Strategic Resilience:

Data-Driven Customer-Centric Sales and Marketing for Improving Pesticide Shop Performance

A midterm report for the BDM capstone Project

Submitted by

Name: Pranab Kumar Manna

Roll number: 22f1000887

IITM Online BS Degree Program,

Indian Institute of Technology, Madras

Chennai Tamil Nadu, India, 600036

Contents

1 Executive Summary

Krishna Agritech Industries, a retail pesticides business based on Rajarhat, South 24 Pgs, West Bengal is facing critical challenges in inventory management, such as customer retention and market competitiveness. Frequent issues such as overstocking, stockout have led to financial losses and customer satisfaction. Moreover, limited marketing outreach and growing competition from larger pesticide retailers have further affected the store's profitability and market position.

To address these challenges, I utilise historical data on key parameters including Date Range, Product name, Quantity sold, Inventory level, Customer type, Region and other details. Customer surveys were also conducted to gather feedback on product satisfaction, service quality and churn reasons. Descriptive statistics and visual tools such as bar charts, time series, pareto charts and pie charts were used to identify sales pattern, inventory gaps and customer segments.

Advance analytical tools were used such as time series analysis to understand pesticides sales trend and inventory optimization strategies to align stock levels with seasonal demands and fluctuations. This analysis also identifies high demand product and customer churn patterns, forming the basis for improved inventory management and targeted customer engagement strategies. The upcoming phases will be more focused on applying data driven solutions for automated inventory control, tailored product promotions, strategy customer retention efforts. These initiative product wastages, free up blocked capital, enhance customer satisfaction, improved overall profitability and operational efficacy of Krishna Agritech Industries.

2 Proof of originality of the Data

- **Business Name:** Krishna Agritech Industries
- **Address:** Rajarhat, Po-Shirakole, South 24 Parganas, West Bengal, India, 743513.
- **GST No:** 19AAVFK2836P1ZB
- Video of interaction with the owner: Video Link
- Letter of Authorization: Letter Link

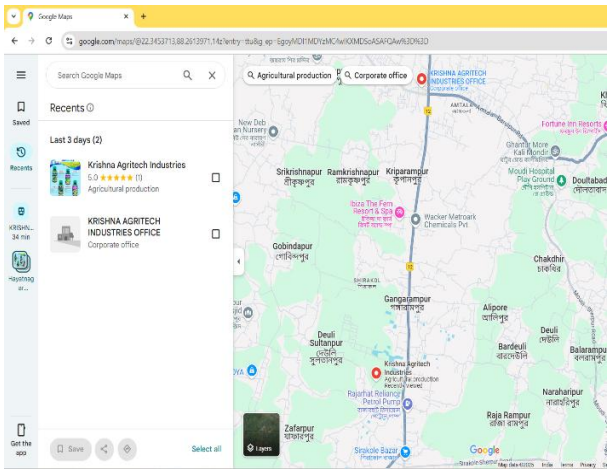

Fig 1. Shops GMap Location (Two Branches)

Fig 2. Owner & his son (I interacted at Rajarhat Branch)

Fig 3. Inside view of the shop (Amtala Branch)

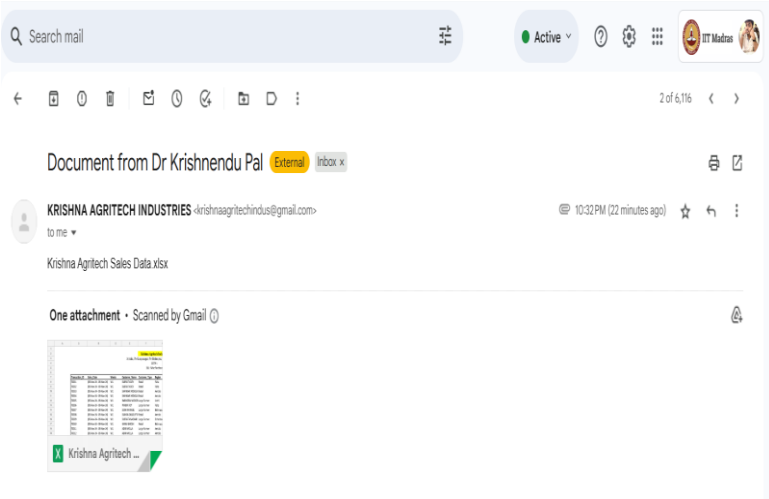

Fig 4. Email from Krishna Agritech, providing their data in excel.

