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Application of Vendor Managed Inventory Cooperation Model to Encourage Distribution of Products in Ud. Sari Jaya

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Abstract. UD. Sari Jaya is a home industry that produces cassava and other tubers into chips. Cassava chips are the main product because of their high level of consumer interest in the product compared to others—the Problems faced by UD. Sari Jaya is that they are unable to meet the market demand more effectively. In the process of providing the needs, UD. Sari Jaya often performs several deliveries to each stall caused by the lack of product availability at the stall, causing demand to be unfulfilled. The number of Retailers to be served, the lack of information on needs is one of the obstacles in the process of inventory replenishment. Vendor Managed Inventory (VMI) is one of the Collaboration Model in the supply chain between producers and retailers where collaboration is expected to make arrangements regarding the number of lot sizes order as well as the frequency of deliveries to each stall with a minimum total cost, by thus UD. Sari Jaya can have reasonable control in the process of fulfilling the needs of this Cassava Chips.

Keywords: Vendor Managed Inventory (VMI); collaboration; replenishment

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1. Introduction

With the development of various industrial sectors in Indonesia, it is indistinguishable from the emergence of many small industries that originated from within the country. Efforts to improve and develop small industries need more considerable attention to promote regional economic growth. With the advent of such small industries, it certainly creates new jobs and thereby contributes to opportunities to reduce unemployment in the region.

UD. Sari Jaya is one of the domestic industries producing cassava chips in Depok, West Java. In addition to cassava chips, the domestic industry is UD. Sari Jaya also processes potatoes and macaroni as offered product variations. One of the obstacles is regulating the availability of goods to ensure the sustainability of sales against cassava chips as a distribution channel. The actual state occurs between UD. Sari Jaya, with these stalls as retailers, will not get benefit from the stall due to sales errors, as each stall is often out of stock. The sales errors are due to a lack of coordination and information from the stall to the supplier. As a result, there is no planned volume or frequency of delivery, resulting in ineffective processes and additional losses for both parties. Vendor Managed Inventory (VMI) is one of a collaborative model that is considered suitable for managing inventory and shipping products to facilitate the distribution of these Cassava Chips products. VMI is an industrial policy approach to bring together and coordinate all stakeholders in the supply chain [7]. With VMI, suppliers manage retailer inventory by specifying the retailer's replenishment volume and time intervals by accessing the availability and demand volume of goods that the retailer needs to meet [3].

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2. Research Methodology

In conducting research, research steps are needed to facilitate the writer in achieving his goals. This research was conducted on the distribution system of Cassava Chips Products in the UD Sari Jaya home industry. Where the products produced are marketed through retailers of stalls in the Depok Region, West Java, the total is 50 stalls.

The actual system observed is a traditional system where the problem occurs due to the ineffectiveness of delivery caused by the absence of information about the needs of consumers and the number of stalls to be served. In the second condition, the VMI model is tried to be implemented where the supplier takes control in planning the Purchaser inventory. As a result, the Buyer no longer bears full costs of ordering and costs as a result of the collaboration. On the supplier's side, by applying VMI, the management of product distribution is more effective, and guarantees of sales can be known even though as an impact Suppliers must bear the administrative costs of order to the Buyer, and still bear the costs of the shortage as a penalty for deficiencies that occur.

The demand faced by the supplier is probabilistic because even though there is a sharing of information from the Buyer, the supplier still cannot know the actual condition of the sale of the cassava chips. The brief frame of mind used in this study can be seen in Figure 1.

