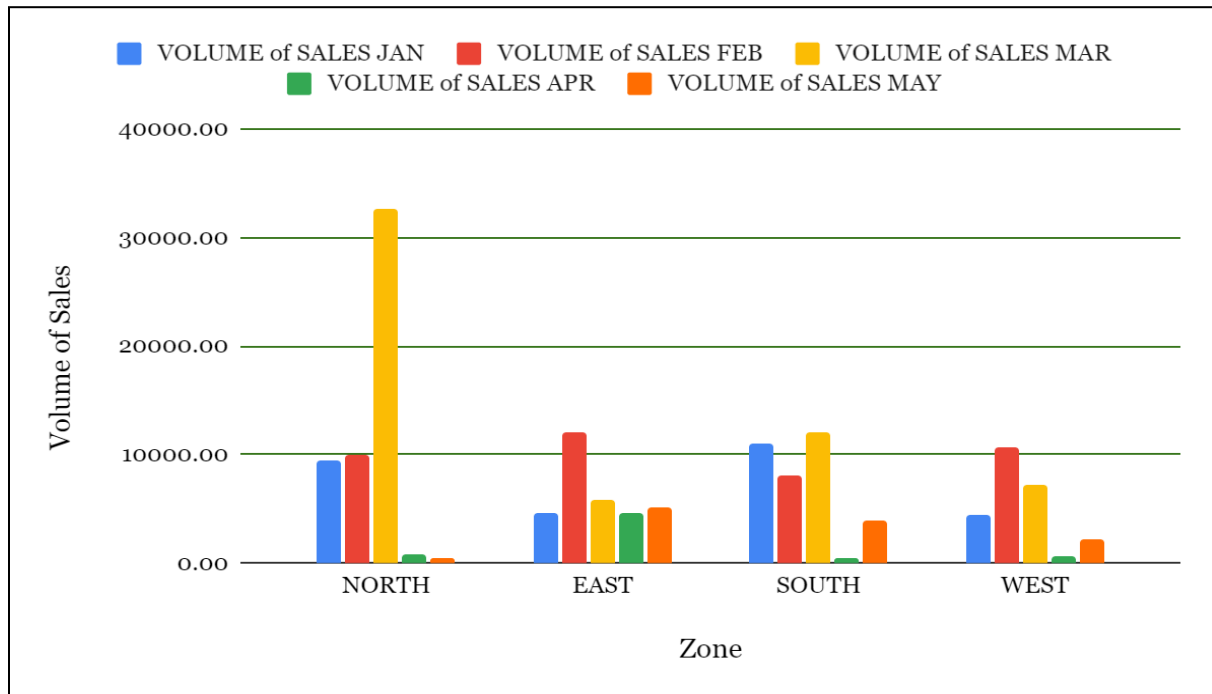No. of Customers and Volume of Sales (Normalised)

Figure 2.4 : Monthly Volume of Sales in the Zones

Observing the graph (in Figure 2.4) reveals visible data patterns that shed light on the dynamics of sales volume. Notably, the trend emerges wherein the initial months, January and February, boast substantial sales figures, while March exhibits a moderate level of sales. In stark contrast, April and May contribute insignificantly to the overall sales volume across all three zones. This consistent pattern holds sway for the majority of locations, discounting any potential outliers. This discernment unveils invaluable insights into the seasonality of demand, a phenomenon intricately intertwined with the underlying agricultural cycles of the region.

The alignment of this pattern with the region's agricultural calendar is striking. January serves as the commencement of the sowing season, characterised by heightened demand for fertilisers to prepare the soil adequately. Subsequently, from February through mid-March, the growth season prevails, necessitating an elevation in the usage of fertilisers. However, the tide turns from mid-March to mid-May as farmers shift their focus to harvesting their produce. This period witnesses a decline in fertiliser demand as the soil undergo a phase of renewal, rendering fertiliser application minimal.

This cyclic behaviour underscores the pivotal connection between sales patterns and the localised agricultural rhythm. Recognizing and acknowledging these seasonal fluctuations present opportunities for informed inventory management, targeted marketing strategies, and astute resource allocation. Moreover, the ability to glean such profound insights from sales data exemplifies the prowess of data-driven decision-making, particularly when intertwined with the innate cadence of the local economy.