Fig 5. Front View of Shop and Board.

3 Metadata

- The data was provided in excel sheet
- Range of data is Nov,2024 to Apr,2025 (Total 22 Weeks)
- The excel sheet has six sheets - Sales_Data, Purchase_Data, Inventory_Fungicide_Data, Inventory_Herbicide_Data, Inventory_Insecticide_Data, Inventory_Plant_Nutrition_Data

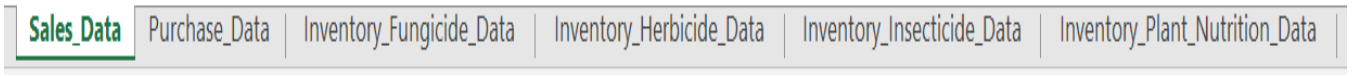

Fig 6. Screenshot of all data sheets, provided by owner

3.1 Sales Data

This sheet contains data related to the weekly sale of the pesticides. The features recorded in the sheet are as follows -

- Transaction_ID: This feature is unique identifier for selling each product.
- Sales_Date : Weekly date range.
- Weeks: Each weekly range has been assigned with unique values.
- Customer_Name: Name of the purchase customer.
- Customer_Type: Which type of customer purchased the product (either Retail or Large Farmer or Unknown)
- Region: The customer belongs to which region or from which area.
- Product_Name: Name of the pesticide product, customer purchased.
- Package_Quantity: Package Size of all products along with its units (ex 200ml, 1L, 1kg, 500gm, 1pouch, etc)
- Sale_Price: Per unit selling price of products.
- Sale_Quantity: Total sold product quantity.
- Profit: This feature measures the margin of total profit after selling.
- Season: This feature indicates which season product has been sold (either Pre-Winter, Winter or Growing).

- Category: Types of products has been sold, there are four types of products here (Fungicide, Herbicide, Insecticide, Plant Nutrition).

3.2 Purchase Data

This sheet contains data related to the weekly purchase of all four types pesticides across five months (total 22 weeks). The features recorded in the sheet are as follows

- Product_Name: Name of the pesticide's product.
- Package_Quantity: Package Size of all products along with its units (ex - 200ml, 1L, 1kg, 500gm, 1pouch, etc)
- Purchase_Price: Per unit purchase price of the products by owner.
- Category: Types of product has been sold, there are four types of product here (Fungicide, Herbicide, Insecticide, Plant_Nutrition).

3.3 Inventory Data for Fungicide

This sheet contains data related to the weekly stock in and stock out data of fungicides. The features recorded in the sheet are as follows

- Product_Name: Name of the fungicide's product.
- Sales_Date: Weekly date range
- Weeks: Each weekly range has been assigned with unique values.
- Purchase_Quantity: Weekly purchase quantity of fungicide product by owner.
- Sales_Quantity: Weekly selling quantity of fungicide product by customers.
- Closing_Stock: Weekly remaining unsold fungicide product's quantity in stock.

3.4 Inventory Data for Herbicide

This sheet contains data related to the weekly stock in and stock out data of herbicide. The features recorded in the sheet are as follows

- Product_Name: Name of the herbicide product.
- Sales_Date: Weekly date range
- Weeks: Each weekly range has been assigned with unique values.
- Purchase_Quantity: Weekly purchase quantity of the herbicide product by owner.

- Sales_Quantity: Weekly selling quantity of herbicide product by customers.
- Closing_Stock: Weekly remaining unsold herbicide product's quantity in stock.

