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Optimisation of Fertiliser Delivery Distribution from Distributor to Farmer Group Using Excel Solver in Tanjung Village

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ABSTRACT

Subsidised fertilisers are declared as goods that are monitored for distribution with a specific target, namely farmers. In the distribution process, the government cooperates with various components including the Ministry of Industry and Trade, the Ministry of Agriculture, the Ministry of State-Owned Enterprises and the Ministry of Home Affairs. At the same time, transportation and communication technologies continue to develop rapidly, such as mobile communications and the Internet, which drive the continuous development of the supply chain and technologies related to its regulatory management. This research aims to find out how to optimise the fertiliser transprortation Fertiliser Delivery Distribution and a series of fertiliser supply systems from Distributors to Farmer Groups Using Excel Solvers in Tanjung Village so as to provide better user control. The benefits of this research for distributors can help buffer distributor management to determine the quantity and time of delivery of subsidised fertiliser to official kiosks. The research method uses a case study which is a method of collecting and processing data through review / study of various research reports, flowsheets, research journals, as well as books and other relevant literature.

Keywords: *Excel Solver, Fertiliser Distribution, Optimisation*

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INTRODUCTION

Indonesia is an agrarian country because most of its population has a job in the field or in the agricultural sector (Abbou-Ou-Cherif, 2019). With the amount of agricultural land spread across the surface in Indonesia, making the Indonesian population has very high natural resources. However, when Indonesia is in the process

of becoming an industrialised country, such as the example of the processing industry in the agricultural sector (Al-Rumaihi, 2023).

Fertiliser is one of the production inputs that can optimise agricultural production. The role of the fertiliser industry in the economy, especially the agricultural sector, is unquestionable, as the area of agricultural land continues to increase on plantations in Indonesia, the need for fertiliser is increasing (Amagada, 2023). Demanding an increase in the amount of fertiliser requires an increase in the volume of fertiliser production (Baccour, 2024). The very important position of fertiliser in agricultural production is quite encouraging for government intervention in regulating fertiliser trade. The government policy related to this issue is subsidy. The fertiliser subsidy implemented since 1971 aims to reduce the cost borne by farmers of procuring fertiliser so that farmers do not have difficulty obtaining fertiliser due to cost, to support this, companies must distribute fertiliser to farmers (Fan, 2022).

Subsidised fertilisers are declared as goods that are monitored for distribution with a specific target, namely farmers. In the distribution process, the government cooperates with various components including the Ministry of Industry and Trade, the Ministry of Agriculture, the Ministry of State-Owned Enterprises and the Ministry of Home Affairs. This shows that the distribution of subsidised fertiliser is crucial to the agricultural sector in Indonesia. The distribution flow to reach farmers is from producers to distributors, from distributors to agents or official fertiliser kiosks, from official kiosks sold to farmers at relatively cheap prices using certain conditions such as depositing ID cards, provided that the subsidised fertiliser is properly realised and right on target by the government (Bai, 2024).

Optimising the distribution of fertiliser deliveries from distributors to farmer groups can be done through several approaches (Han, 2024). One of the most effective is the use of technology such as the Tani Card, which ensures that subsidised fertiliser is targeted. In addition, fertiliser distribution optimisation models using mathematical approaches and algorithms, such as Strategic Evolution, have also proven effective in reducing costs and improving distribution efficiency (Huang, 2024).

Supply chain profit is the total profit shared across all stages of the supply chain. The higher the profit of a supply chain, the more successful the supply chain is. The success of a supply chain should be measured in terms of the profitability of the supply chain as a whole and not the profitability of individual actors (Alaan, 2023). For any supply chain, there is one source of revenue, the consumer (Kravchuk, 2019). Meanwhile, all flows of information, products and funds generate costs for the supply chain. Therefore, good organisation of these flows is the key to supply chain success. Effective supply chain management involves the management of supply chain assets and product, information, and fund flows to maximise supply chain profits (Chang, 2023).

