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Design of Product Inventory Control Models for Cost Efficiency in Organic Vegetable Agroindustry

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ABSTRACT

Indonesia is an agricultural country that has the opportunity to develop organic agriculture. In recent years, the public's attention to organic farming has increased. One of the prospective commodities that can be developed using an organic farming system in Indonesia is vegetables. Organic vegetable agroindustry is an agribusiness company in West Java which is engaged in organic agriculture. The problem faced by the Organic vegetable agroindustry is uncontrolled inventory control caused by erratic (dynamic) and fluctuating customer demand. Inventory management aims to determine the planning of organic vegetable commodity control Organic vegetable agroindustry in the context of efficiency and minimizing inventory costs incurred by the company. The Wagner-Within Algorithm method and the Heuristic Silver Meal method have the same goal, namely to produce an optimum message quantity at a low cost. From the results of data processing, it is found that the best proposed method is the inventory cost using the Heuristic Silver Meal method because it can produce the lowest cost compared to the Wagner-Within Algorithm method with a savings of IDR. 64,000,000, - and 26% efficiency from the method applied by the company with a total inventory cost of IDR. 178,235,754.

Keywords: Wagner-Within; Silver-Meal Heuristic; Inventory

INTRODUCTION

Currently, the opportunity to develop organic agriculture is increasing in Indonesia, which is an agricultural country. One of the organic agriculture that is currently in demand is the cultivation of organic vegetable commodities. Organic vegetables in their cultivation must be given intensive care and protection from pests, diseases, and others. To overcome this, organic vegetables do not use chemicals at all. One of the areas in Indonesia that cultivates organic vegetables is West Java because the climate, weather and soil conditions in this area support organic vegetable farming. Organic vegetable agroindustry is one of the agribusiness companies in West Java which is engaged in organic vegetables. Organic vegetable agroindustry is located in Cianjur, West Java, Indonesia.

Organic vegetable agroindustry cultivates about 30 types of organic vegetables, including spinach, beetroot, broccoli, chickpeas, chilies, caysim, leeks, corn, long beans, kale, red beans, kailan, potatoes, cabbage, cauliflower, cucumber, cucumber japan, chayote, lettuce, aloe vera, pakcoy, oyong, paprika, eggplant, tomato, carrot, mustard greens, zucchini, kale, and butternut pumpkin, which are marketed in several supermarkets in Indonesia.

The problem faced by Organic vegetable agroindustry is the uncontrolled inventory control caused by uncertain (dynamic) and fluctuating customer demand. If demand exceeds existing inventory, it will cause a shortage of stock (stock out) and if demand is less than existing inventory, it will cause excess stock (overstock). Uncontrolled inventory will result in losses for the company. The loss experienced by the company is that if there is less inventory (stock out), the company loses because the expected profit is not achieved and the emergence of disappointment from customers. On the other hand, if there is excess inventory, the company will lose money because of high storage and ordering costs. Therefore, good inventory management is needed to avoid losses.

Inventory management aims to determine the planning for controlling organic vegetable commodities at Organic vegetable agroindustry in order to be efficient and minimize inventory costs incurred by the company. The right method used in this research is the Wagner-Within Algorithm. According to Sadjadi, the Wagner-Within Algorithm is a method that uses an optimization procedure based on a dynamic programming model, which is a mathematical model whose solution guarantees that the calculation result is the optimum result. The purpose of this method is to obtain the optimum ordering strategy by minimizing ordering costs and holding costs [1].

The other method used is the Silver Meal Heuristic method which is used as a comparison in minimizing inventory costs. Silver Meal Heuristic Method is a deterministic model with the HSM method is a method that can take into account

the amount of inventory and the amount of demand is the same, so the company can determine the number of goods that must be distributed [2]. The Wagner-Within Algorithm method and the Silver Meal Heuristic method have the same goal, namely to produce the optimum message quantity at a low cost.

