AGRISOCIONOMICS
Jurnal Sosial Ekonomi dan Kebijakan Pertanian
ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

OPTIMIZATION OF GEDONG GINCU MANGO DISTRIBUTION COSTS IN MAJALENGKA DISTRICT

Jaka Sulaksana*, Ida Marina, and Inka Fatimah R.
Agribusiness Study Program, Faculty of Agriculture, Majalengka University, Majalengka, West Java, Indonesia

*Correspondence Email: jsulaksana@gmail.com

Submitted 16 July 2023; Approved 21 August 2023

ABSTRACT

Facing free trade, Indonesia is required to increase the performance of mango production in order to compete with mangoes from other countries, but the performance of gedong gincu mango agribusiness still faces a number of obstacles, both on farm and off farm. One of them is to optimize distribution costs by designing a transportation model to determine the amount of goods that must be sent from each source to each destination in such a way that the total transportation cost is minimum. The transportation model used is Vogel's Approximation Method. The purpose of this research was to find out the description of the distribution of gedong gincu mangoes in Majalengka District, the distribution costs incurred from source to destination and find out the optimization of distribution costs. The method used was quantitative with survey research techniques. The results of this research were an overview of the distribution of Gedong Gincu mangoes involving 5 parties, namely farmers, collectors, dealers, retailers and consumers which can be done with 4 marketing channels. The distribution costs incurred were different, on the four channels the lowest distribution costs are Rp 29,000 and the highest fee is Rp 74,000/kg. In channel I, it did not carry out cost optimization calculations because it did not make shipments out of town, for optimization in channel II it is Rp 13,950,000, channel III is Rp 249,100,000 and channel IV is Rp 250,980,000. Thus, it can be concluded that the lowest cost is on ordinary channel II. Further research is recommended to perform optimal testing by means of a stepping stone.

Keywords: *cost optimization, distribution, mango*

BACKGROUND

Facing free trade, Indonesia as a producing country is required to improve the performance of mango production in order to be able to compete with mangoes from other countries. Previously, gedong gincu mango (then it will be called just gedong gincu) was once a competitor for mango producers around the world because of gedong gincu mango has a unique spatial pattern, namely having specific or distinctive size, shape, color, taste and smell and very attractive. If linked to the strategic program of the Ministry of Agriculture, gedong gincu mango can be one of the leading commodities to support income, because this gedong gincu mango contributes 11.06% to the total production of mango commodities in West Java Province. It shows that mango is one of the commodity that has the potential to be developed in the context of regional development and economic improvement. However, like agricultural commodities in general, the performance of gedong gincu mango agribusiness still faces several obstacles, both at the cultivation level (on farm)

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

and off farm (Awaliyah, 2018; Salim et al., 2023). One of them is at the distribution stage which usually requires high cost.

In order to the performance of mango agribusiness in Indonesia, especially in the city of Majalengka, to increase, the distribution costs of gedong gincu mangoes, which are not small, must always be optimalized. If compare with another variety, distribution cost of gedong gincu mango is higher because it has specific characteristics and only can be found in Majalengka and its surrounding. Cost optimization needs to be applied to various business activities, and one thing to do is to optimize distribution costs. To solve these problems then designed a model, namely a transportation model with the intention of determining the amount of goods that must be sent from each source to each objective such shape so that cost total transportation become minimum (Pranati, 2018).

Arrangement of gedong gincu mango distribution from sources to places that need it optimally can be done through transportation methods. Product allocation must be arranged in such a way, because there are differences in allocation costs from one source places objective. There is a number of type method transportation, which they all aim at the optimal solution of transportation problems Which happen (Subagyo, 2021). Problems transportation can be equated with problem program linear. Application of the linear programming technique first time done by formulating the problem transportation and solve it (Taufiq, 2017). The initial completion method of transportation that is North West Conner (NWC), Least Cost, and Vogel's Approximation Method (VAM), solution beginning in method transportation Can solve distribution optimization problems. The initial solution used in this research is the Vogel's Approximation Method (VAM), because this method is the easiest and fastest method of solving transportation's problem.

Majalengka Regency is one of the areas which is a center for mango commodities in West Java, especially gedong gincu mango. The district's contribution was 11.06 percent of the total production of mango commodities in West Java Province in 2018 (BPS, 2019b). This shows that mango is a commodity that has the potential to be developed in the framework of regional development and economic improvement. However, for the mango farmers it is not yet optimal and there is a significant increase in their welfare because ownership of land area is still small. Production center of gedong gincu in Majalengka sub-district distributed among several place in Majalengka Regency. Distribution from source to destination different budgets because they have different destinations, in terms of distributing gedong gincu mangoes here still use the manual method. That is become one reason the distribution of goods and distribution costs are not optimal. The distribution of a product must be done optimally. It is analyzed by using Vogel's approximation method.

In solving the problem of optimizing distribution costs, several transportation methods can be used, namely using the Vogel's Approximation Method (VAM), Least Cost Method (LC), North West Corner (NWC), Stepping Stone Method, and Modified Distribution (MODI). Method transportation can help finish problem distribution of products from sources to several destinations and pressing the total distribution costs through the help of Quantitative Management (QM) software because they are tools that can be used to find solutions from modeling forms using quantitative methods that can quickly, easily and accurately provide solutions from the included modeling forms. Hence the method of transportation useful to help distribution Which optimal. For optimizing cost distribution so needed method Which appropriate so product can distributed to objective with minimum cost that is using Vogel's methodapproximation Method (VAM). The aim of researchs are to know the description of the distribution of gedong gincu mango in Majalengka District; to know the cost of distribution from the location of the business to the destination; and to know optimization Gedong gincu distribution

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

costs using Vogel's Approximation Method (VAM). In contrast to previous studies, in which there were only transportation cost optimization calculations using the VAM method, this research has a novelty, namely distribution cost optimization calculations which include not only transportation costs but user fees, unloading costs and product packaging cost.