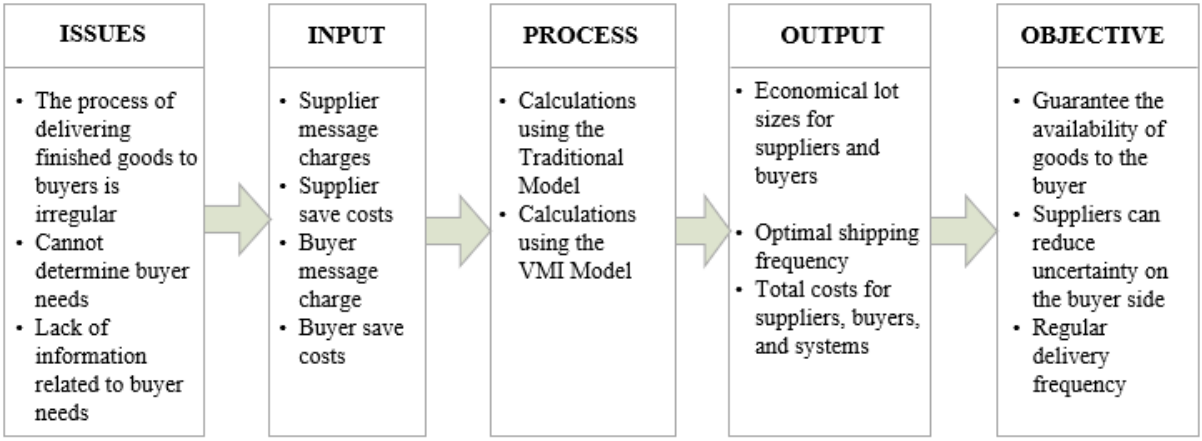

Figure 1. Research framework

The problems identified are irregular delivery of the finished product to the Buyer, who cannot determine the Buyer's needs, and lack of information related to the Buyer's needs. Inputs include supplier message costs, supplier savings costs, buyer order costs, and buyer savings costs. The processes performed are calculations using the traditional model and calculations using the VMI model. The output achieved is the size of the economic order of the Buyer and supplier, the optimal shipping frequency, and the total cost of the supplier, Buyer, and system. The supplier can reduce the uncertainty on the part of buyers and the frequency of regular deliveries concerning the goals achieved to make goods available to buyers.

3. Results and Discussions

Based on monthly data obtained from 50 stalls demand of Cassava chips at UD Sari Jaya retailer shows in Table 1.

Table 1. The Demand for cassava chips

No.	List of Stall	Demand Per Month	No.	List of Stall	Demand Per Month
1	Wr. Wati	240	26	Wr. Kelontong Ibu Nuryanti	600
2	Wr. Lestari	240	27	Wr. Kelontong Esa	600
3	Wr. Lokes Psr lama	480	28	Wr. Kelontong Mulya	600
4	Wr. Dodo Psr kemiri	360	29	Wr. Kelontong Ar Raihan	480

5	Wr. Iwan Psr kemiri	480	30	Wr. Sembako Bpk Wardi	600
6	Wr. Luna Psr kemiri	600	31	Wr. Kelontong Barokah	600
7	Wr. Gun 1 Psr kemiri	600	32	Wr. Kelontong Sugiti	360
8	Wr. Gun 2 Psr kemiri	360	33	Wr. Sembako Murni	480
9	Wr. Asep Psr kemiri	480	34	Wr. Mba Ajeng	360
10	Wr. Triyanto Psr Baru	480	35	Wr. Kelongont Lima Jaya	480
11	Wr. Dpk 2 Tengah	600	36	Wr. Sembako Ibu Nyai	480
12	Wr. Sumber Rezeki Snack Srengseng	480	37	Wr. Sembako Sumber rezeki	600
13	Wr. Snack Kukusan Beji	360	38	Wr. Kelontong H. Sueb	600
14	Wr. Lulu	600	39	Wr. Bakti Jaya	480
15	Wr. Sembako Ibu Hj. Yoyoh	600	40	Wr. Lima Saudara	240
16	Wr. Sembako Grosir Bhaki Karya	600	41	Wr. Minoriya	360
17	Wr. Ko Hasan	360	42	Wr. Bpk Wardi	480
18	Wr. Sinar Baru	240	43	Wr. Ucok	360
19	Wr. Sembako YKS	600	44	Wr. Sembako Kalimantan	480
20	Wr. El Shirazy	480	45	Wr. Madura	480
21	Wr. Murni	360	46	Wr. Yuliana	240
22	Wr. Tri Jaya	480	47	Wr. Kelontong Dalimunthe	480
23	Wr. Bhakti Karya	480	48	Wr. Empat Bersaudara	480
24	Wr. Kelontong Abi	600	49	Wr. Kelontong Tasya Kembang	480
25	Wr. Kelontong Yadi	480	50	Wr. Bu Abbas	360