METHODS

A. Time and Place of Research

This research was conducted at the Organic Vegetable Agroindustry inventory division located in Cianjur, West Java, Indonesia. The time of the research was carried out on August 03 – September 02, 2021 for 1 month (4 weeks) on weekdays at 09.00-17.00 WIB.

B. Research Design

This research is a descriptive quantitative research, namely research that emphasizes objective phenomena that are studied quantitatively or carried out using numbers, statistical processing, structure, and controlled experiments. The research method used in data collection is by means of observation and documentation. This research begins by identifying and formulating problems that occur, namely the existence of fluctuating demand and the absence of inventory control in the Organic Vegetable Agroindustry which causes high inventory costs. After the problem is identified and formulated, the next step is to determine the objectives to be achieved and study the literature related to inventory control.

C. Data Collection Techniques

The data collection technique used to obtain data in this study was carried out by field research, namely the research was carried out directly in the Organic Vegetable Agroindustry. Direct data collection techniques carried out by interviews, documentation, and observation.

1. Interview, Interview is a collection of data used to obtain information directly from the source. Questions and answers were made to the operational manager, administrative and financial staff (Purchasing), the head of the garden and the head of the warehouse for the Organic Vegetable Agroindustry. During the question and answer session (interviews) information was obtained about the company and problems were found in the Organic Vegetable Agroindustry.

2. Documentation, Documentation is an activity carried out to obtain the required written data from the research site. Documentation is carried out by collecting data from company documents, such as inventory data for organic vegetables, demand for organic vegetables, ordering costs, and storage costs.

D. Data Analysis Techniques

This study aims to provide a solution in planning and controlling the optimum supply of organic vegetable commodities with minimum inventory costs by using the Wagner-Within Algorithm and Silver Meal Heuristics.

While the analytical method used to overcome situations where there are very many materials that must be controlled, so that inventory control decisions begin by making a classification of existing materials is FSN analysis (Fast Moving, Slow Moving, Non-Moving).

1.Determine the FSN Classification

FSN Analysis (Fast, Slow and Non-moving) is a way of grouping inventory based on the speed of movement of goods [3]. FSN analysis is a method of making classes according to the level of value, from the highest to the lowest value and is divided into three classes, namely F, S and N. FSN analysis aims to identify the stock of low-value and high-value products in the company. The FSN analysis method, can be a support in the problems of the company and is useful in controlling low-value products. To do this, the steps that must be taken are as follows [3].

a. Calculation of average stay and consumption rate.

$$Average\ Stay = \frac{Total\ Inventory\ Holding\ Balance}{Opening\ Balance + Total\ Receipt}$$

$$Consumption\ Rate = \frac{Total\ Issue\ Quantity}{Total\ Period\ Duration}$$

Information:
Receipt : Quantity of goods entering the warehouse
Issue : Quantity of goods out of warehouse
Balance : The difference in the quantity of goods in and out
Inventory Holding Balance: Inventory of goods in warehouse

b. FSN classification is based on average stay of the items.
c. FSN classification based on consumption rate.
d. The final classification of goods that have been categorized into classes F, S and N in Table 1.

TABLE 1: FSN Final Classification

Average Stay	*Consumption Rate*	Klasifikasi Akhir
F	F	F
F	S	S
F	N	S
S	F	F
S	S	S
S	N	N
N	F	S
N	S	N
N	N	N

2. Forecasting

Forecasting is the process of estimating how many needs in the future which include needs in terms of quantity, quality, time and location needed in order to meet the demand for goods or services. In a complex and dynamic free market condition, demand forecasting is indispensable as a reference in making good and accurate production planning. Therefore, accurate forecasting is information that is needed in making production plans [4].

The Exponential Smoothing (ES) method calculates the average (estimated) demand data. The ES methodology remembers the last estimate of the average demand value and combines it with the latest observed actual value to form a new average estimate [5].