RESEARCH METHODS

This study uses a method with research techniques, namely survey research techniques. This survey research technique is a quantitative research technique used to obtain data that occurred in the past or currently (Sugiyono, 2018). Survey research is also defined as the process of conducting research using surveys that researchers send to survey respondents. The data collected from the survey and then statistically analyzed to draw meaningful research conclusions. The data collected in this study are primary data and secondary data. The primary data in this study includes distribution descriptions, distribution costs for the capacity of each warehouse, delivery destinations and demand for gedong gincu mangoes. Primary data were obtained from direct interviews and data documentation from mango farmers and/or suppliers. While the secondary data in this study included data on the general condition of the study area and statistical data such as a summary of the amount of mango production from BPS. Secondary data is obtained from related agencies or offices such as the Office of Food Security, Agriculture and Fisheries or BPS and the like. Respondents are mango farmers in Majalengka District. The technique for determining the respondents was carried out using a saturated sampling technique, namely for all members of the Ciandeu farmer group which consisted of 30 peoples.

RESULT AND DISCUSSION

Description of Gedong Gincu Mango Distribution in Majalengka District

Based on the results of identification of distribution in the marketing of gedong gincu mangoes in Majalengka sub-district, the distribution of gedong gincu mangoes involves 5 parties, namely farmers, collectors, dealers, retailers, and consumers which can be carried out with 4 marketing channels, namely:

Figure 1. Distribution Channels I

In first channel, gedong gincu mangoes that have been harvested by farmers, by immediately sold if there are consumers who want to buy directly from farmers. Usually, consumers buy only from around the farmer's residence. However, in this channel there are marketing limitations that cause farmers' income to be less than channels II, III and IV which can reach a wider range of consumers.

Figure 2. Distribution Channels II

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

In the second channel, mangoes that have been harvested by farmers are sold to collectors, one of which is due to the lack of relationships that farmers have to sell their crops and also that all of yield will be purchased by collectors in the area. It is not uncommon for collectors to sell the mangoes directly to consumers who come there. In this channel, farmers can get benefits because all their crops are always purchased by collectors.

Figure 3. Distribution Channels III

In this third channel, farmers sell their crops to collectors, then to traders with a wider relationship than other farmers, collectors sell the mangoes to major dealers, which then reach consumers. In this channel, farmers get more profit because by setting marketing arrangements in harvested mangoes there will always be more demand so they can get more income.

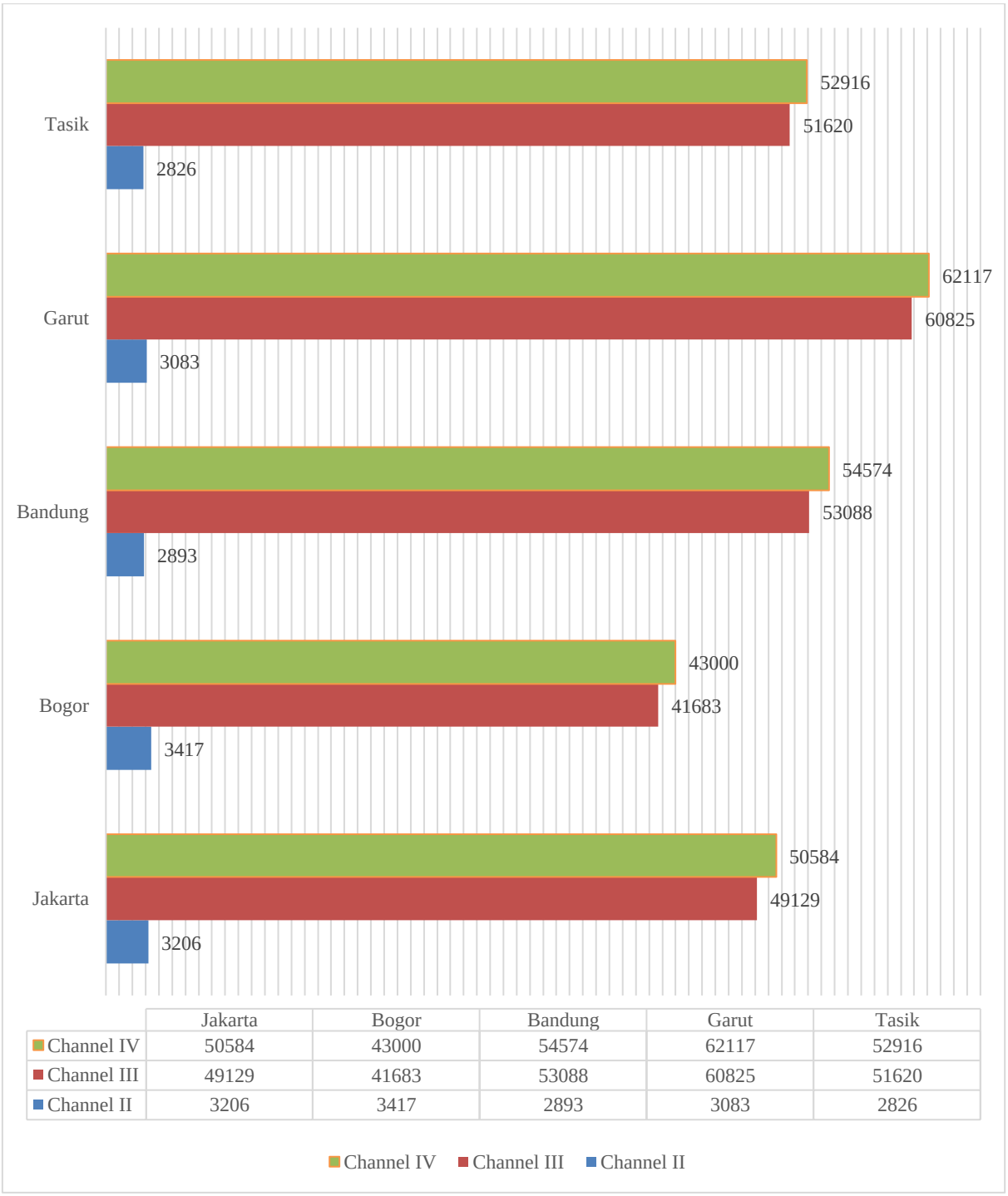
Figure 4. Distribution Channels IV

In this fourth channel, farmers sell to collectors, then sell to dealers, then resell to retailers in several areas before reaching consumers. In this channel, farmers get more profit because by setting marketing arrangements in harvested mangoes there will always be more demand so they can get more income.