3.1 The parameters used

1. Supplier Order Cost
   Supplier Order Cost represents the costs incurred by UD. Sari Jaya each time ordering raw materials, which is Rp. 30,000 per order.
2. Supplier Holding Cost
   It is a cost for storing raw materials to be able to meet the number of Warung requests, which is Rp. 100. The saving cost components are warehouse rental costs, electricity costs, and labor costs.
3. Buyer Order Cost
   Buyer Order Cost represents the cost incurred by each stall per one-time order. The amount of the order cost for each stall is assumed to be the same, that is Rp. 17,000 per order. The cost of this order consists of the cost of ordering & shipping as well as product ownership costs.
4. Buyer Holding Costs
   The saving cost for each is assumed to be the same, which is 10% of the electricity cost, which is Rp. 15,000, which is charged to the number of needs in each stall.

3.2 Calculation of the Traditional Model supplier inventory policy

The Traditional Model is an initial condition of the system, which is observed where the number of supplier requests is a determination of the supplier's capacity in each shipment, which is 200 kg per shipment. The Notation and parameters used are as follows:

1. Notation:
   a. Decision Variable
      Q_p : Lot size of supplier order (kg)
   b. Parameter
      D : The level of supplier demand = 200 kg
      A_p : The total cost of supplier order = Rp. 30,000/order
      P_p : Price of raw material per kg = Rp. 3,000/kg
      h_p : Holding cost of finished product = Rp. 100/pcs/month
      Cu_p : Shortage cost from supplier to buyer = Rp. 750/kg

L : *Lead time* 1 day = $\frac{1}{30\ days} = 0.03$
SD : Standard deviation = 2.078,4 kg
SL : Standard deviation when *lead time* $S\sqrt{L}$ = $2.078{,}4\sqrt{0{,}03} = 359.92\ kg$
N : Shortage quantity = 210 pcs
SS : Safety stock = 839 kg
α : Shortage of inventory probability = 0.01
$z(\alpha)$: Value of z distribution for shortage of inventory event probability = 2.33
$f(z\alpha)$: Function value = 0.0283
$\psi(z\alpha)$: Partial Expectation = 0.0037

2. Calculate the Economical Order Lot Size for Suppliers ($Q_p *$)

$$Q_p *= \sqrt{\frac{2D(A_p + C_u N)}{h_p}} \quad (1)$$

$$Q_p *= \sqrt{\frac{2\times200(30.000+750\times210)}{100}}$$

= 866.02 ≈ 866 kg per month

3. Calculate Total Supplier Costs

Total supplier cost = Order cost + Holding cost + Shortage cost

$$= \left(\frac{demand\ level}{order\ lot\ size} \times order\ cost\ per\ order\right) + (average\ inventory\ at\ supplier \times holding\ cost\ per\ pcs/periode) + (shortage\ quantity \times shortage\ cost\ to\ buyer)$$

$$= \left(\frac{D}{Q_p}A_p\right) + \left(h_p\left(\frac{1}{2}Q_p + SS\right)\right) + \left(\frac{Cu_p DN}{Q_p}\right) \quad (2)$$

$$= \left(\frac{200}{866}30.000\right) + \left(100\left(\frac{1}{2}866 + 839\right)\right) + \left(\frac{750\times200\times210}{866}\right)$$

$= Rp.\ 170{,}502.53 \approx$ Rp. 170,503 per month

3.3 Calculation of the Traditional Model of the buyer's inventory policy

The traditional condition of the Buyer or stall is that the stall's needs are not known with certainty, which results in a shortage condition when the availability of the product is entirely run out before the day of delivery. The following calculation is carried out for each Warung to find out the Order Lot in each Warung in the Initial Condition based on the number of needs that must be fulfilled. The following calculation is an example of a calculation using the First stall Data (Wr. Wati).