3.5 Inventory Data for Insecticide

This sheet contains data related to the weekly stock in and stock out data of insecticides. The features recorded in the sheet are as follows

- Product_Name: Name of the insecticide product.
- Sales_Date: Weekly date range
- Weeks: Each weekly range has been assigned with unique values.
- Purchase_Quantity: Weekly purchase quantity of insecticide product by owner.
- Sales_Quantity: Weekly selling quantity of insecticide product by customers.
- Closing_Stock: Weekly remaining unsold insecticide product's quantity in stock.

3.6 Inventory Data for Plant Nutrition

This sheet contains data related to the weekly stock in and stock out data of plant nutrition. The features recorded in the sheet are as follows

- Product_Name: Name of the plant nutrition product.
- Sales_Date: Weekly date range
- Weeks: Each weekly range has been assigned with unique values.
- Purchase_Quantity: Weekly purchase quantity of the plant nutrition product by owner.
- Sales_Quantity: Weekly selling quantity of plant nutrition product by customers.
- Closing_Stock: Weekly remaining unsold plant nutrition's quantity in stock.

Link to the data: Data for BDM Project (Kindly download in your local system)

4 Descriptive Statistics

The dataset provided includes sales, purchase, inventory information for various pesticides data over 22-week period. Most important feature variables are:

- **Product_Name:** Name of pesticides.
- **Total Sale:** Total number of units sold.
- **Category:** Types of pesticides (fungicide, insecticide, herbicide, plant nutrition)
- **Maximum Sale:** The highest number of units sold in a single week.
- **Minimum Sale:** The lowest number of units sold in a single week.
- **Revenue Generated:** The total revenue generated from all the four types of products.
- **Profit:** The total profit earned from all four category.
- **Weekly Sales and Revenue:** Sales and revenue data broken down by week.

Summary statistics for four different types of pesticides:

- **Total Sales Quantity:**

Fungicide		*Herbicide*		*Insecticide*		*Plant Nutrition*	
Mean	6.70	Mean	6.83	Mean	6.89	Mean	6.67
Standard Error	0.10	Standard Error	0.10	Standard Error	0.11	Standard Error	0.12
Median	7	Median	7	Median	7	Median	7
Mode	6	Mode	7	Mode	7	Mode	6
Standard Deviation	1.94	Standard Deviation	1.86	Standard Deviation	2.25	Standard Deviation	2.00
Sample Variance	3.78	Sample Variance	3.46	Sample Variance	5.04	Sample Variance	3.99
Kurtosis	-0.27	Kurtosis	-0.38	Kurtosis	8.24	Kurtosis	0.00
Skewness	0.05	Skewness	-0.06	Skewness	1.35	Skewness	-0.17
Range	12	Range	9	Range	21	Range	11
Minimum	1	Minimum	2	Minimum	1	Minimum	1
Maximum	13	Maximum	11	Maximum	22	Maximum	12
Sum	2694	Sum	2474	Sum	3099	Sum	1842
Count	402	Count	362	Count	450	Count	276