This comprehension goes beyond merely explaining the sales trend; it holds paramount importance for optimising business operations, augmenting customer contentment, and fostering sustainable practices harmonised with the agricultural cycle. By leveraging this knowledge, companies can proactively adjust their strategies to ensure product availability during peak demand seasons, minimising inventory waste during troughs, and crafting marketing campaigns that resonate with the agricultural community's needs. In essence, this data-derived understanding empowers enterprises to not only adapt to the ebb and flow of the market but also to align with the pulse of the community they serve.

Figure 2.5 - Zonal Contribution

NORMALISED SHARE of ZONE

NORTH 21.9%
EAST 23.3%
SOUTH 20.9%
WEST 33.9%
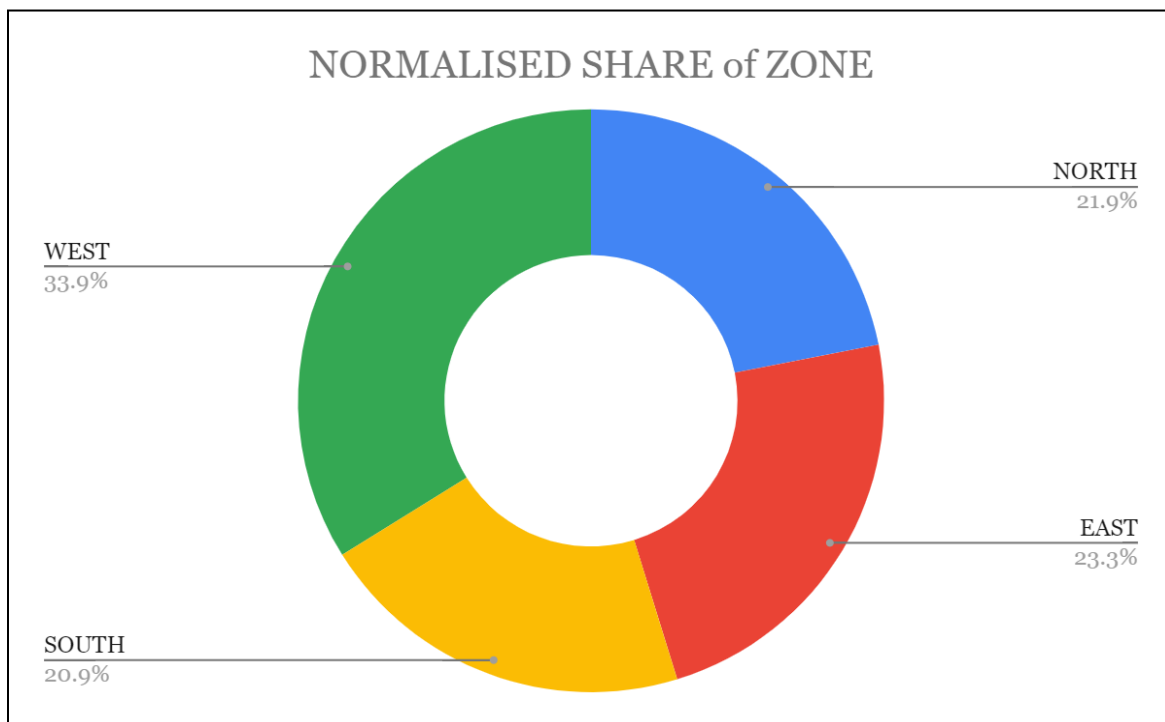
The above doughnut depicts the overall zonal contribution of every zone considering both the components - volume of sales and number of customers. It is calculated by weighted summation of the normalised number of customers(50%) and the normalised volume of sales(50%).

After normalising the volume of sales and the number of customers we see North-West is a profitable area considering an all round study of the area. These two zones combined can have a potentially growing market. It is an area close to the alluvial plains of the Ganges and is also dotted with natural irrigation sources.

Despite a good volume of sales contribution of the Eastern Zone it is not a pragmatic decision to tap into that area since it is growing towards the city and in coming years the percentage of land dedicated to agriculture will decrease in that area. If we closely look into the topography, we can see the absence of any accessible waterbody in that zone making irrigation dependent largely on electricity.

The Southern Zone being in close proximity to the Organisation reports a considerably consistent share of sales.