3. Determine the minimum cost using the Wagner-Within Algorithm (AWW) Method

According to Sadjadi, the Wagner and Within Algorithm is a method that uses an optimization procedure based on a dynamic programming model, which is a mathematical model whose solution guarantees that the calculation results are optimum results. The purpose of this method is to obtain the optimum ordering strategy by minimizing ordering costs and holding costs [1]. According to Tersine, the AWW steps are as follows [6]:

a. Calculate the total cost matrix (order cost and storage cost), then defined O_{en}. O_{en}'s formulation is stated as follows:

$$O_{en} = A + h\sum_{t=e}^{n}(q_{en} - q_{et})$$

For $1 \le e \le n \le N$

Information:

A : Ordering Cost (IDR/order)
h : Holding Cost per unit per period (IDR/unit/period)
q_{et} : $\sum_{t=e}^{n} = D_t$
Dt : Demand in period t
e : The initial limit of the period covered by n q order q_{et}
n : Maximum period covered by order q_{et}

b. Value f_n is the value of the total cost and optimal ordering which is calculated using the following formula:

$$f_n = Min\ [O_{en} + f_{e-1}]$$

For e = 1, 2,... n and n = 1, 2,... N

c. The optimal fT obtained from a backward recursive calculation as follows:

$$f_N = O_{en} + f_{e-1}$$

The last-order is placed in period e to fulfill demand from period e to period N.

$$f_{e-1} = O_{ve-1} + f_{v-1}$$

The order before the last-order must be made in period v to fulfill the demand from period v to period e-1.

$$f_{e-1} = O_u + f_0$$

The first order must be placed in period 1 to fulfill requests from period1 to period u-1.

1. Determine the minimum cost by using and the Silver Meal Heuristic Method

The Silver Meal method or often also called the SM method was developed by Edward Silver and Harlan Meal based on the cost period. The determination of the average cost per period is the number of periods in which additional orders are increased. Addition of orders is made when the average cost of the first period increases. If the order arrives at the beginning of the first period and can meet the needs until the end of the T period [7].

Mathematically the unit cost of inventory per period is stated as follows [8]:

$$\frac{TRC\ (T)}{T}$$

$$\frac{C + total\ biaya\ simpan\ akhir\ periode\ T}{T}$$

$$\frac{C + h\ \sum_{k=1}^{T}(k-1)R_k}{T}$$

Keterangan: biaya pemesanan per periode
h : biaya simpan per periode
$TRC\ (T)$: total biaya relevan pada periode T
T : waktu penambahan dalam periode
R_k : rata-rata permintaan dalam periode k

The goal is to determine T to minimize the total relevant costs per period. The following are the steps of the Silver Meal Method [8]:

a. Determine the tentative lot size starting from period T. Tentative lot size = need (net requirement) in period T. Calculate the total cost per period.
b. Add the need for the next period to the lot. Then calculate the total cost per period.
c. Compare the total cost per current period with the previous one, if TRC(L) TRC(L-1) go back to step 2 and TRC(L) > TRC(L-1) go to step 4.
d. The lot size in the period.

$$T = \sum_{t-T}^{L-t} dt$$

Now T = L, if the end of the planning horizon has been reached, stop the algorithm, if not, go back to step 1. In its later application, the consideration for determining the lot size is the minimum average cost for each period and the existing warehouse capacity [9].

RESULT AND DISCUSSION

Inventory data of Organic vegetable agroindustry was obtained during the last year, inventory data is data on goods available in the warehouse. This inventory data is used for FSN analysis. Organic vegetable agroindustry's demand data was obtained over the past year, demand data is used as a reference for forecasting demand data in the coming period and FSN analysis. The following is supply and demand data for June and July 2021.