Added by Wisner, Tan, and Leong; 2009 said that supply chain management can be understood as an effort to coordinate and integrate a number of product-related activities in the supply chain to improve operating efficiency, quality, and customer service in order to obtain a sustainable competitive advantage for all collaborating organisations (Kodong, 2019).

This research aims to find out how to optimise fertiliser transprortation Fertiliser Delivery Distribution and a series of fertiliser supply systems from Distributors to Farmer Groups Using Excel Solver in Tanjung Village so as to provide better user control (Kozhushko, 2024).

The benefits of this research for distributors can help buffer distributor management to determine the quantity and time of delivery of subsidised fertiliser to official kiosks (Liu, 2023). Can cut the possibility of overstock and lost stock that occurs so that it can provide the best service to farmers. For kiosks, it can determine the amount of fertiliser needed for each farmer during the planting period.

Research objectives

1. To determine the internal and external factors that influence the calculation of fertiliser from distributors to farmer groups in Tanjung village.
2. To find out alternative fertiliser calculation strategies using the excel solver method in Tanjung village.

RESEARCH METHODOLOGY

Observation is a method of obtaining data by direct research and observation in the field in accordance with the existing conditions in the company (Rahman, 2021). Through observation, researchers can see firsthand how processes and activities take place, so that the data obtained is more accurate and relevant to the real situation in the field. This method is very useful for understanding dynamics and problems that may not be visible in secondary data or written reports (Min, 2020).

Documentation is a method used to obtain data by documenting the actual situation in the field, such as through direct viewing and photographing. With documentation, researchers can collect visual and written evidence that can be used for further analysis (Shi, 2021). Case study, on the other hand, is a method of collecting and processing data through review or study of various research reports, flowsheets, research journals, as well as books and other relevant literature (Ajeng, 2023). This method allows researchers to conduct in-depth analyses based on various existing sources of information, so as to provide a comprehensive picture of the phenomenon under study.

RESULT AND DISCUSSION

Advantages

The calculation of fertiliser distribution in Tanjung village is adequate, the calculation from the government is sufficient for the input of fertiliser for residents, (Head of Tanjung village 29/june/2024).

In Tanjung Village, the use of organic fertiliser is quite rare, and it is very difficult for residents to get various kinds of fertiliser. It is quite minimal, in the calculation all can be fulfilled but, in fact, it is not, perhaps because there is a sales council from the government so that residents who want to get fertiliser are by buying.

Microsoft Excel is the main application for recording and processing data for various fields and purposes. Such as accounting, sales, statistical analysis, and so on. The use of Microsoft Excel is very wide, both among the general public, professionals, and organisations to produce various data processing techniques and data modelling in the form of reports and graphics (Sharipov, 2021). However, the many features offered by Microsoft Excel often raise the question of when and how they should be used. Moreover, since an Excel problem can be solved in many ways, it is also necessary to understand how to use Ms Excel effectively and efficiently. Microsoft Excel includes many basic excel formulas or functions that can be used to get sums, averages, maximum and minimum values and other calculations on various cells or ranges. To use basic excel functions correctly, you must understand the different parts of each Microsoft Excel function and how to structure each function argument to calculate the given values and references.

Optimising fertiliser transport Moving towards higher-end products and services will force companies to invest and focus on their supply chains to gain a competitive advantage that can support their business continuity. At the same time, transport and communication technologies continue to develop rapidly, such as mobile communications and the Internet, which drives the continuous development of the supply chain and the technologies associated with its regulatory management (Guritno and Harsasi, 2014). Supply Chain Management is an approach used to achieve efficient integration between suppliers, manufacturers, distributors, retailers, as well as customers. is goods produced in large quantities perfectly, at the right time, and in the right place for a predetermined purpose achieving a minimal port system and also achieving a holistic port system desired service level.