Distribution Cost of Gedong Gincu Mango Expenses from Source to Destination

Based on the identification results, the following is a diagram of distribution costs incurred from sources to destinations. Distribution costs on channel I, namely from farmers directly to consumers so that it does not require large costs as in channels II, III and IV, because consumers come directly to the farmers' homes so there are no distribution costs and retribution costs. Channel I is not included in the diagram because channel I is only in the area of the farmer's location.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024



	Jakarta	Bogor	Bandung	Garut	Tasik
Channel IV	50584	43000	54574	62117	52916
Channel III	49129	41683	53088	60825	51620
Channel II	3206	3417	2893	3083	2826

Figure 5. Channel Gedong Gincu Mango Distribution Costs

This diagram shows distribution costs, which are colored blue, namely channel II with distribution from farmers selling to collectors and collectors selling back to consumers. This fee includes transportation costs, unloading costs and packaging costs. There is no retribution fee because they do not enter the market. The orange diagram shows channel III, namely distribution from farmers directly sold to collectors and then sold to dealers before reaching consumers. This fee is higher than the cost in channels I & II because of market retribution costs. The gray diagram shows distribution costs in channel IV, namely distribution from farmers directly sold to collectors, sold to dealers and then to retailers before reaching consumers. The cost on channel IV is the biggest cost among the

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

costs on channels I, II and III. This diagram shows that the biggest distribution cost is Rp 62,117 on channel IV by sending to Garut City, while the smallest fee is Rp 2,826 on channel II by sending to Tasikmalaya.

Optimizing the Cost of Distribution of Gedong Gincu Mango Using Vogel's Approximation Method (VAM)

Optimization is an activity to get the best results below circumstances which are given. With the optimization of distribution costs can be achieved optimal distribution costs.

1. Channel I Cost Optimization

In channel I there are no transportation costs, but only unloading costs with an average cost of 30 farmers of Rp 93,- /kg and a packaging fee of Rp 953,- /kg. In channel I, it does not carry out cost optimization calculations because farmers do not send mangoes to cities but only in the areas where farmers live. There are no optimization table in this channel.

2. Channel Cost Optimization II

Farmers send harvested mangoes to the cities of Jakarta, Bogor, Bandung, Garut and Tasik. The figures shown are distribution costs incurred for shipping, requests and the capacity of the gedong gincu mango. Costs on channel II include transportation costs, unloading costs and packaging costs without retribution costs because they do not enter the market. The following is the result of cost optimization using Quantitative Management (QM) Software. In this table (Table 1) there are destination cities that are used as sources by farmers, for a column that has a value of zero indicates that farmers do not send gedong gincu mangoes to that city.

Table 1. Initial Table of Channel II Transportation

From/ To	Jakarta	Bogor	Bandung	Garut	Tasik	Supply
Farmer 1	0	3.400	0	0	0	500
Farmer 2	2.200	0	2.200	0	0	200
Farmer 3	0	0	2.650	2.650	0	200
Farmer 4	0	0	0	0	2.775	500
Farmer 5	0	0	2.800	0	0	100
Farmer 6	0	0	0	2.980	2.980	500
Farmer 7	0	3.400	0	0	0	300
Farmer 8	3.350	0	3.350	0	0	1.000
Farmer 9	0	0	0	2.480	0	700
Farmer 10	0	0	2.700	0	0	500
Farmer 11	0	0	2.800	0	0	500
Farmer 12	0	0	2.700	0	0	500
Farmer 13	0	0	0	0	2.825	300
Farmer 14	0	0	2.800	0	0	700
Farmer 15	3.500	0	0	0	0	700
Farmer 16	0	0	2.800	0	0	500
Farmer 17	0	0	0	0	2.775	300
Farmer 18	3.390	0	3.390	3.390	0	1.000
Farmer 19	0	0	2.800	0	0	100
Farmer 20	28.750	0	3.050	0	0	400
Farmer 21	0	0	3.200	0	0	2.000
Farmer 22	0	0	3.300	0	0	4.000
Farmer 23	0	0	0	0	2.775	300
Farmer 24	3.550	0	0	0	0	700
Farmer 25	0	0	0	3.330	0	200
Farmer 26	0	3.450	0	0	0	400
Farmer 27	0	0	2.900	0	0	600
Farmer 28	0	0	0	3.630	0	800
Farmer 29	0	0	2.800	0	0	600
Farmer 30	3.400	0	0	0	0	200
Demand	2.700	1.200	11.400	2.350	1.250	

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Transportation Shipments

Demonstrate the optimal solution for distribution costs. Therefore, in order to obtain optimal costs, one of them is that farmers must send 500 kg of mangoes, as well as for other farmers who must send mangoes with the amount listed in the table. It can be seen in the table that the optimal cost on channel II is Rp 13,950,000. In the optimization calculations, in other cases, farmers can send mangoes to all cities, but in this study, in fact, farmers have not been able to send them to various cities because of limited relations in marketing to other cities.

Table 2. Transportation Shipment Channel II

Optimal cost = $13.950.000	Jakarta	Bogor	Bandung	Garut	Tasik	Dummy
Farmer 1			500,			
Farmer 2			200,			
Farmer 3			200,			
Farmer 4			500,			
Farmer 5			100,			
Farmer 6			500,			
Farmer 7			300,			
Farmer 8				750,	250,	
Farmer 9			700,			
Farmer 10			500,			
Farmer 11			500,			
Farmer 12			500,			
Farmer 13			300,			
Farmer 14			700,			
Farmer 15			700,			
Farmer 16			500,			
Farmer 17			300,			
Farmer 18					1.000,	
Farmer 19			100,			
Farmer 20			400,			
Farmer 21	300,		100,	1.600,		
Farmer 22	2.400,	1.200,				400,
Farmer 23			300,			
Farmer 24			700,			
Farmer 25			200,			
Farmer 26			400,			
Farmer 27			600,			
Farmer 28			800,			
Farmer 29			600,			
Farmer 30			200,			

Marginal Cost

Marginal costs are additional costs incurred if farmers are forced to make deliveries to other cities because of a desire to increase their income. For example, as can be seen in the table, farmer 1 pays additional costs to Jakarta of Rp 3,200, to Bogor of Rp 6,600, to Garut of Rp 3,200 and to Tasik of Rp 3,200. To Bandung there are no additional costs because the costs incurred are already optimal.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 3. Marginal Cost Channel II

