

Distribution requirement planning for feed based on SMADISPRO software development

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Abstract. Feed has an important role in livestock productivity. Distribution planning is a process that can ensure that supply will balance demand. The method used in determining distribution needs is Distribution Requirement Planning (DRP). The results of this study show that the ideal amount of feed requirements is 4,193 kg. This calculation was developed through software called SMADISPRO to make it easier for companies to determine the amount of distribution needs automatically.

1 Introduction

The animal feed industry has experienced rapid development in recent decades. Feed is one of the main components that is important in a livestock business. Feed plays an important role in livestock productivity. The feed given to livestock, especially ruminant livestock, is feed that contains fiber, protein and other nutrients that are sufficient to meet the needs of livestock life, therefore, the availability of feed stock must always be maintained..

Distribution planning is a process that can ensure that inventory will balance demand. An indication of the success of this goal is that demand can be met [1], [2]. Distribution Requirement Planning (DRP) can create better product delivery scheduling, maintain stock to meet consumer needs, and be more responsive to uncertain events that occur in the distribution [3], [4].

The transformation of the digital era requires business actors to utilize technology that leads to industry 4.0 [5]. This can change manual activities towards digitalization as a support for business actors in planning distribution needs [6]–[8]. This study aims to determine the planned amount of feed requirements to be distributed through the use of technology in the form of software.

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2 Material and Methods

This research method uses the Distribution Requirement Planning (DRP) model, which is a system that determines inventory demand at distribution centers, combines historical demand, and functions as input for production and material systems [9]. This model is similar to Material Requirement Planning (MRP) but focuses on ordering raw materials [10]. This model uses the following matrix:

Lead Time:

Lot Size :

Safety Stock:

POH Previous:

	1	2	3	4
GR				
SR				
POH				
NR				
PORec				
PORI				

Fig. 1 DRP Matrix

1. Lead Time
Lead time consists of the time during which the shipping, picking and packaging process begins at the time of ordering and the receipt of the order by the consumer [11].
2. Lot Size
The number of items ordered refers to the agreed lot size [12]
3. Safety Stock
To anticipate demand uncertainty relative to forecasts [13] [14].
4. Project On Hand (POH)
This result is obtained from the calculation of initial inventory minus Gross Requirements [15].
5. Gross Requirement (GR)
This is demand data originating from consumers [16].
6. Scheduling Receipts (SR)
There are a number of scheduled arrivals of goods [17].
7. Net Requirement (NR)
Net demand is obtained from the difference between demand and existing stock conditions [18].
8. Planned Order (POReceipt and PORelease)
The ordering and shipping planning stage has not been implemented. This is different from scheduled receipts which means the goods have been sent or are in process [19], [20].

3 Results and Discussion

This research was conducted in one of the animal feed industries in the Bogor Region. This company has 10 products sold to several consumers. The distribution needs scheme can be seen in Figure 2.

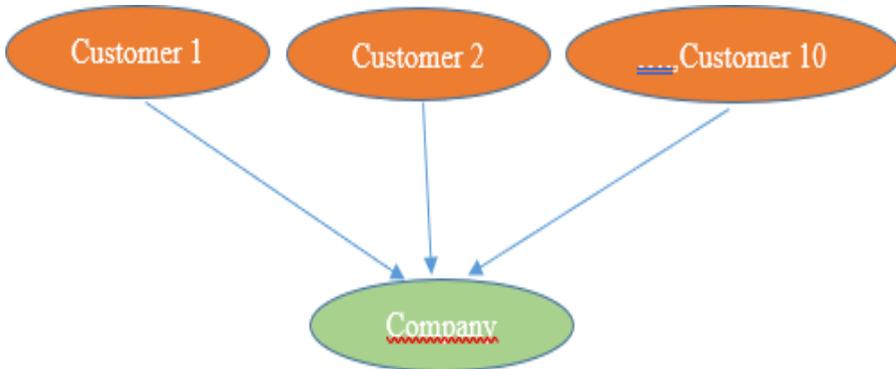


Fig 2. Distribution Requirement Scheme

Based on the amount of needs from each consumer, the company must be able to manage production based on the results of the DRP calculation. Planned order Release each calculation becomes a reference for demand for the company so that it is included in the Company's Gross Requirement DRP. The simulation of the calculation for 1 month of the DRP method is as follows:

Customer K-Plus

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 500

Table 1. DRP K-Plus

	1	2	3	4
GR	1.360	2.040	480	2.240
SR				
POH	0	0	0	0
NR	860	2.040	480	2.240
PORec	860	2.040	480	2.240
PORI	2.040	480	2.240	

**Customer
 Coffee Skin**

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 50

Table 2. DRP Coffee Skin

	1	2	3	4
GR	65	0	38	103
SR				
POH	0	0	0	0
NR	15	0	38	103
PORec	15	0	38	103
PORl	0	38	103	

Customer Kale

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 100

Table 3. DRP Kale

	1	2	3	4
GR	24	132	72	194
SR				
POH	76	0	0	0
NR		56	72	194
PORec		56	72	194
PORl	56	72	194	

**Customer Mia
 Optima B**

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 100

Table 4. DRP Mio Optima B

	1	2	3	4
GR	160	440	600	99
SR				
POH	0	0	0	0
NR	60	440	600	99
PORec	60	440	600	99
PORl	440	600	99	

Customer Katul

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 5

Table 5. DRP Katul

	1	2	3	4
GR	50	0	18	0
SR				
POH	0	0	0	0
NR	45	0	18	0
PORec	45	0	18	0
PORl	0	18	0	

Customer Mio Optima C

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 400

Table 6. DRP Mio Optima C

	1	2	3	4
GR	480	520	1.440	400
SR				
POH	0	0	0	0
NR	80	520	1.440	400
PORec	80	520	1.440	400
PORl	520	1.440	400	

**Customer
 Pollard KK**

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 5

Table 7. DRP Pollard KK

	1	2	3	4
GR	50	0	0	50
SR				
POH	0	0	0	0
NR	45	0	0	50
PORec	45	0	0	50
PORI	0	0	50	

**Customer
 Kopra**

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 5

Table 8. DRP Copra

	1	2	3	4
GR	0	0	50	0
SR				
POH	5	5	0	0
NR			45	0
PORec			45	0
PORI		45	0	

**Customer Mio
 Optima A**

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 100

Table 9. DRP Mio Optima A

	1	2	3	4
GR	0	0	1.600	0
SR				
POH	100	100	0	0
NR			1.500	0
PORec			1.500	0
PORl		1.500	0	

Customer Soy Sauce Pulp

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 5

Table 10. DRP SoySauce Pulp

	1	2	3	4
GR	0	0	0	54
SR				
POH	5	5	5	0
NR				49
PORec				49
PORl			49	

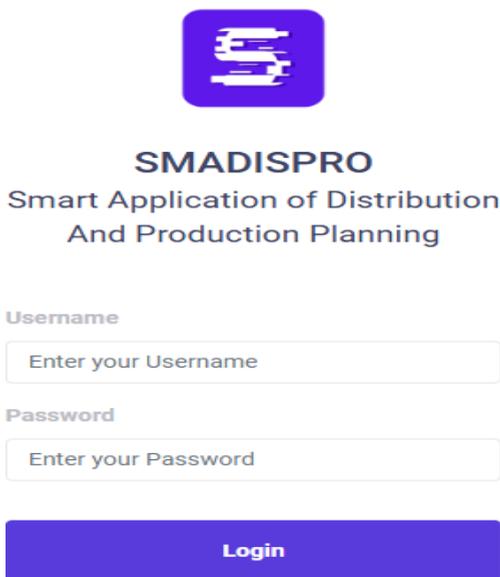
COMPANY

Lead Time: 1 Week
 Lot Size : L4L
 Safety Stock: 0
 First POH: 500

Table 11. DRP Company

	1	2	3	4
GR	3.056	4.193	3.135	0
SR				
POH	0	0	0	0
NR	3.056	4.193	3.135	0
PORec	3.056	4.193	3.135	0
PORl	4.193	3.135	0	

Based on the results of the DRP calculation above, it was obtained that the amount of production that must be prepared to distribute each consumer's needs the most in the second week is 4,193 Kg to carry out the process of ordering raw material preparation to the supplier so that these needs can be met. The production process carried out is in the form of mixing from each raw material ordered by the supplier. To make it easier for users to plan the amount of feed distribution needs, the development of internet-based software is carried out. This software is called Smart Application Distribution and Production (SMADISPRO) which can be a decision support for users in determining the amount of feed distribution needs. Users only input data into the DRP matrix and automatically the results of the calculation of the amount of needs can be known. The initial display on the SMADISPRO software can be seen in Figure 3.