1. Notation:
   a. Decision Variable
      Q_b : Buyer order lot size (pcs)
   b. Parameter
      D : Demand level of buyer = 240 pcs
      A_{pb} : Administration order cost = Rp.10,000/order
      A_{ub} : Transportation cost = Rp.1,000/order
      A_{kb} : Product ownership cost = Rp. 6,000/pack
      A_b : The total cost of the Buyer's order = Rp. 17,000/order
      P_b : Product purchase price = Rp. 24,000/pack
      h_b : Finished product holding cost = Rp. 63/pcs/month
      Cu_b : Shortage cost of buyer = Rp. 4.6/pcs
      L : *Lead time* 1 day = $\frac{1}{30\ days} = 0.03$
      SD : Standard deviation = 800 pcs
      SL : Standard deviation when lead time $S\sqrt{L}$ = $800\sqrt{0.03} = 138.64\ pcs$
      N : Shortage quantity = 216 pcs
      SS : Safety stock = 261 pcs
      α : Shortage of inventory probability = 0.03
      $z(\alpha)$: Value of z distribution for shortage of inventory event probability = 1.88

$f(z\alpha)$: Function value = 0.0790
$\psi(z\alpha)$: Partial Expectation = 0.0143

2. Calculating Buyer's Economic Order Quantity (Q_b*)

$$Q_b* = \sqrt{\frac{2D(A_b+C_bN)}{h_b}} \quad (3)$$

$$Q_b* = \sqrt{\frac{2\times240(17{,}000+41.6\times216)}{63}}$$

$$= \sqrt{198{,}095.23} = 447 \text{ pcs per month}$$

The results of the calculation of the size of an economic order lot for other stalls can be seen in Table 2 results of Calculation of Lot Size Ordering Traditional Model Buyers.

Table 2. Calculation of lot size for traditional model buyer order result

No.	List of Stall	Demand Per Month	Buyer's Economic Order Quantity	No.	List of Stall	Demand Per Month	Buyer's Economic Order Quantity
1	Wr. Wati	240	447	26	Wr. Kelontong Ibu Nuryanti	600	994
2	Wr. Lestari	240	447	27	Wr. Kelontong Esa	600	994
3	Wr. Lokes Psr lama	480	813	28	Wr. Kelontong Mulya	600	994
4	Wr. Dodo Psr kemiri	360	630	29	Wr. Kelontong Ar Raihan	480	813
5	Wr. Iwan Psr kemiri	480	813	30	Wr. Sembako Bpk Wardi	600	994
6	Wr. Luna Psr kemiri	600	994	31	Wr. Kelontong Barokah	600	994
7	Wr. Gun 1 Psr kemiri	600	994	32	Wr. Kelontong Sugiti	360	630
8	Wr. Gun 2 Psr kemiri	360	630	33	Wr. Sembako Murni	480	813
9	Wr. Asep Psr kemiri	480	813	34	Wr. Mba Ajeng	360	630
10	Wr. Triyanto Psr Baru	480	813	35	Wr. Kelongont Lima Jaya	480	813
11	Wr. Dpk 2 Tengah	600	994	36	Wr. Sembako Ibu Nyai	480	813
12	Wr. Sumber Rezeki Snack Srengseng	480	813	37	Wr. Sembako Sumber rezeki	600	994
13	Wr. Snack Kukusan Beji	360	630	38	Wr. Kelontong H. Sueb	600	994
14	Wr. Lulu	600	994	39	Wr. Bakti Jaya	480	813
15	Wr. Sembako Ibu Hj. Yoyoh	600	994	40	Wr. Lima Saudara	240	447
16	Wr. Sembako Grosir Bhaki Karya	600	994	41	Wr. Minoriya	360	630
17	Wr. Ko Hasan	360	630	42	Wr. Bpk Wardi	480	813
18	Wr. Sinar Baru	240	447	43	Wr. Ucok	360	630
19	Wr. Sembako YKS	600	994	44	Wr. Sembako Kalimantan	480	813
20	Wr. El Shirazy	480	813	45	Wr. Madura	480	813
21	Wr. Murni	360	630	46	Wr. Yuliana	240	447
22	Wr. Tri Jaya	480	813	47	Wr. Kelontong Dalimunthe	480	813
23	Wr. Bhakti Karya	480	813	48	Wr. Empat Bersaudara	480	813
24	Wr. Kelontong Abi	600	994	49	Wr. Kelontong Tasya Kembang	480	813
25	Wr. Kelontong Yadi	480	813	50	Wr. Bu Abbas	360	630

3. Calculating Total Cost of Buyer

After obtaining the economic order lot size for each stall, then the next Total Buyer Cost can be known. The following example is a calculation using Data first stall (Wr. Wati).