Table 1. Summary Statistics of Four Type Pesticides

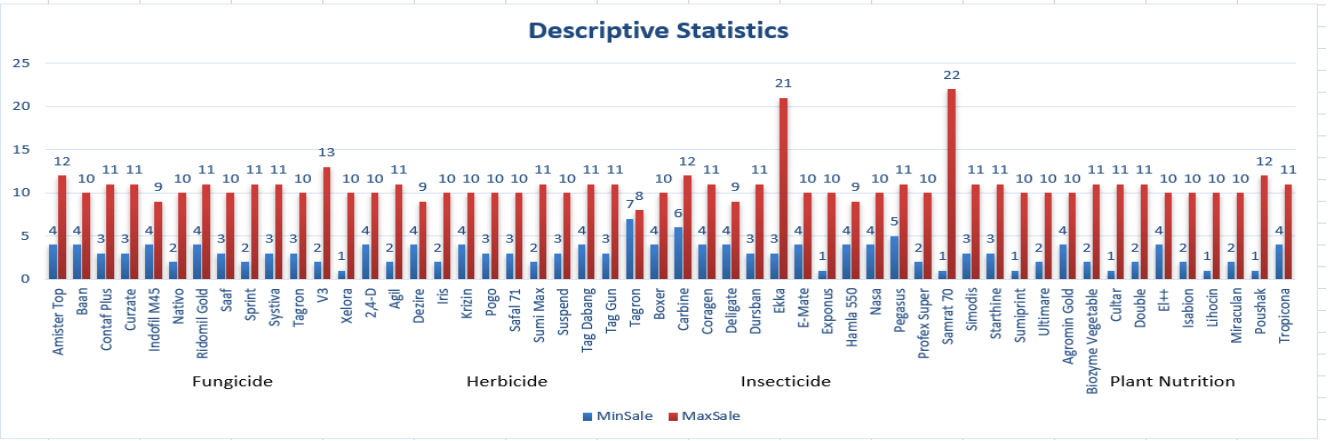

Fig 7. Min-Max Descriptive Statistics

Summary statistics for all pesticides products:

- **Total Sale Quantity For all Products:**

Row Labels	Total(Sale)	Average(Sale)	Min(Sale)	Max(Sale)	StdDev(Sale)	Var(Sale)	Revenue(Rates*Sale_Qty)	%Share Revenue
Fungicide	**2694**	**6.70**	**1**	**13**	**1.94**	**3.78**	**1790514**	**100%**
Amister Top	143	7.15	4	12	2.25	5.08	174460	10%
Baan	145	6.90	4	10	1.70	2.89	33350	2%
Contaf Plus	112	6.59	3	11	2.00	4.01	33929	2%
Curzate	173	6.92	3	11	2.18	4.74	195974	11%
Indofil M45	303	6.89	4	9	1.57	2.48	75013	4%
Nativo	229	6.54	2	10	1.70	2.90	160300	9%
Ridomil Gold	203	6.77	4	11	1.83	3.36	324800	18%
Saaf	416	6.50	3	10	1.67	2.79	167596	9%
Sprint	258	6.79	2	11	2.02	4.06	156362	9%
Systiva	217	6.78	3	11	2.18	4.76	227850	13%
Tagron	192	6.62	3	10	2.14	4.60	5760	0.3%
V3	155	6.74	2	13	2.47	6.11	39020	2%
Xelora	148	6.17	1	10	2.33	5.45	196100	11%
Herbicide	**2474**	**6.83**	**2**	**11**	**1.86**	**3.46**	**803828**	**100%**
2,4-D	352	6.90	4	10	1.53	2.33	77440	10%
Agil	254	7.06	2	11	2.04	4.17	206728	26%
Dezire	181	6.70	4	9	1.56	2.45	21720	3%
Iris	171	6.84	2	10	2.19	4.81	184099	23%
Krizin	145	6.90	4	10	2.19	4.79	21750	3%
Pogo	280	7.18	3	10	1.62	2.62	46882	6%
Safal 71	172	5.93	3	10	1.77	3.14	12040	1%
Sumi Max	263	6.92	2	11	1.98	3.91	31560	4%
Suspend	167	6.19	3	10	1.78	3.16	45090	6%
Tag Dabang	187	6.93	4	11	1.80	3.23	35530	4%
Tag Gun	287	7.18	3	11	2.06	4.25	120540	15%
Tagron	15	7.50	7	8	0.71	0.50	450	0.1%
Insecticide	**3099**	**6.89**	**1**	**22**	**2.25**	**5.04**	**1366875**	**100%**
Boxer	50	7.14	4	10	2.34	5.48	21714	2%
Carbine	124	7.75	6	12	1.44	2.07	29838	2%
Coragen	111	7.40	4	11	1.88	3.54	55648	4%
Deligate	100	7.14	4	9	1.35	1.82	27000	2%
Dursban	236	6.94	3	11	1.97	3.88	63720	5%
Ekka	364	7.00	3	21	3.06	9.33	24150	2%
E-Mate	104	6.12	4	10	1.90	3.61	3120	0.2%
Exponus	215	6.32	1	10	2.16	4.65	216644	16%
Hamla 550	108	6.75	4	9	1.57	2.47	54810	4%
Nasa	193	7.15	4	10	1.81	3.28	38600	3%
Pegasus	174	7.25	5	11	1.62	2.63	17400	1%
Profex Super	164	6.56	2	10	2.16	4.67	49397	4%
Samrat 70	344	7.02	1	22	3.07	9.44	6880	1%
Simodis	184	7.08	3	11	2.02	4.07	239554	18%
Starthine	171	6.84	3	11	2.32	5.39	60055	4%
Sumiprint	283	6.74	1	10	1.95	3.81	264625	19%
Ultimare	174	6.44	2	10	2.15	4.64	193720	14%
Plant Nutrition	**1842**	**6.67**	**1**	**12**	**2.00**	**3.99**	**643893**	**100%**
Agromin Gold	172	6.37	4	10	1.60	2.55	66475	10%
Biozyme Vegetable	185	7.40	2	11	2.40	5.75	40626	6%
Cultar	202	6.73	1	11	2.13	4.55	46460	7%
Double	232	6.63	2	11	2.07	4.30	111691	17%
EI++	186	6.41	4	10	1.59	2.54	31299	5%
Isabion	190	6.55	2	10	1.66	2.76	105352	16%
Lihocin	139	6.62	1	10	2.58	6.65	82923	13%
Miraculan	142	6.45	2	10	2.20	4.83	20719	3%
Poushak	218	6.41	1	12	2.08	4.31	90534	14%
Tropicona	176	7.33	4	11	1.58	2.49	47813	7%
Grand Total	**10109**	**6.78**	**1**	**22**	**2.03**	**4.12**	**4605111**	**100%**