According to Jay Heizer and Barry Render (2005, p631), transportation modelling is an iterative procedure for solving the problem of minimising the cost of shipping products from several sources to several destinations. So the definition of transportation is the transfer of goods and services from several places of origin (sources) to several destinations by solving transportation cost problems so that these costs are optimal. The transshipment problem is a special case of the transportation problem which is part of the science of operation research. While the transport problem is a method used to organise distribution from sources that provide the same or similar products to the destination in an optimal manner. Distribution is carried out in such a way that the

demand from several destinations can be met from several origins, each of which can have different demands and capacities.

In agricultural transport planning, several problems have been documented in the literature. Some of them have been aimed at optimising SC logistics planning, such as the study conducted (Shiyi, 2023). They modelled public food SC in India, meeting aggregate demand across states. The transport planning model involves transporting large quantities of food grains, via limited-capacity vehicles, from food-surplus states to food-deficit states. They used a non-LP mixed integration model to minimise the total cost (i.e. transportation, storage, and system operation), considering storage, capacity, and demand restrictions. The proposed model is solved via metaheuristics, using a modification of ant colony optimisation.

According to (Zeng, 2023) SCM is the management of flows between and among supply chain stages to maximise total supply chain profitability. SCM is the management of flows between supply chain stages to maximise total supply chain profitability. Supply chain management is an integrative philosophy used to manage the total flow through the distribution channel from suppliers to end users. Another definition is the management of the chain or operations and centres through which inventory moves from the source of supply to the end customer or point of use (Compton & Jessop, 1995). One of the objectives of supply chain management may be to reduce or eliminate the inventory buffer that exists between organisations in a chain through sharing information regarding demand and current inventory levels. Logistics and supply chain management can provide many ways to improve efficiency and productivity and therefore contribute significantly to reducing unit costs.

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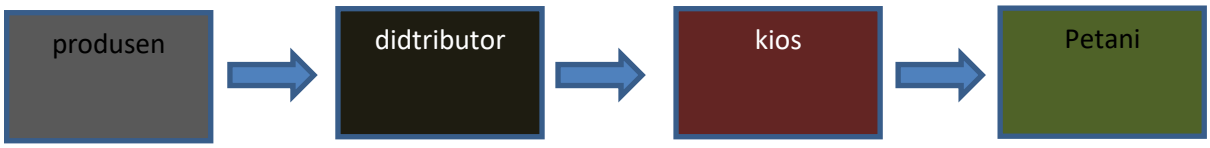

The amount of fertiliser income that farmers should receive and its price. With the initial amount of fertiliser from the producer as much as 3.00 kilos of fertiliser with a

G1 | harga pupuk

	A	B	C	D	E	F	G	H	I	J
1	no	produsen	distributor	kios	petani	jumlah pupuk	harga pupuk	Biaya Pengiriman	total	
2		jumlah pupuk 300	distributor 1= 150 kilo	pak mat	juhai	50 kilo	30.000.	1.500. 000	3.000.000	
3					misluki	50 kilo	30.000.	1.500. 000	3.000.000	
4					martiyem	50 kilo	30.000.	1.500. 000	3.000.000	
5			distributor 2=150 kilo	pak udin	marbuaah	50 kilo	30.000.	1.500. 000	3.000.000	
6					junaidi	50 kilo	30.000.	1.500. 000	3.000.000	
7					misnati	50 kilo	30.000.	1.500. 000	3.000.000	
8										
9								Rumus Biaya Pengirman		
10								berat barang X harga =		
11								5o kilo X 30.000= 1.500. 000		
12										

selling price per kilo of 30,000 RP.

So the price of fertiliser received by the farmer is IDR 1,500,000/kilo, plus the delivery fee of 1,500,000. So what the farmer spent is Rp 3,000,000 out of the total amount. Finally, the user can save the transport plan in a different MS Excel file, and restart the Initial button to evaluate a new scenario (change the model parameters) for which a new transport plan is sought

CONCLUSION

In agricultural transport planning, several issues have been documented in the literature. Some of them have been aimed at optimising integrative SC logistics planning used to manage the total flow through the distribution channel from suppliers to end-users or manage the operations and central chain through inventory, moving from the source of supply to the end customer or point of use.

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