	Jakarta	Bogor	Bandung	Garut	Tasik	Dummy
Farmer 1	3.200,	6.600,		3.200,	3.200,	3.200,
Farmer 2	3.200,	1.000,		1.000,	1.000,	1.000,
Farmer 3	550,	550,		3.200,	550,	550,
Farmer 4	3.200,	3.200,		3.200,	5.975,	3.200,
Farmer 5	400,	400,		400,	400,	400,
Farmer 6	3.200,	3.200,		6.180,	6.180,	3.200,
Farmer 7	3.200,	6.600,		3.200,	3.200,	3.200,
Farmer 8	3.350,	0,	150,			0,
Farmer 9	3.200,	3.200,		5.680,	3.200,	3.200,
Farmer 10	500,	500,		500,	500,	500,
Farmer 11	400,	400,		400,	400,	400,
Farmer 12	500,	500,		500,	500,	500,
Farmer 13	3.200,	3.200,		3.200,	6.025,	3.200,
Farmer 14	400,	400,		400,	400,	400,
Farmer 15	6.700,	3.200,		3.200,	3.200,	3.200,
Farmer 16	400,	400,		400,	400,	400,
Farmer 17	3.200,	3.200,		3.200,	5.975,	3.200,
Farmer 18	3.390,	0,	190,	3.390,		0,
Farmer 19	400,	400,		400,	400,	400,
Farmer 20	28.900,	150,		150,	150,	150,
Farmer 21		0,			0,	0,
Farmer 22			100,	0,	0,	
Farmer 23	3.200,	3.200,		3.200,	5.975,	3.200,
Farmer 24	6.750,	3.200,		3.200,	3.200,	3.200,
Farmer 25	3.200,	3.200,		6.530,	3.200,	3.200,
Farmer 26	3.200,	6.650,		3.200,	3.200,	3.200,
Farmer 27	300,	300,		300,	300,	300,
Farmer 28	3.200,	3.200,		6.830,	3.200,	3.200,
Farmer 29	400,	400,		400,	400,	400,
Farmer 30	6.600,	3.200,		3.200,	3.200,	3.200,

Final SolutionTable

The Final Solution shows the final solution table which is the combined result of the calculation of distribution costs, the nominal numbers in pink are the marginal cost of each farmer, while the nominal numbers in blue show the amount of allocation issued. This final solution table appears by itself which is a combination of previous calculations that does not affect other calculations.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 4. Final Solution Channel II

	Jakarta	Bogor	Bandung	Garut	Tasik	Dummy
Farmer 1	[3200]	[6600]	500,	[3200]	[3200]	[3200]
Farmer 2	[3200]	[1000]	200,	[1000]	[1000]	[1000]
Farmer 3	[550]	[550]	200,	[3200]	[550]	[550]
Farmer 4	[3200]	[3200]	500,	[3200]	[5975]	[3200]
Farmer 5	[400]	[400]	100,	[400]	[400]	[400]
Farmer 6	[3200]	[3200]	500,	[6180]	[6180]	[3200]
Farmer 7	[3200]	[6600]	300,	[3200]	[3200]	[3200]
Farmer 8	[3350]	[0]	[150]	750,	250,	[0]
Farmer 9	[3200]	[3200]	700,	[5680]	[3200]	[3200]
Farmer 10	[500]	[500]	500,	[500]	[500]	[500]
Farmer 11	[400]	[400]	500,	[400]	[400]	[400]
Farmer 12	[500]	[500]	500,	[500]	[500]	[500]
Farmer 13	[3200]	[3200]	300,	[3200]	[6025]	[3200]
Farmer 14	[400]	[400]	700,	[400]	[400]	[400]
Farmer 15	[6700]	[3200]	700,	[3200]	[3200]	[3200]
Farmer 16	[400]	[400]	500,	[400]	[400]	[400]
Farmer 17	[3200]	[3200]	300,	[3200]	[5975]	[3200]
Farmer 18	[3390]	[0]	[190]	[3390]	1.000,	[0]
Farmer 19	[400]	[400]	100,	[400]	[400]	[400]
Farmer 20	[28900]	[150]	400,	[150]	[150]	[150]
Farmer 21	300,	[0]	100,	1.600,	[0]	[0]
Farmer 22	2.400,	1.200,	[100]	[0]	[0]	400,
Farmer 23	[3200]	[3200]	300,	[3200]	[5975]	[3200]
Farmer 24	[6750]	[3200]	700,	[3200]	[3200]	[3200]
Farmer 25	[3200]	[3200]	200,	[6530]	[3200]	[3200]
Farmer 26	[3200]	[6650]	400,	[3200]	[3200]	[3200]
Farmer 27	[300]	[300]	600,	[300]	[300]	[300]
Farmer 28	[3200]	[3200]	800,	[6830]	[3200]	[3200]
Farmer 29	[400]	[400]	600,	[400]	[400]	[400]
Farmer 30	[6600]	[3200]	200,	[3200]	[3200]	[3200]

Shipping List

In this case, farmers deliver only to certain cities and do not ship to all cities. This shipping cost appears in the shipping list stage. In this case the shipping list shows the details of the allocation, namely the cost/kg of mangoes and the total cost of each allocation. In this table, one of them is farmer 1 sending 200 kg of mangoes to Bandung at a cost of Rp 2,200/kg, so the total cost of receipt is Rp 440,000.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 5. Shipping List Channel II