Total Cost of Buyer = Order cost + Holding cost + Shortage cost

$$= \left(\frac{demand\ level}{order\ lot\ size} \times order\ cost\ per\ order\right) + (average\ inventory\ at\ supplier \times holding\ cost\ per\ pcs/periode) + (shortage\ quantity \times shortage\ cost\ to\ buyer)$$

$$= \left(\frac{D}{Q_b}A_b\right) + \left(h_b\left(\frac{1}{2}Q_b + SS\right)\right) + \left(\frac{Cu_bDN}{Q_b}\right) \quad (4)$$

$$= \left(\frac{240}{447}17{,}000\right) + \left(63\left(\frac{1}{2}447 + 261\right)\right) + \left(\frac{41.6\times240\times216}{447}\right)$$

$= Rp.\ 44.219$ per month

The results of the calculation of the Total Cost of Buyers for other stalls can be seen in Table 3.

Table 3. Results of the calculation of the total cost of buyers

No.	List of Stall	Total Cost of Buyer (Rp)	No.	List of Stall	Total Cost of Buyer (Rp)
1	Wr. Wati	44,219	26	Wr. Kelontong Ibu Nuryanti	31,376
2	Wr. Lestari	44,219	27	Wr. Kelontong Esa	31,376
3	Wr. Lokes Psr lama	33,542	28	Wr. Kelontong Mulya	31,376
4	Wr. Dodo Psr kemiri	37,128	29	Wr. Kelontong Ar Raihan	33,542
5	Wr. Iwan Psr kemiri	33,542	30	Wr. Sembako Bpk Wardi	31,376
6	Wr. Luna Psr kemiri	31,376	31	Wr. Kelontong Barokah	31,376
7	Wr. Gun 1 Psr kemiri	31,376	32	Wr. Kelontong Sugiti	37,128
8	Wr. Gun 2 Psr kemiri	37,128	33	Wr. Sembako Murni	33,542
9	Wr. Asep Psr kemiri	33,542	34	Wr. Mba Ajeng	37,128
10	Wr. Triyanto Psr Baru	33,542	35	Wr. Kelongont Lima Jaya	33,542
11	Wr. Dpk 2 Tengah	31,376	36	Wr. Sembako Ibu Nyai	33,542
12	Wr. Sumber Rezeki Snack Srengseng	33,542	37	Wr. Sembako Sumber rezeki	31,376
13	Wr. Snack Kukusan Beji	37,128	38	Wr. Kelontong H. Sueb	31,376
14	Wr. Lulu	31,376	39	Wr. Bakti Jaya	33,542
15	Wr. Sembako Ibu Hj. Yoyoh	31,376	40	Wr. Lima Saudara	44,219
16	Wr. Sembako Grosir Bhaki Karya	31,376	41	Wr. Minoriya	37,128
17	Wr. Ko Hasan	37,128	42	Wr. Bpk Wardi	33,542
18	Wr. Sinar Baru	44,219	43	Wr. Ucok	37,128
19	Wr. Sembako YKS	31,376	44	Wr. Sembako Kalimantan	33,542
20	Wr. El Shirazy	33,542	45	Wr. Madura	33,542
21	Wr. Murni	37,128	46	Wr. Yuliana	44,219
22	Wr. Tri Jaya	33,542	47	Wr. Kelontong Dalimunthe	33,542
23	Wr. Bhakti Karya	33,542	48	Wr. Empat Bersaudara	33,542
24	Wr. Kelontong Abi	31,376	49	Wr. Kelontong Tasya Kembang	33,542
25	Wr. Kelontong Yadi	33,542	50	Wr. Bu Abbas	37,128

3.4 Calculation with Vendor Managed Inventory (VMI) Model

To make arrangements for delivery schedules and the large number of products that must be delivered to each stall, the VMI Model is applied. The Buyer's Order Cost consists of the Administration Order Cost, the Transportation Cost, and the Product Ownership Cost for the Buyer.