4. Recommendation as per Interpretation of Results & Findings :

These proposed solutions hold significant potential in resolving BRPACS's challenges. To counter the impact of seasonality, the adoption of non-permanent outlets stands as a pragmatic measure. Mitigating the human resource scarcity necessitates targeted interventions. Yet, it's essential to account for the diverse customer demands in different zones and the distinct geographical features of each zone. This strategic approach ensures that the solutions are intricately aligned with the nuanced characteristics of each zone, maximising their effectiveness in addressing the problem statements.

a. Category of Outlet

With the available human resources, it is not possible to have any full-time outlet, given the seasonality of demand, neither is it the need of the hour. The cost-benefit ratio of such an outlet would be very less, therefore there can be the following categories for optimum utility.

- Pre-order Distribution Outlet : One day delivery - farmers can place an order a day before through the helpline number and BRPACS would deliver it to the next day in the Krishak Bazar (Government owned Farmers' Market). This would be a negligible cost delivery for BRPACS, as there is no fee required for the Krishak Bazar place, the only cost incurred here would be the rental cost of the vehicle used.

- In-person Outlet : An in-person outlet can be opened in the South-Western Zone which would aid the Western area of budding farmers with an experimental mindset. The timings of this outlet would be post lunch timings - 03:00 pm - 05:00 pm, that is the time when farmers usually come back from their field if they have worked in the afternoon hours and the farmers who go to visit their field post afternoon for different irrigation purposes.

  Holding one of the bi-weekly sessions once a month in this outlet would attract the farmers and they would also be able to purchase fertilisers in high volume since it would no longer be a transportation hassle.

    b. Location of Outlet

The number of customers and volume of sales is studied. We can see that there are large scale farmers in the northern zone whereas small scale farmers occupy the eastern zone. Closely looking at the toposheet we can see that eastern zone has

    c. Developing a Bilingual Android Application

Intended Purpose :

- Scan and Order 24x7 - Anytime the farmers can place an order. The application can have an option on selecting the date of delivery. This would enable the farmers to pre-book their orders and BRPACS would also be able to be ready for the delivery.

- Cropping Problem Consultation - Upload cropping problems by choosing from the options provided and get recommendations of fertilisers. BRPACS can also have a 2-hour call support for the farmers from 5pm - 7pm, based on the pictures or their needs the farmers can have trained guidance for their problems.

- Live Streaming the Bi-weekly sessions - In this area, there is a tradition of farmers sitting together in a group in early morning and evening listening to Radio channels' discussion on different plant diseases. Therefore making the bi-weekly session recordings available in the application can be a good way to educate the farmers. These sessions are held to address the regional crop diseases and their respective solutions therefore this will be a better suit for the farmers than the radio as these would address their local cropping needs and failures.

    The new products like Nano Urea, the upcoming drone technology etc can be introduced at the end of these sessions and in the homepage of the application as well.

5. Conclusion :

From our limited interactions with farmers across diverse zones, a clear desire to procure fertilisers from BRPACS is seen. These interactions also highlight their eagerness to glean invaluable insights and solutions during the bi-weekly sessions conducted by the organisation. This enthusiasm underscores a promising trajectory, wherein informed and empowered farmers actively engage in shaping their agricultural success through collaboration with BRPACS.

Nevertheless, farmers struggle with pivotal hurdles of transportation cost, and secondly around crop failures. The struggle to recover combined production costs in one season, spiralling into debt cycles as they resort to private vendors for fertilisers, incurring augmented costs upon repayment. This systemic ordeal ensnares farmers persistently.
A deeper analysis reveals that these challenges stem from crop failures and inadequate liquid finances. BRPACS's mission emerges as a responsive solution, aiming to mitigate these hardships and foster an environment where farmers' well-being is synonymous with agricultural

success. Educating farmers about profitable crop patterns, comprehending crop failure causes, and tailoring sessions to local cropping patterns and diseases would establish a symbiotic environment between the farmers and BRPACS.

In the realm of challenges, the synergy of innovative outlets and empowering technology emerges as a beacon of hope for farmers, solving the problems of sales of BRPACS and paving a path towards the farmers' liberation from the cycle of hardship. With time we can envision a future where the strength of farmers fuels the foundation of prosperity. I would like to conclude this project with this couplet :

"Through outlets and apps, when knowledge takes its height,
Farmers' plight shall find its end in the light."