From	To	Shipment	Cost per unit	Shipment cost
Farmer 1	Bandung	500,	0,	0,
Farmer 2	Bandung	200,	2.200,	440.000,
Farmer 3	Bandung	200,	2.650,	530.000,
Farmer 4	Bandung	500,	0,	0,
Farmer 5	Bandung	100,	2.800,	280.000,
Farmer 6	Bandung	500,	0,	0,
Farmer 7	Bandung	300,	0,	0,
Farmer 8	Garut	750,	0,	0,
Farmer 8	Tasik	250,	0,	0,
Farmer 9	Bandung	700,	0,	0,
Farmer 10	Bandung	500,	2.700,	1.350.000,
Farmer 11	Bandung	500,	2.800,	1.400.000,
Farmer 12	Bandung	500,	2.700,	1.350.000,
Farmer 13	Bandung	300,	0,	0,
Farmer 14	Bandung	700,	2.800,	1.960.000,
Farmer 15	Bandung	700,	0,	0,
Farmer 16	Bandung	500,	2.800,	1.400.000,
Farmer 17	Bandung	300,	0,	0,
Farmer 18	Tasik	1.000,	0,	0,
Farmer 19	Bandung	100,	2.800,	280.000,
Farmer 20	Bandung	400,	3.050,	1.220.000,
Farmer 21	Jakarta	300,	0,	0,
Farmer 21	Bandung	100,	3.200,	320.000,
Farmer 21	Garut	1.600,	0,	0,
Farmer 22	Jakarta	2.400,	0,	0,
Farmer 22	Bogor	1.200,	0,	0,
Farmer 22	Dummy	400,	0,	0,
Farmer 23	Bandung	300,	0,	0,
Farmer 24	Bandung	700,	0,	0,
Farmer 25	Bandung	200,	0,	0,
Farmer 26	Bandung	400,	0,	0,
Farmer 27	Bandung	600,	2.900,	1.740.000,
Farmer 28	Bandung	800,	0,	0,
Farmer 29	Bandung	600,	2.800,	1.680.000,
Farmer 30	Bandung	200,	0,	0,

3. Channel III Cost Optimization

The costs on channel III are higher than the costs on channels I & II because apart from transportation costs, unloading costs, and packaging costs, they also include retribution fees. The following is the result of cost optimization using Quantitative Management (QM) Software.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 6. Initial Table of Channel III Transportation

From/To	Jakarta	Bogor	Bandung	Garut	Tasik	Supply
Farmer 1	0	53.700	0	0	0	500
Farmer 2	52.650	0	52.650	0	0	200
Farmer 3	0	0	68.140	68.140	0	200
Farmer 4	0	0	0	0	53.125	500
Farmer 5	0	0	45.100	0	0	100
Farmer 6	0	0	0	48.380	48.380	500
Farmer 7	0	28.650	0	0	0	300
Farmer 8	45.650	0	45.650	0	0	1.000
Farmer 9	0	0	0	52.830	0	700
Farmer 10	0	0	63.100	0	0	500
Farmer 11	0	0	45.150	0	0	500
Farmer 12	0	0	63.150	0	0	500
Farmer 13	0	0	0	0	73.175	300
Farmer 14	0	0	45.200	0	0	700
Farmer 15	63.800	0	0	0	0	700
Farmer 16	0	0	53.150	0	0	500
Farmer 17	0	0	0	0	45.125	300
Farmer 18	63.690	0	63.690	63.690	0	1.000
Farmer 19	0	0	45.100	0	0	100
Farmer 20	28.450	0	28.450	0	0	400
Farmer 21	0	0	63.650	0	0	2.000
Farmer 22	0	0	63.650	0	0	4.000
Farmer 23	0	0	0	0	43.175	300
Farmer 24	53.750	0	0	0	0	700
Farmer 25	0	0	0	63.630	0	200
Farmer 26	0	45.700	0	0	0	400
Farmer 27	0	0	58.200	0	0	600
Farmer 28	0	0	0	73.980	0	800
Farmer 29	0	0	63.250	0	0	600
Farmer 30	43.700	0	0	0	0	200
Demand	2.700	1.200	11.400	2.350	1.250	

Transportation Shipments

Demonstrate the optimal solution for distribution costs. So, in order to obtain optimal costs, one of them is that farmers must send 500 kg of mangoes, as well as for other farmers who must send mangoes with the amount listed in the table. It can be seen in the table that the optimal cost on channel III is Rp 249,100,000. In the optimization calculations, in other cases, farmers can send mangoes to all cities, but in this study, in fact, farmers have not been able to send them to various cities because of limited relations in marketing to other cities.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 7. Transportation Shipment Channel III

Optimal cost = $249.100.000	Jakarta	Bogor	Bandung	Garut	Tasik	Dummy
Farmer 1			500,			
Farmer 2			200,			
Farmer 3					200,	
Farmer 4			500,			
Farmer 5			100,			
Farmer 6			500,			
Farmer 7			300,			
Farmer 8			1.000,			
Farmer 9			700,			
Farmer 10			500,			
Farmer 11			500,			
Farmer 12			400,	50,	50,	
Farmer 13			300,			
Farmer 14			700,			
Farmer 15			700,			
Farmer 16			500,			
Farmer 17			300,			
Farmer 18					1.000,	
Farmer 19			100,			
Farmer 20			400,			
Farmer 21				1.600,		400,
Farmer 22	2.100,	1.200,		700,		
Farmer 23			300,			
Farmer 24			700,			
Farmer 25			200,			
Farmer 26			400,			
Farmer 27			600,			
Farmer 28			800,			
Farmer 29	600,					
Farmer 30			200,			

Marginal Cost

Marginal costs are additional costs incurred if farmers are forced to make deliveries to other cities because of a desire to increase their income. For example, as can be seen in the table, farmer 1 incurs additional costs to Jakarta of Rp 63,150, to Bogor of Rp 116,850, to Garut of Rp 63,150 and to Tasik of Rp 63,150. To Bandung there are no additional costs because the costs incurred are already optimal.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 8. Marginal Cost Channel III

	Jakarta	Bogor	Bandung	Garut	Tasik	Dummy
Farmer 1	63.150,	116.850,		63.150,	63.150,	63.150,
Farmer 2	63.150,	10.500,		10.500,	10.500,	10.500,
Farmer 3	0,	0,	4.990,	68.140,		0,
Farmer 4	63.150,	63.150,		63.150,	116.275,	63.150,
Farmer 5	18.050,	18.050,		18.050,	18.050,	18.050,
Farmer 6	63.150,	63.150,		111.530,	111.530,	63.150,
Farmer 7	63.150,	91.800,		63.150,	63.150,	63.150,
Farmer 8	63.150,	17.500,		17.500,	17.500,	17.500,
Farmer 9	63.150,	63.150,		115.980,	63.150,	63.150,
Farmer 10	50,	50,		50,	50,	50,
Farmer 11	18.000,	18.000,		18.000,	18.000,	18.000,
Farmer 12	0,	0,				0,
Farmer 13	63.150,	63.150,		63.150,	136.325,	63.150,
Farmer 14	17.950,	17.950,		17.950,	17.950,	17.950,
Farmer 15	126.950,	63.150,		63.150,	63.150,	63.150,
Farmer 16	10.000,	10.000,		10.000,	10.000,	10.000,
Farmer 17	63.150,	63.150,		63.150,	108.275,	63.150,
Farmer 18	63.690,	0,	540,	63.690,		0,
Farmer 19	18.050,	18.050,		18.050,	18.050,	18.050,
Farmer 20	63.150,	34.700,		34.700,	34.700,	34.700,
Farmer 21	0,	0,	500,		0,	
Farmer 22			500,		0,	0,
Farmer 23	63.150,	63.150,		63.150,	106.325,	63.150,
Farmer 24	116.900,	63.150,		63.150,	63.150,	63.150,
Farmer 25	63.150,	63.150,		126.780,	63.150,	63.150,
Farmer 26	63.150,	108.850,		63.150,	63.150,	63.150,
Farmer 27	4.950,	4.950,		4.950,	4.950,	4.950,
Farmer 28	63.150,	63.150,		137.130,	63.150,	63.150,
Farmer 29		0,	100,	0,	0,	0,
Farmer 30	106.850,	63.150,		63.150,	63.150,	63.150,