Decision Variable:
$Q_p *$: Economic order lot size of the supplier (kg)
$Q_b *$: Economic order lot size of the Buyer (pcs)
$m_p *$: Frequency of delivery from suppliers to buyers

Parameter
D : Demand level of the Buyer (pcs)
A_{ab} : Administration order cost = Rp. 0
A_{ub} : Transportation cost = Rp. 1,000/order
A_{ub} : Ongkos kepemilikan produk pembeli = Rp.6,000/pack
A_b : Total order cost of buyer = Rp.7,000/order
A_p : Total order cost of supplier = Rp.30,000/order
h_p : Total finished product holding cost of supplier = Rp.100/pcs/month
h_b : Total finished product holding cost of buyer = Rp.63/pcs
P_p : The purchase price of raw materials at the supplier = Rp.3,000/kg
P_b : The purchase price of the finished product = Rp.24,000/pack
Cu_p : Shortage cost from the supplier to Buyer = Rp.750/kg
Cu_b : Shortage cost of Buyer = Rp.750/kg
N_p : Shortage quantity of supplier = 210 pack
N_b : Shortage quantity of Buyer = 216 pack
SS_p : Safety stock supplier = 839 kg
SS_b : Safety stock buyer = 261 pcs
α_p : Shortage of inventory probability of supplier = 0.01
α_b : Shortage of inventory probability of buyer = 0.03
$z(\alpha)_p$: Value of z distribution for the shortage of inventory event probability of supplier = 2.33
$z(\alpha)_b$: Value of z distribution for the shortage of inventory event probability of buyer = 1.88
$f(z\alpha)_p$: Function value α of supplier = 0.0283
$f(z\alpha)_b$: Function value α of buyer = 0.0790
$\psi(z\alpha)_p$: Partial Expectation α of supplier = 0.0037
$\psi(z\alpha)_b$: Partial Expectation α of Buyer = 0.0143

3.5 Calculation of Buyer Economic Order Quantity, Supplier Economic Order Quantity, and Optimal Delivery Frequency for Suppliers

In order obtaining the optimal number of economic order sizes for buyers and suppliers with the optimal shipping frequency for suppliers, it can be done using the following formula:

$$m_p * = \sqrt{\frac{h_b(A_p + Cu_p N)}{h_p A_b}} \quad (5)$$

$$= \sqrt{\frac{63(30{,}000 + 750 \times 216)}{100 \times 7{,}000}}$$

= 4,15 ≈ 4 times delivery per month

$$Q_b * = \sqrt{\frac{2D(A_p + Cu_p N + mA_b)}{m(h_p m + h_b)}} \quad (6)$$

$$= \sqrt{\frac{2 \times 240(30{,}000 + 750 \times 216 + 4 \times 7{,}000)}{4(100 \times 4 + 63)}}$$

= 231,86 ≈ 232 pcs per month

$Q_p * = m_p Q_b$
$Q_p *$ = 928 kg per month

The VMI model calculation to determine the lot size of buyers and supplier's economic order and the frequency of delivery from suppliers to buyers for other stalls can be seen in Table 4.