SMADISPRO
Smart Application of Distribution
And Production Planning

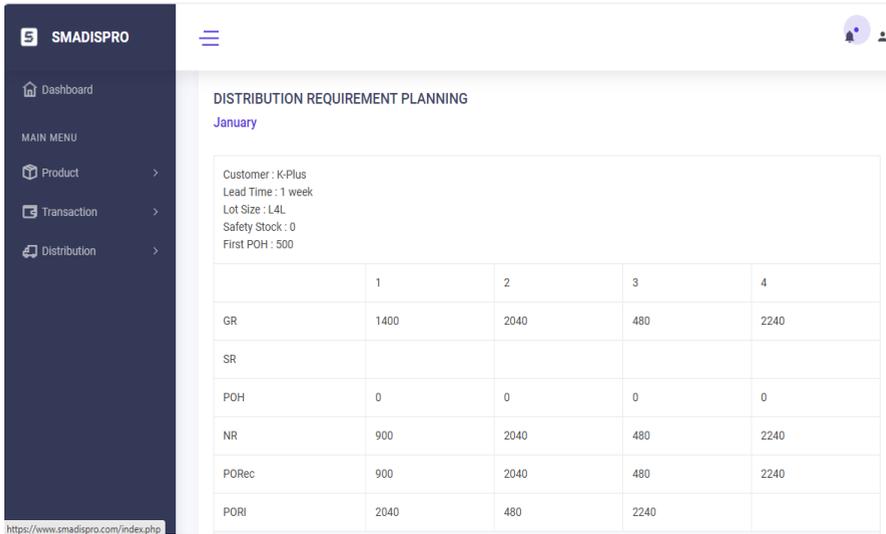
Username
Enter your Username

Password
Enter your Password

Login

Fig 3. Software Login Display

After the user logs into the software, the user can select the distribution menu to input monthly data on distribution needs. Data input is in the form of requests from customers every week, the set lead time, the amount of stock available in the warehouse, the size of the shipment, and the set safety stock. After that, the results of the DRP calculation can be seen directly on the menu display until they reach the company's distribution needs. An example of the display on the DRP calculation in the SMADISPRO Software can be seen in Figure 4.



Customer : K-Plus
Lead Time : 1 week
Lot Size : L4L
Safety Stock : 0
First POH : 500

	1	2	3	4
GR	1400	2040	480	2240
SR				
POH	0	0	0	0
NR	900	2040	480	2240
PORec	900	2040	480	2240
PORI	2040	480	2240	

Fig 4. DRP Display

4 Conclusion

DRP Model can facilitate companies, especially the animal feed industry, in meeting feed distribution needs. With the use of this technology in the form of SMADISPRO software, it will be easier for companies to make decisions regarding the ideal amount of feed requirements.

5 Acknowledgements

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References

- [1] W. Wang, R. Y. K. Fung, and Y. Chai, "Approach of just-in-time distribution requirements planning for supply chain management," *Int. J. Prod. Econ.*, **91**, 2, 101–107, (2004)
- [2] S. Karimi-Arpanahi, M. Jooshaki, M. Moeini-Aghaie, A. Abbaspour, and M. Fotuhi-Firuzabad, "Incorporating flexibility requirements into distribution system expansion planning studies based on regulatory policies," *Int. J. Electr. Power Energy Syst.*, **118**, 105769, (2020)
- [3] R. V. Pitt and C. New, "Requirements Planning.," *Oper. Res. Q.*, **26**, 3, 664, (1975)
- [4] I. Rizkya, K. Syahputri, R. M. Sari, I. Siregar, M. M. Tambunan, and Anizar, "DRP: Joint Requirement Planning in Distribution Centre and Manufacturing," *IOP Conf. Ser. Mater. Sci. Eng.*, **434**, 1, (2018)
- [5] M. J. Piatkowski, "Expectations and challenges in the labour market in the context of industrial revolution 4.0. the agglomeration method-based analysis for Poland and Other EU Member States," *Sustain.*, **12**, 13, (2020)