Final Solution Table

The Final Solution shows the final solution table which is the combined result of the calculation of distribution costs, the nominal numbers in pink are the marginal cost of each farmer, while the nominal numbers in blue show the amount of allocation issued. This final solution table appears by itself which is a combination of previous calculations that does not affect other calculations.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 9. Final Solution Channel III

	Jakarta	Bogor	Bandung	Garut	Tasik	Dummy
Farmer 1	[63150]	[116850]	500,	[63150]	[63150]	[63150]
Farmer 2	[63150]	[10500]	200,	[10500]	[10500]	[10500]
Farmer 3	[0]	[0]	[4990]	[68140]	200,	[0]
Farmer 4	[63150]	[63150]	500,	[63150]	[116275]	[63150]
Farmer 5	[18050]	[18050]	100,	[18050]	[18050]	[18050]
Farmer 6	[63150]	[63150]	500,	[111530]	[111530]	[63150]
Farmer 7	[63150]	[91800]	300,	[63150]	[63150]	[63150]
Farmer 8	[63150]	[17500]	1.000,	[17500]	[17500]	[17500]
Farmer 9	[63150]	[63150]	700,	[115980]	[63150]	[63150]
Farmer 10	[50]	[50]	500,	[50]	[50]	[50]
Farmer 11	[18000]	[18000]	500,	[18000]	[18000]	[18000]
Farmer 12	[0]	[0]	400,	50,	50,	[0]
Farmer 13	[63150]	[63150]	300,	[63150]	[136325]	[63150]
Farmer 14	[17950]	[17950]	700,	[17950]	[17950]	[17950]
Farmer 15	[126950]	[63150]	700,	[63150]	[63150]	[63150]
Farmer 16	[10000]	[10000]	500,	[10000]	[10000]	[10000]
Farmer 17	[63150]	[63150]	300,	[63150]	[108275]	[63150]
Farmer 18	[63690]	[0]	[540]	[63690]	1.000,	[0]
Farmer 19	[18050]	[18050]	100,	[18050]	[18050]	[18050]
Farmer 20	[63150]	[34700]	400,	[34700]	[34700]	[34700]
Farmer 21	[0]	[0]	[500]	1.600,	[0]	400,
Farmer 22	2.100,	1.200,	[500]	700,	[0]	[0]
Farmer 23	[63150]	[63150]	300,	[63150]	[106325]	[63150]
Farmer 24	[116900]	[63150]	700,	[63150]	[63150]	[63150]
Farmer 25	[63150]	[63150]	200,	[126780]	[63150]	[63150]
Farmer 26	[63150]	[108850]	400,	[63150]	[63150]	[63150]
Farmer 27	[4950]	[4950]	600,	[4950]	[4950]	[4950]
Farmer 28	[63150]	[63150]	800,	[137130]	[63150]	[63150]
Farmer 29	600,	[0]	[100]	[0]	[0]	[0]
Farmer 30	[106850]	[63150]	200,	[63150]	[63150]	[63150]

Shipping List

In this case, farmers deliver only to certain cities and do not ship to all cities. This shipping cost appears in the shipping list stage. The shipping list shows the details of the allocation, namely the cost/kg of mangoes and the total cost of each allocation. In this table, one of them is farmer 1 sending 200 kg of mangoes to Bandung at a cost of Rp 52,650/kg, so the total cost of receipt is Rp 10,530,000.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 10. Shipping List Channel III

From	To	Shipment	Cost per unit	Shipment cost
Farmer 1	Bandung	500,	0,	0,
Farmer 2	Bandung	200,	52.650,	10.530.000,
Farmer 3	Tasik	200,	0,	0,
Farmer 4	Bandung	500,	0,	0,
Farmer 5	Bandung	100,	45.100,	4.510.000,
Farmer 6	Bandung	500,	0,	0,
Farmer 7	Bandung	300,	0,	0,
Farmer 8	Bandung	1.000,	45.650,	45.650.000,
Farmer 9	Bandung	700,	0,	0,
Farmer 10	Bandung	500,	63.100,	31.550.000,
Farmer 11	Bandung	500,	45.150,	22.575.000,
Farmer 12	Bandung	400,	63.150,	25.260.000,
Farmer 12	Garut	50,	0,	0,
Farmer 12	Tasik	50,	0,	0,
Farmer 13	Bandung	300,	0,	0,
Farmer 14	Bandung	700,	45.200,	31.640.000,
Farmer 15	Bandung	700,	0,	0,
Farmer 16	Bandung	500,	53.150,	26.575.000,
Farmer 17	Bandung	300,	0,	0,
Farmer 18	Tasik	1.000,	0,	0,
Farmer 19	Bandung	100,	45.100,	4.510.000,
Farmer 20	Bandung	400,	28.450,	11.380.000,
Farmer 21	Garut	1.600,	0,	0,
Farmer 21	Dummy	400,	0,	0,
Farmer 22	Jakarta	2.100,	0,	0,
Farmer 22	Bogor	1.200,	0,	0,
Farmer 22	Garut	700,	0,	0,
Farmer 23	Bandung	300,	0,	0,
Farmer 24	Bandung	700,	0,	0,
Farmer 25	Bandung	200,	0,	0,
Farmer 26	Bandung	400,	0,	0,
Farmer 27	Bandung	600,	58.200,	34.920.000,
Farmer 28	Bandung	800,	0,	0,
Farmer 29	Jakarta	600,	0,	0,
Farmer 30	Bandung	200,	0,	0,

4. Channel IV Cost Optimization

Costs in channel IV are the biggest costs incurred because apart from transportation costs, unloading costs and packaging costs, they also include retribution costs, besides that the marketing chain is more numerous than channels I, II & III. It seems that more chain, higher cost. Then, farmer share can be assumed is lower than before. It is added by the fact that gedong gincu is the unique

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

fruit, and can make the trader put higher price or it can be said that in every chain, cost is liite bit higher than usual mango. The following is the result of cost optimization using Quantitative Management (QM) Software.