Table 2. Summary Statistics of all Products

- Average Sales in 5 months is 2021.8 units (Average sales for Fungicide, Herbicide, Insecticide and Plant-Nutrition are 538.8 units, 494.8 units, 619.8 units and 368.4 units respectively)
- Highest: Saaf (416 units)
- Lowest: Targon (15 units)

- **Revenue Generated:**
  - Average Revenue generated: Rs 921,022.15 (in 5 months). where revenue from fungicide, herbicide, insecticide and plant-nutrition are Rs 358,102.8, Rs 160,765.6, Rs 273,375 and Rs 128,778.6 respectively.
  - Highest: Ridomil Gold (Rs 324,800)
  - Lowest: Targon (Rs 450)

5 Detailed Explanation of Analysis Process/Method

Process:

- **Data Collection:** Sales, revenue, Inventory data were collected for various pesticides product over a 22- week period (around 5 months).
- **Data Cleaning and Preprocessing**: Data cleaning was done for missing values, data inconsistency in product name, categories and ensured sales_date/weeks formatting and removed duplicates records.
- **Descriptive Analysis:** Key statistics such as total sales, maximum, minimum weekly sales, total revenue, and profit margin were computed across all types of pesticides.
- **Pareto Analysis:** Conducted to identify the pesticide products contributing the most to total sales and revenue.
- **Sales And Trend Analysis:** Weekly sales trends were visualized to understand seasonality and identify peak demand period, enabling precise inventory planning and marketing strategy making.

Method Justification:

- **Data Cleaning and Preprocessing:** Improves data accuracy by removing error data, inconsistency, ensuring smooth integration across datasets for reliable analysis.
- **Descriptive Statistics:** Provides a clear summary of the data, highlighting key metrics such as sales, revenue, percentage revenue share, profit margin. This method is in need for understanding the overall performance of each pesticide products.
- **Pareto Analysis:** It helps in identifying few important products that contribute the most to sales and revenue, helping for more focused decision-making and resource allocation.
- **Sales And Trend Analysis:** It essential to detect patterns in customers' purchasing behavior over time. Analyzing the sales trends, we can easily identify seasonal fluctuation, peak

demand time, this will help to align inventory level with expected demand, preventing from stockout, overstocking and will be helping for improving sales and maximizing profitability.