- [6] S. H. Santosa, A. P. Hidayat, and R. Siskandar, "Safea application design on determining the optimal order quantity of chicken eggs based on fuzzy logic," *IAES Int. J. Artif. Intell.*, **10**, 4, 858–871, (2021)
- [7] A. P. Hidayat, S. H. Santosa, R. Siskandar, and R. G. Baskoro, "Evaluation of Chicken Eggs Supply With Fuzzy AHP Approach Through Development of Safea Software," *J. Logistik Indones.*, **5**, 2, 104–110, (2021)
- [8] S. Chen, S. Brahma, J. Mackay, C. Cao, and B. Aliakbarian, "The role of smart packaging system in food supply chain," *J. Food Sci.*, **85**, 3, 517–525, (2020)
- [9] D. J. Bowersox, D. J. Closs, M. B. Cooper, and J. C. Bowersox, *Gestão logística da cadeia de suprimentos*. AMGH Editora, (2013)
- [10] C. C. Bozarth, R. B. Handfield, and H. J. Weiss, *Introduction to operations and supply chain management*. Pearson Prentice Hall Upper Saddle River, NJ, (2008)
- [11] H. Zhang, X. Chao, and C. Shi, "Closing the gap: A learning algorithm for lost-sales inventory systems with lead times," *Manage. Sci.*, **66**, 5, 1962–1980, (2020)
- [12] C. Basnet and J. M. Y. Leung, "Inventory lot-sizing with supplier selection," *Comput. Oper. Res.*, **32**, 1, 1–14, (2005)
- [13] J. Barros, P. Cortez, and M. S. Carvalho, "A systematic literature review about dimensioning safety stock under uncertainties and risks in the procurement process," *Oper. Res. Perspect.*, **8**, 100192, (2021)
- [14] S. Sarkar and B. C. Giri, "Safety stock management in a supply chain model with waiting time and price discount dependent backlogging rate in stochastic environment," *Oper. Res.*, **22**, 2, 917–946, (2022)
- [15] F. Aldiansyah and A. Endih Nurhidayat, "Pengoptimalisasi Sistem Distribusi Pesanan Buku Paket dengan Metode DRP & Tabu Search," *J. Indones. Sos. Sains*, **3**, 9, 1263–1277, (2022)
- [16] Y. Ngatilah, N. Rahmawati, C. Pujiastuti, I. Porwati, and A. Y. Hutagalung, "Inventory Control System Using Distribution Requirement Planning (DRP) (Case Study : Food Company)," *J. Phys. Conf. Ser.*, **1569**, 3, (2020)
- [17] A. Fole, N. I. Safutra, T. Alisyahbana, and Y. Almuhajirin, "Peningkatkan Efisiensi Rantai Pasok melalui Material Requirement Planning untuk Bahan Baku dalam Produksi Lemari : Studi Kasus CV . Indo Mebel," **9**, 01, 11–21, (2024)
- [18] S. Permana, M. Andriani, and D. Dewiyana, "Production Capacity Requirements Planning Using The Capacity Method Requirement Planning," *Int. J. Eng. Sci. Inf. Technol.*, **1**, 4, 36–40, 2021
- [19] D. C. T. Agustin and G. M. Sudiartha, "Optimization of Planning and Scheduling Distribution Activities (Empirical Study at Packed Drinking-Water Distribution Company in Bali, Indonesia)," *Academia.Edu*, 4, 611–616, (2021)
- [20] S. N. W Pramono, M. Mujiya Ulkhaq, and M. Naufal, "an Application of Distribution Requirements Planning in Inventory Management: a Case Study," *Orig. Res. Artic. Asian J. Adv. Res.*, **4**, 1, 1404–1411, (2021)