Table 4. Calculation results using the VMI model

No.	List of Stall	Delivery Frequency	Order Lot Sizing for Buyer	Order Lot Sizing for Supplier
1	Wr. Wati	4	232	928
2	Wr. Lestari	4	232	928
3	Wr. Lokes Psr lama	3	464	1392
4	Wr. Dodo Psr kemiri	3	348	1044
5	Wr. Iwan Psr kemiri	3	464	1392
6	Wr. Luna Psr kemiri	3	580	1740
7	Wr. Gun 1 Psr kemiri	3	580	1740
8	Wr. Gun 2 Psr kemiri	3	348	1044
9	Wr. Asep Psr kemiri	3	464	1392
10	Wr. Triyanto Psr Baru	3	464	1392
11	Wr. Dpk 2 Tengah	3	580	1740
12	Wr. Sumber Rezeki Snack Srengseng	3	464	1392
13	Wr. Snack Kukusan Beji	3	348	1044
14	Wr. Lulu	3	580	1740
15	Wr. Sembako Ibu Hj. Yoyoh	3	580	1740
16	Wr. Sembako Grosir Bhaki Karya	3	580	1740
17	Wr. Ko Hasan	3	348	1044
18	Wr. Sinar Baru	4	232	928
19	Wr. Sembako YKS	3	580	1740
20	Wr. El Shirazy	3	464	1392
21	Wr. Murni	3	348	1044
22	Wr. Tri Jaya	3	464	1392
23	Wr. Bhakti Karya	3	464	1392
24	Wr. Kelontong Abi	3	580	1740
25	Wr. Kelontong Yadi	3	464	1392
26	Wr. Kelontong Ibu Nuryanti	3	580	1740
27	Wr. Kelontong Esa	3	580	1740
28	Wr. Kelontong Mulya	3	580	1740
29	Wr. Kelontong Ar Raihan	3	464	1392
30	Wr. Sembako Bpk Wardi	3	580	1740
31	Wr. Kelontong Barokah	3	580	1740
32	Wr. Kelontong Sugiti	3	348	1044
33	Wr. Sembako Murni	3	464	1392
34	Wr. Mba Ajeng	3	348	1044
35	Wr. Kelongont Lima Jaya	3	464	1392
36	Wr. Sembako Ibu Nyai	3	464	1392
37	Wr. Sembako Sumber rezeki	3	580	1740
38	Wr. Kelontong H. Sueb	3	580	1740
39	Wr. Bakti Jaya	3	464	1392
40	Wr. Lima Saudara	4	232	928
41	Wr. Minoriya	3	348	1044
42	Wr. Bpk Wardi	3	464	1392
43	Wr. Ucok	3	348	1044
44	Wr. Sembako Kalimantan	3	464	1392
45	Wr. Madura	3	464	1392

46	Wr. Yuliana	4	232	928
47	Wr. Kelontong Dalimunthe	3	464	1392
48	Wr. Empat Bersaudara	3	464	1392
49	Wr. Kelontong Tasya Kembang	3	464	1392
50	Wr. Bu Abbas	3	348	1044

3.6 Calculation of Total Buyer and Supplier Costs with VMI

By implementing the VMI policy whereby the supplier takes over the planning of the order, the Buyer no longer holds the cost of the product shortage and the cost of making the order so that the total costs are borne by the Buyer. Here is an example calculation for the first stall (Wr. Wati):

Total Buyer Cost = Order Receipt Cost + Save Cost

$$TC_b^{VMI} = \left(\frac{D}{Q_b}A_b\right) + \left(h_b\frac{Q_b}{2}\right) \quad (7)$$
$$= \left(\frac{240}{232}7{,}000\right) + \left(63\frac{232}{2}\right)$$
$$= Rp.\,14{,}549.37 \approx \text{Rp. } 14{,}549 \text{ per month}$$

Total Cost of Supplier = Order Cost of Supplier + Holding Cost of Supplier + Shortage Cost of Supplier + Administration order cost of Buyer

$$TC_P^{VMI} = \left(\frac{D_p}{m_pQ_b}A_p\right) + \left(h_p\left(\frac{1}{2}m_pQ_b + SS\right)\right) + \left(\frac{Cu_pDN}{m_pQ_b}\right) + \left(\frac{D}{Q_b}A_p\right) \quad (8)$$
$$= \left(\frac{200}{928}\times 30{,}000\right) + \left(100\left(\frac{1}{2}928 + 839\right)\right) + \left(\frac{750\times 200\times 210}{928}\right) + \left(\frac{240}{232}\times 7{,}000\right)$$
$$= Rp.\,178{,}208.19 \approx \text{Rp. } 178{,}208 \text{ per month}$$

4. Conclusions

1. Inventory policy using the VMI Model is considered to be able to overcome both the shortage and excess of goods due to demand uncertainty and limited information provided. With the VMI model, buyers can collaborate with suppliers in inventory planning to reduce the risk of unsold products and shortages of goods. On the supplier side, the supplier can easily find out the distribution planning to each Warung so that it can encourage the development of its business units.
2. Total costs incurred by UD. Sari Jaya in ordering raw materials to suppliers using the Traditional model of Rp. 170,503 per month and using a VMI model of Rp. 186,370 per month, or in other words, increases with the risk and additional ordering activities taken over by the supplier.
3. UD. Sari Jaya should be able to find additional suppliers of cassava raw materials if there is a higher demand for UD. Sari Jaya can maximize the benefits obtained.

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