Why This Method is More Appropriate:

- **Comprehensive Overview:** Descriptive Statistics give us a broader view about data.
- **Focused Insight:** Pareto Analysis highlights top performing products driving majority of sales and profits, helping prioritization of products.
- **Actionable Information:** Trend calculation provides practical insights for inventory and supply chain management.

6 Results and Findings

- **Sales Contribution on Profitability:** Insecticides with high sales contributing most revenues whereas herbicides with high sales making comparatively less revenues.

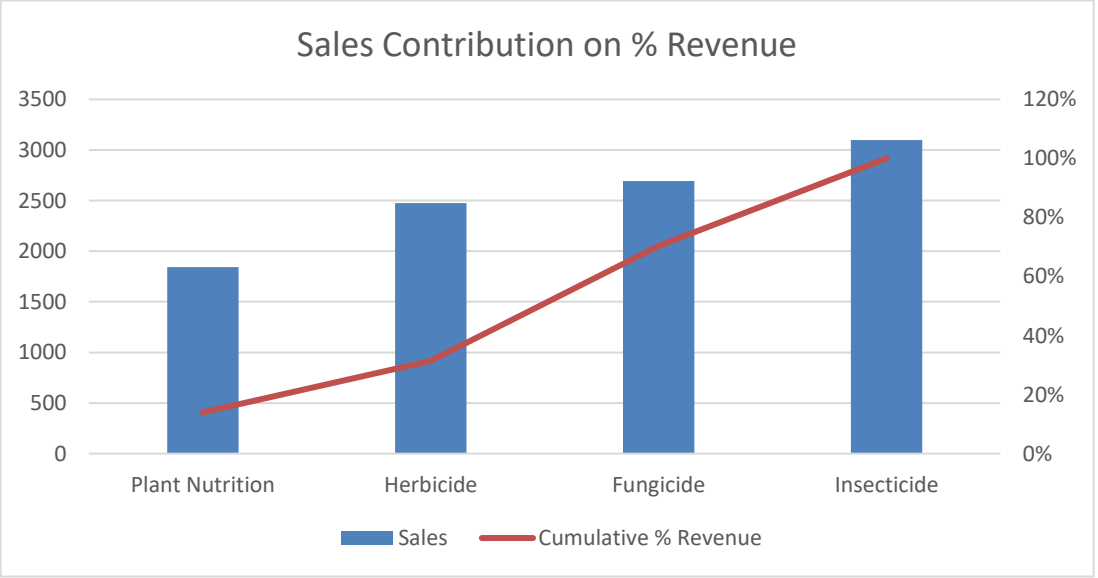

Fig 8. Sales Vs. %Revenue

  - The blue bars represent the sales of each type of pesticides.
  - The brown color line represents the percentage contribution in revenue.

  This chart helps identify pesticides with high volume of sales and high contribution to profit, allowing the owner to make informed decisions about which pesticides to stock less and which to more.

- **Top five Performers (Revenue):** Ridomil Gold (Fungicide), Sumiprint (Insecticide), Simodis (Insecticide), Systiva (Fungicide), Exponus (Insecticide) are the top five product

which are generating most of the revenue.