TABLE 2: Data Demand and Supply of Organic Vegetables

No	Product	Demand (Kg)		Inventory (Kg)	
		June	July	June	July
1	Green Spinach	1586,00	1488,50	1638,87	1538,12
2	Red Spinach	464,75	530,50	480,24	548,18
3	Beetroot	752,63	677,38	777,71	699,95
4	Broccoli	7340,88	7027,43	7585,58	7261,68
5	Beans	1333,00	1162,75	1377,43	1201,51
6	Curly Red Chili	281,00	279,25	290,37	288,56
7	Caisim	828,50	826,00	856,12	853,53
8	Leek	1127,25	1004,25	1164,83	1037,73
9	Horenzo	543,50	469,00	561,62	484,63
10	Pickled Corn	855,25	773,75	883,76	799,54
11	Sweet Corn Skin	3273,00	2711,04	3382,10	2801,41
12	Peeled Sweet Corn	1808,50	1774,00	1868,78	1833,13
13	Red beans	914,40	674,93	944,88	697,42
14	Long beans	820,38	542,00	847,72	560,07
15	Kale	839,00	771,75	866,97	797,48
16	Kailan	504,88	518,00	521,70	535,27
17	Potato	2156,00	2121,65	2227,87	2192,37
18	Cauliflower	1948,55	2045,93	2013,50	2114,13
19	Cucumber	3474,98	3250,46	3590,81	3358,81
20	White Cabbage	2988,82	2639,09	3088,45	2727,06
21	Kyuri	545,19	488,15	563,37	504,42
22	Chayote	921,00	882,68	951,70	912,10
23	Lettuce Head	1917,50	1950,50	1981,42	2015,52
24	Aloe vera	1880,13	1521,35	1942,80	1572,06
25	Turnip	1421,59	1342,50	1468,98	1387,25
26	Oyong	1828,02	1832,69	1888,95	1893,78
27	Pak coy	1201,63	1047,88	1241,68	1082,80
28	Green paprika	666,00	834,50	688,20	862,32
29	Red paprika	420,00	486,00	434,00	502,20
30	Yellow Peppers	482,00	543,50	498,07	561,62
31	Green Bitter gourd	1536,06	1290,20	1587,26	1333,21
32	Chinese cabbage	3989,00	3504,18	4121,97	3620,99
33	Curly lettuce	788,81	776,56	815,11	802,45
34	Celery	432,39	495,38	446,80	511,89
35	Purple Eggplant	1965,59	1552,16	2031,11	1603,90
36	Tomato	3995,55	3516,94	4128,74	3634,17
37	Carrot	2297,82	2232,90	2374,41	2307,32
38	Zukini	1578,62	1495,19	1631,24	1545,03
39	Butternut Pumpkin	757,00	1056,00	782,23	1091,20
40	Kale	479,50	502,50	495,48	519,25

Table 2 shows that the supply of organic vegetable commodities at Organic vegetable agroindustry changes or fluctuates every month. The company's holding costs consist of several costs used in holding inventory. The costs considered in this study are the cost of electricity consumption and the cost of warehouse labor. The cost of storing organic vegetable commodities per kilogram is IDR. 1.137,59, -. Ordering costs are costs used in ordering vegetables at Organic vegetable agroindustry. The costs considered in this study are the cost of electricity usage, internet costs, administrative and office costs, and transportation costs. The cost of storing organic vegetable commodities in one period (1 month) is IDR. 4,000,000, -.

a. Determine the FSN Classification

Based on the FSN analysis, the results of the final classification of organic vegetable commodities are shown in the following table:

TABLE 3: Result FSN Classification

Product	*Average Stay*	*Consumption Rate*	*Final FSN Classification*
Green Spinach	N	F	S
Red Spinach	N	N	N
Beetroot	N	S	N
Broccoli	N	F	S
Beans	N	S	N
Butternut Pumpkin	N	S	N
Curly Red Chili	F	N	S
Caisim	S	S	S
Leek	S	S	S
Horenzo	N	N	N
Pickled Corn	S	S	S
Sweet Corn Skin	F	F	F
Peeled Sweet Corn	N	S	N
Red beans	N	S	N
Long beans	N	N	N
Kailan	F	N	S
Kale	N	N	N
Kale	N	S	N
Cauliflower	N	F	S
Potato	N	F	S
Cucumber	N	F	S
White Cabbage	S	F	F
Kyuri	N	N	N
Chayote	N	S	N
Lettuce Head	N	F	S
Aloe vera	N	F	S
Turnip	N	F	S
Oyong	N	F	S
Pakcoy	N	S	N
Green paprica	S	N	N
Yellow Peppers	S	N	N
Red paprika	F	N	S
Green Bitter gourd	F	S	S
Chinese cabbage	N	F	S
Curly lettuce	S	N	N
Celery	N	N	N
Purple eggplant	S	F	F
Tomato	N	F	S
Carrot	N	F	S
Zukini	N	F	S