Table 11. Initial Table of Channel IV Transportation

From/To	Jakarta	Bogor	Bandung	Tasik	Garut	Supply
Farmer 1	0	54.000	0	0	0	500
Farmer 2	53.000	0	53.000	0	0	200
Farmer 3	0	0	68.490	0	68.490	200
Farmer 4	0	0	0	53.475	0	500
Farmer 5	0	0	45.500	0	0	100
Farmer 6	0	0	0	48.680	48.680	500
Farmer 7	0	29.000	0	0	0	300
Farmer 8	46.050	0	46.050	0	0	1.000
Farmer 9	0	0	0	0	53.180	700
Farmer 10	0	0	63.500	0	0	500
Farmer 11	0	0	45.500	0	0	500
Farmer 12	0	0	63.500	0	0	500
Farmer 13	0	0	0	73.475	0	300
Farmer 14	0	0	45.600	0	0	700
Farmer 15	64.100	0	0	0	0	700
Farmer 16	0	0	53.500	0	0	500
Farmer 17	0	0	0	45.475	0	300
Farmer 18	64.090	0	64.090	0	64.090	1.000
Farmer 19	0	0	45.500	0	0	100
Farmer 20	28.750	0	28.750	0	0	400
Farmer 21	0	0	64.000	0	0	2.000
Farmer 22	0	0	64.000	0	0	4.000
Farmer 23	0	0	0	43.475	0	300
Farmer 24	54.100	0	0	0	0	700
Farmer 25	0	0	0	0	63.980	200
Farmer 26	0	46.000	0	0	0	400
Farmer 27	0	0	58.600	0	0	600
Farmer 28	0	0	0	0	74.280	800
Farmer 29	0	0	63.600	0	0	600
Farmer 30	44.000	0	0	0	0	200
Demand	2.700	1.200	11.400	2.350	1.250	

Transportation Shipments

Demonstrate the optimal solution for distribution costs. So, in order to obtain optimal costs, one of them is that farmers must send 500 kg of mangoes, as well as for other farmers who must send mangoes with the amount listed in the table. It can be seen in the table that the optimal cost for channel IV is Rp 250,980,000. In the optimization calculations, in other cases, farmers can send mangoes to all cities, but in this study, in fact, farmers have not been able to send them to various cities because of limited relations in marketing to other cities.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 12. Table of Transportation Shipment Channel IV

Optimal cost = $250.980.000	Jakarta	Bogor	Bandung	Tasik	Garut	Dummy
Farmer 1			500,			
Farmer 2			200,			
Farmer 3				200,		
Farmer 4			500,			
Farmer 5			100,			
Farmer 6			500,			
Farmer 7			300,			
Farmer 8			1.000,			
Farmer 9			700,			
Farmer 10			500,			
Farmer 11			500,			
Farmer 12			400,	100,		
Farmer 13			300,			
Farmer 14			700,			
Farmer 15			700,			
Farmer 16			500,			
Farmer 17			300,			
Farmer 18				600,		400,
Farmer 19			100,			
Farmer 20			400,			
Farmer 21				750,	1.250,	
Farmer 22	2.100,	1.200,		700,		
Farmer 23			300,			
Farmer 24			700,			
Farmer 25			200,			
Farmer 26			400,			
Farmer 27			600,			
Farmer 28			800,			
Farmer 29	600,					
Farmer 30			200,			

Marginal Cost

Marginal costs are additional costs incurred if farmers are forced to make deliveries to other cities because of a desire to increase their income. For example, as can be seen in the table, farmer 1 incurs additional costs to Jakarta of Rp 63,500, to Bogor of Rp 117,500, to Garut of Rp 63,500 and to Tasik of Rp 63,500. To Bandung there are no additional costs because the costs incurred are already optimal.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 13. Marginal Cost Channel IV

	Jakarta	Bogor	Bandung	Tasik	Garut	Dummy
Farmer 1	63.500,	117.500,		63.500,	63.500,	63.500,
Farmer 2	63.500,	10.500,		10.500,	10.500,	10.500,
Farmer 3	0,	0,	4.990,		68.490,	0,
Farmer 4	63.500,	63.500,		116.975,	63.500,	63.500,
Farmer 5	18.000,	18.000,		18.000,	18.000,	18.000,
Farmer 6	63.500,	63.500,		112.180,	112.180,	63.500,
Farmer 7	63.500,	92.500,		63.500,	63.500,	63.500,
Farmer 8	63.500,	17.450,		17.450,	17.450,	17.450,
Farmer 9	63.500,	63.500,		63.500,	116.680,	63.500,
Farmer 10	0,	0,		0,	0,	0,
Farmer 11	18.000,	18.000,		18.000,	18.000,	18.000,
Farmer 12	0,	0,			0,	0,
Farmer 13	63.500,	63.500,		136.975,	63.500,	63.500,
Farmer 14	17.900,	17.900,		17.900,	17.900,	17.900,
Farmer 15	127.600,	63.500,		63.500,	63.500,	63.500,
Farmer 16	10.000,	10.000,		10.000,	10.000,	10.000,
Farmer 17	63.500,	63.500,		108.975,	63.500,	63.500,
Farmer 18	64.090,	0,	590,		64.090,	
Farmer 19	18.000,	18.000,		18.000,	18.000,	18.000,
Farmer 20	63.500,	34.750,		34.750,	34.750,	34.750,
Farmer 21	0,	0,	500,			0,
Farmer 22			500,		0,	0,
Farmer 23	63.500,	63.500,		106.975,	63.500,	63.500,
Farmer 24	117.600,	63.500,		63.500,	63.500,	63.500,
Farmer 25	63.500,	63.500,		63.500,	127.480,	63.500,
Farmer 26	63.500,	109.500,		63.500,	63.500,	63.500,
Farmer 27	4.900,	4.900,		4.900,	4.900,	4.900,
Farmer 28	63.500,	63.500,		63.500,	137.780,	63.500,
Farmer 29		0,	100,	0,	0,	0,
Farmer 30	107.500,	63.500,		63.500,	63.500,	63.500,