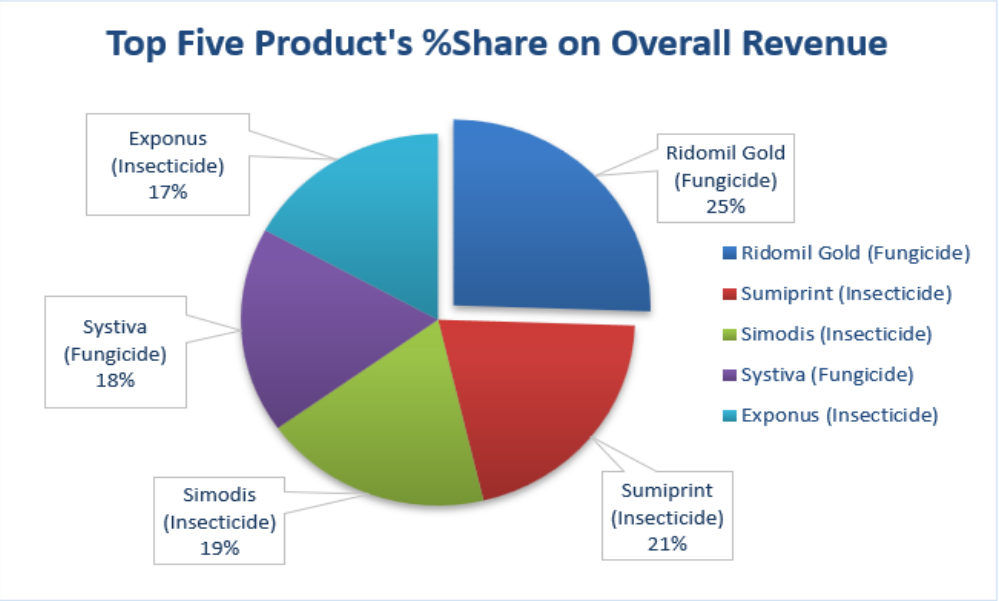

Fig 9. Pie Graph for Top Revenue Generating Products

- **Top five Performers (Profit):** Ridomil Gold, Sumiprint, Exponus, Simodis are the top profitable products based on their popularity.

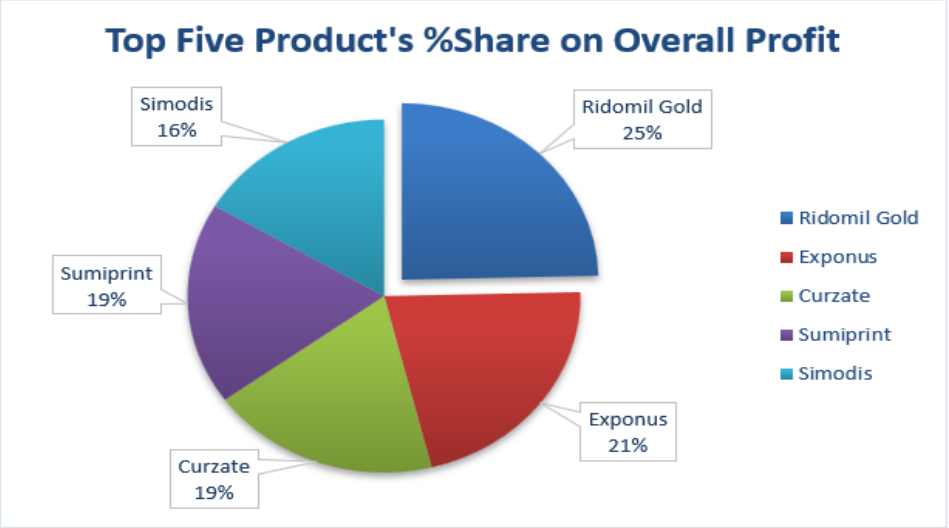

Fig 10. Pie Graph for Top Profit Generating Products

- **High Demand & Revenue Product:** Exponus and Sumiprint are the most demanding and both revenue as well as profit generating products. Moreover, amongst all other pesticides, Insecticide is the more demanding and profit making compared to others and driving bulk of revenue, should remain in strategic focus.
- **High Sales but Low Revenue:** Saaf (416 units), 2,4-D (352 units) and Ekka (364 units) are the most demanding product among all pesticide products but their contribution to

profit making as well as revenue generation is very poor.

- **Inventory Efficiency Metrics:** In first graph, we can see sharp spike in Nov, 2024 in sales, possibly indicating major campaign or seasonal onset. The sales dip in mid of Dec,2024 and again rise in Jan-Feb,2025, possibly aligning with planting or treatment cycle. Sales variability is high on Nov,2024 and lowest during mid Dec to early Jan, indicating predicable demand drops.