After the FSN analysis, it can be seen that there are 3 (three) organic vegetable commodity products that are prioritized and then enter the data processing for analysis, namely sweet corn, white cabbage, and purple eggplant with the final classification result (Final FSN Classification) category F (fast). moving) or moving fast.

b. Forecasting (Forecasting)

Forecasting is done using demand data for organic vegetable commodities which have been analyzed using FSN analysis, namely on demand data for sweet corn, white cabbage, and purple eggplant commodities in August 2019 - July 2020. Demand forecasts are carried out for August 2020 - July 2021 using the method Single Exponential Smoothing with trial and error value 0.1; 0.2; 0.3; 0.4; 0.5; 0.6; 0.7; 0.8; and 0.9 in order to get the best forecasting results using the Statistix 10 software. The following are the forecasting results for the great commodity of sweet skin using the Statistix 10 software.

TABLE 6: Forecasting Results of Sweet Corn Skin

Metode SES	MAD	MSE	MAPE
0,1	737,05	926507	25,75
0,2	653,22	892799	22,09
0,3	597,86	850241	19,92
0,4	579,30	815067	19,06
0,5	598,05	788006	19,75
0,6	602,76	767805	20,00
0,7	592,32	754033	19,72
0,8	572,45	746967	19,12
0,9	544,37	747252	18,24

From the results of the comparison of the error values of the forecasting errors of 3 organic vegetable commodities, the three showed the smallest error value in the Single Exponential Smoothing forecasting result 0.9. Thus, the results of Single Exponential Smoothing forecasting with 0.9 were chosen as the best method for forecasting that has been done.

The results of forecasting recapitulation of peeled sweet corn, white cabbage, and purple eggplant commodities using Statistix 10 software are presented in the following Table 5.

TABLE 5: Result Forecasting

Period	Result *Forecasting* (Kg)		
	Sweet Corn Skin	White Cabbage	Purple eggplant
August 2021	2737,68	2680,20	1765,64
September 2021	1988,09	2356,92	1437,64
October 2021	1755,81	1983,54	1370,64
November 2021	2113,28	2156,30	1463,17
December 2021	2129,68	2199,91	1614,98
January 2022	2112,87	2150,49	1273,00
February 2022	2295,22	2352,10	1343,20
March 2022	2021,51	2261,72	1406,47
April 2022	4335,62	3637,17	2610,45
May 2022	4421,29	3871,92	2740,57
June 2022	3599,06	3475,99	2345,42
July 2022	3305,61	3037,54	2003,57
Total	**30794,21**	**32163,80**	**21374,75**

c. Determining the minimum cost using the Wagner-Within Algorithm Method

1. Inventory Cost Jagung Manis Kulit

O11 = 4.000.000 + 1.137,59 ((2.737,68 - 2.737,68))
= 4.000.000

O12 = 4.000.000 + 1.137,59 ((4.725,77 - 2.737,68) + (4.725,77 - 4.725,77))
= 6.261.631

O1212 = 4.000.000 + 1.137,59 ((32.815,72 – 32.815,72))
= 4.000.000

The results of the calculation of the minimum cost are then presented in Table 7 below.