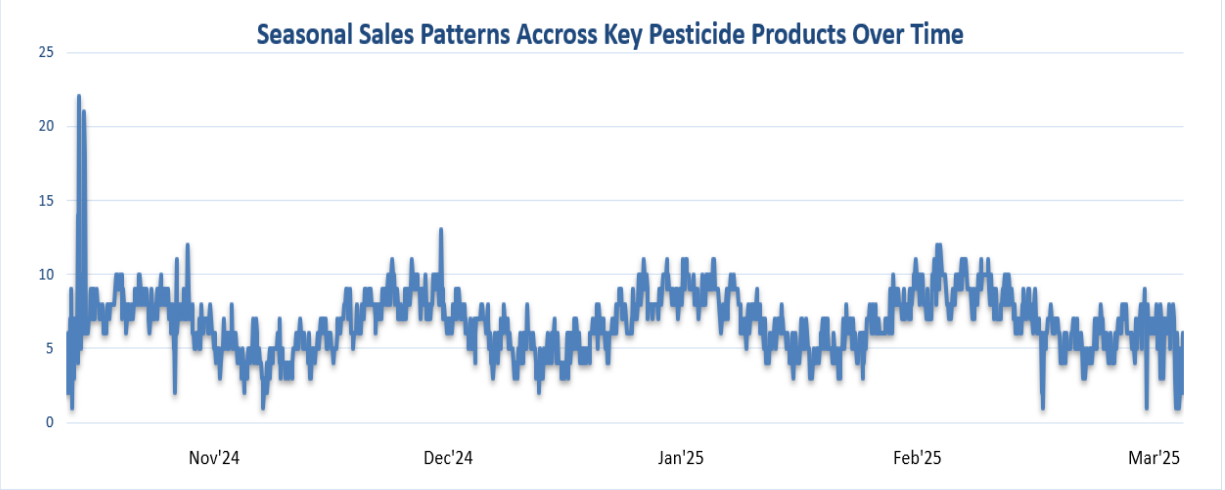

Fig 11. Time Series Graphs of all products for five months

From the below chart, we can see, sales peak occurs in W8, W11, W17 indicating pushing inventory stocks. Post W18, reduce inventory significantly to minimize the overstock.

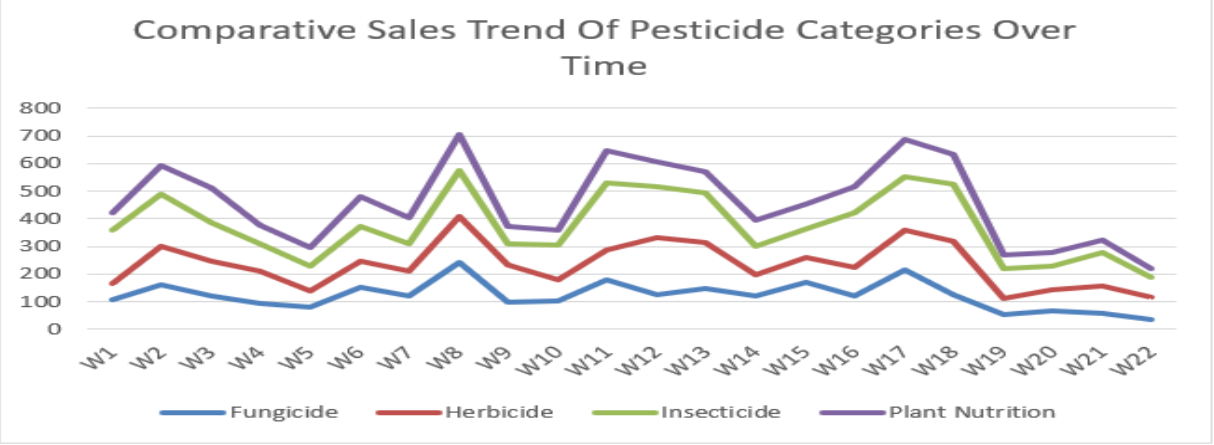

Fig 12. Weekly Time Series Graph of all Four Types of Pesticides