TABEL 7: Skin Sweet Corn Matrix

n \ e	1	2	3	4	5	6	7	8	9	10	11	12
1	4000000	6261631	10256415	17468554	27159364	39177263	54843379	70940926	110398190	155664727	196607274	237971992
2		4000000	5997392	10805484	18073592	27687911	40743008	54540905	89066011	129302933	166151225	203755514
3			4000000	6404046	11249452	18460191	28904268	40402516	69995464	105202771	137956808	171800668
4				4000000	6422703	11229862	19062920	28261518	52922308	83100000	111759783	141843214
5					4000000	6403580	11625618	18524567	38253199	63401275	87966803	114289806
6						4000000	6611019	11210318	26006792	46125253	66596527	89159100
7							4000000	6299650	16163965	31252811	47629830	66431974
8								4000000	8932158	18991389	31274153	46315868
9									4000000	9029615	17218125	28499411
10										4000000	8094255	15615112
11											4000000	7760429
12												4000000

2. Minimum Cost of Sweet Corn Skin

f0 = 0
f1 = Min [(O11 + f0)]
= 4.000.000 untuk O11 + f
.
.
.
f12 = Min [(O111 + f0)] ; (O211 + f1) ; (O311 + f2) ; (O411 + f3) ; (O511 + f4) ; (O611 + f5) ; (O711 + f6) ; (O811 + f7) ; (O911 + f8) ; (O1011 + f9) ; (O1111 + f10)]
= 41.129.336 untuk O1112 + f10

The results of the minimum cost calculation are then presented in the recapitulation as follows.

TABEL 8: Recapitulation of The Cost of Sweet Corn Skin

n \ e	1	2	3	4	5	6	7	8	9	10	11	12
1	4000000	6261631	10256415	17468554	27159364	39177263	54843379	70940926	110398190	155664727	196607274	237971992
2		8000000	9997392	14805484	22073592	31687911	44743008	58540905	93066011	133302933	170151225	207755514
3			10261631	12665677	17511083	24721822	35165899	46664147	76257095	111464402	144218439	178062299
4				13997392	16420095	21227254	29060312	38258910	62919700	93097392	121757175	154508891
5					16665677	19069257	24291296	31190245	50918876	76066953	100632481	130709900
6						20420095	23031114	27630413	42426887	62545348	83016621	108228357
7							23069257	25368907	35233223	50322069	66699087	89463088
8								27031114	31963272	42022502	54305266	71684775
9									29368907	34398522	42587031	57868318
10										33368907	37463162	44984019
11											37368907	41129336*)
12												41368907

The last step of the Wagner-Within Algorithm Method is to determine the Plan Order Release. The same calculation was also carried out in determining inventory costs and minimum costs for white cabbage and purple eggplant commodities. The optimal value in the previous step is described in the order lot size and the order period, so that a plan order release is obtained for sweet corn husks using the Silver-Meal heuristic method for 12 periods as below.

TABEL 9: Plan Order Release Sweet Corn Skin

T	0	1	2	3	4	5
D_t		2737,68	1988,09	1755,81	2113,28	2129,68
Q_{op}		2737,68	1988,09	1755,81	2113,28	2129,68
POR	4725,77	1755,81	2113,28	2129,68	2112,87	2295,22
6	7	8	9	10	11	12
2112,87	2295,22	2021,51	4335,62	4421,29	3599,06	3305,61
2112,87	2295,22	2021,51	4335,62	4421,29	3599,06	3305,61
2021,51		4335,62	4421,29	6904,67		

T : Period (Weekly)
D_t : Demand
Q_{op} : Lot size Optimum
POR : *Plan Order Release*

d. Determine the minimum cost using the Silver-Meal Heuristic Method

1. Calculating Average Inventory Cost Per Unit Time Sweet Corn Skin

Period 1

$$TRC_1 = \frac{4.000.000 + (1.137,59\,((1-1)\times 2737,68))}{1}$$

$$= 4.000.000$$

.
.
.

Periode 11,12

$$= \frac{4.000.000 + (1.137,59\,((1-1)\times 3.599,06 + (2-1)\times 3.305,61))}{2}$$

$$= 3.880.214^*$$

*): Optimum

2. Period Combination Recapitulation for Sweet Corn Skin

TABLE 10: Combination Recapitulation of The Cost Period of Sweet Corn Skin

Combination Period	TRC	Cumulative Cost
1	Rp4.000.000	Rp4.000.000
1,2*	Rp3.418.805	Rp6.837.610
1,2,3	Rp3.703.046	Rp11.109.138
3	Rp4.000.000	Rp4.000.000
3,4*	Rp3.202.023	Rp6.404.046
3,4,5	Rp3.749.817	Rp11.249.451
5	Rp4.000.000	Rp4.000.000
5,6*	Rp3.201.789	Rp6.403.578
5,6,7	Rp3.875.206	Rp11.625.618
7	Rp4.000.000	Rp4.000.000
7,8*	Rp3.149.824	Rp6.299.648
7,8,9	Rp5.387.988	Rp16.163.964
9*	Rp4.000.000	Rp4.000.000
9,10	Rp4.514.807	Rp4.514.807
10*	Rp4.000.000	Rp4.000.000
10,11	Rp4.047.127	Rp8.094.254
11	Rp4.000.000	Rp4.000.000
11,12*	Rp3.880.214	Rp7.760.428

3. Order Lot Size Sweet Corn Skin

TABLE 11: Lot Size Ordering Sweet Corn Skin

T	0	1	2	3	4	5
D_t		2737,68	1988,09	1755,81	2113,28	2129,68
Q_{op}		2737,68	1988,09	1755,81	2113,28	2129,68
POR	4725,77		3869,09		4242,55	
6	7	8	9	10	11	12
2112,87	2295,22	2021,51	4335,62	4421,29	3599,06	3305,61
2112,87	2295,22	2021,51	4335,62	4421,29	3599,06	3305,61
4316,73		4335,62	4421,29	6904,67		

The same calculation is also carried out on white cabbage and purple eggplant commodities by calculating the average inventory cost per unit of time and the order lot size.

From all data processing to find the most optimum total inventory cost using the Silver Meal Heuristic method and the Wagner-Within Algorithm, the next step is to determine the final inventory cost according to the known order release plan for the 2 proposed methods and compare them with the methods applied by the company. . Based on the results of data processing with the method applied by the company and 2 proposed methods, the following results are obtained.

TABEL 12: Comparison of Company Methods with Algorithm Wagner-Within

Product	Company	Algorithm *Wagner-Within*	Efficiency
Sweet Corn Skin	Rp85.330.835	Rp77.330.835	9%
White Cabbage	Rp84.589.217	Rp76.589.217	9%
Purple eggplant	Rp72.315.702	Rp56.315.702	22%
Total	Rp242.235.754	Rp210.235.754	13%

TABEL 13: Comparison of Company Methods with Heuristics Silver-Meal

Product	Company	Heuristics *Silver-Meal*	Efficiency
Sweet Corn Skin	Rp85.330.835	Rp65.330.835	23%
White Cabbage	Rp84.589.217	Rp64.589.217	24%
Purple eggplant	Rp72.315.702	Rp48.315.702	33%
Total	Rp242.235.754	Rp178.235.754	26%

Based on the calculations that have been made for inventory costs based on the company's method and the proposed method, the efficiency value for the Wagner-Within Algorithm method is 13% with a savings of IDR.

32,000,000, - while using the Silver Meal Heuristic method, the efficiency value is 26% with a savings of IDR. 64,000,000, -.

CONCLUSIONS

Based on the results of data processing and analysis, conclusions can be drawn in controlling the supply of organic vegetable commodities, as follows:

1. The Silver Meal Heuristic Method and the Wagner-Within Algorithm can produce optimal inventory control, because they provide the best solution by producing a minimum total inventory cost compared to the company's (existing) total inventory cost.

2. From the results of data processing, the best proposed method is the inventory cost using the Silver Meal Heuristic method because it can produce the lowest cost compared to the Wagner-Within Algorithm method with a savings of Rp. 64,000,000, - and 26% efficiency from the method applied by the company with a total inventory cost of Rp. 178,235,754, -.

3. Based on inventory control using the Silver Meal Heuristic method, the optimal order lot size for sweet corn husks is 7 orders, the optimum order lot size for white cabbage is 7 orders, and the optimum order lot size for purple eggplant is 6 booking times.

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