Final Solution Table

The Final Solution shows the final solution table which is the combined result of the calculation of distribution costs, the nominal numbers in pink are the marginal cost of each farmer, while the nominal numbers in blue show the amount of allocation issued. This final solution table appears by itself which is a combination of previous calculations that does not affect other calculations.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 14. Final Solution Channel IV

	Jakarta	Bogor	Bandung	Tasik	Garut	Dummy
Farmer 1	[63500]	[117500]	500,	[63500]	[63500]	[63500]
Farmer 2	[63500]	[10500]	200,	[10500]	[10500]	[10500]
Farmer 3	[0]	[0]	[4990]	200,	[68490]	[0]
Farmer 4	[63500]	[63500]	500,	[116975]	[63500]	[63500]
Farmer 5	[18000]	[18000]	100,	[18000]	[18000]	[18000]
Farmer 6	[63500]	[63500]	500,	[112180]	[112180]	[63500]
Farmer 7	[63500]	[92500]	300,	[63500]	[63500]	[63500]
Farmer 8	[63500]	[17450]	1.000,	[17450]	[17450]	[17450]
Farmer 9	[63500]	[63500]	700,	[63500]	[116680]	[63500]
Farmer 10	[0]	[0]	500,	[0]	[0]	[0]
Farmer 11	[18000]	[18000]	500,	[18000]	[18000]	[18000]
Farmer 12	[0]	[0]	400,	100,	[0]	[0]
Farmer 13	[63500]	[63500]	300,	[136975]	[63500]	[63500]
Farmer 14	[17900]	[17900]	700,	[17900]	[17900]	[17900]
Farmer 15	[127600]	[63500]	700,	[63500]	[63500]	[63500]
Farmer 16	[10000]	[10000]	500,	[10000]	[10000]	[10000]
Farmer 17	[63500]	[63500]	300,	[108975]	[63500]	[63500]
Farmer 18	[64090]	[0]	[590]	600,	[64090]	400,
Farmer 19	[18000]	[18000]	100,	[18000]	[18000]	[18000]
Farmer 20	[63500]	[34750]	400,	[34750]	[34750]	[34750]
Farmer 21	[0]	[0]	[500]	750,	1.250,	[0]
Farmer 22	2.100,	1.200,	[500]	700,	[0]	[0]
Farmer 23	[63500]	[63500]	300,	[106975]	[63500]	[63500]
Farmer 24	[117600]	[63500]	700,	[63500]	[63500]	[63500]
Farmer 25	[63500]	[63500]	200,	[63500]	[127480]	[63500]
Farmer 26	[63500]	[109500]	400,	[63500]	[63500]	[63500]
Farmer 27	[4900]	[4900]	600,	[4900]	[4900]	[4900]
Farmer 28	[63500]	[63500]	800,	[63500]	[137780]	[63500]
Farmer 29	600,	[0]	[100]	[0]	[0]	[0]
Farmer 30	[107500]	[63500]	200,	[63500]	[63500]	[63500]

Shipping List

In this case, farmers deliver only to certain cities and do not ship to all cities. This shipping cost appears in the shipping list stage. In this case the shipping list shows the details of the allocation, namely the cost/kg of mangoes and the total cost of each allocation. In this table, one of them is farmer 1 sending 200 kg of mangoes to Bandung at a cost of Rp 53,000/kg, so the total cost of receipt is Rp 10,600,000.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Table 15. Shipping List Channel IV

From	To	Shipment	Cost per unit	Shipment cost
Farmer 1	Bandung	500,	0,	0,
Farmer 2	Bandung	200,	53.000,	10.600.000,
Farmer 3	Tasik	200,	0,	0,
Farmer 4	Bandung	500,	0,	0,
Farmer 5	Bandung	100,	45.500,	4.550.000,
Farmer 6	Bandung	500,	0,	0,
Farmer 7	Bandung	300,	0,	0,
Farmer 8	Bandung	1.000,	46.050,	46.050.000,
Farmer 9	Bandung	700,	0,	0,
Farmer 10	Bandung	500,	63.500,	31.750.000,
Farmer 11	Bandung	500,	45.500,	22.750.000,
Farmer 12	Bandung	400,	63.500,	25.400.000,
Farmer 12	Tasik	100,	0,	0,
Farmer 13	Bandung	300,	0,	0,
Farmer 14	Bandung	700,	45.600,	31.920.000,
Farmer 15	Bandung	700,	0,	0,
Farmer 16	Bandung	500,	53.500,	26.750.000,
Farmer 17	Bandung	300,	0,	0,
Farmer 18	Tasik	600,	0,	0,
Farmer 18	Dummy	400,	0,	0,
Farmer 19	Bandung	100,	45.500,	4.550.000,
Farmer 20	Bandung	400,	28.750,	11.500.000,
Farmer 21	Tasik	750,	0,	0,
Farmer 21	Garut	1.250,	0,	0,
Farmer 22	Jakarta	2.100,	0,	0,
Farmer 22	Bogor	1.200,	0,	0,
Farmer 22	Tasik	700,	0,	0,
Farmer 23	Bandung	300,	0,	0,
Farmer 24	Bandung	700,	0,	0,
Farmer 25	Bandung	200,	0,	0,
Farmer 26	Bandung	400,	0,	0,
Farmer 27	Bandung	600,	58.600,	35.160.000,
Farmer 28	Bandung	800,	0,	0,
Farmer 29	Jakarta	600,	0,	0,
Farmer 30	Bandung	200,	0,	0,

CONCLUSION AND SUGGESTION

Based on the results of identification of distribution in the marketing of gedong gincu mangoes in Majalengka sub-district, the distribution of gedong gincu mangoes involves 5 parties, namely farmers, collectors, dealers, retailers, and consumers which can be done with 4 marketing channels. The shortest chain is in the first channel which only involves two parties, namely farmers and

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

consumers and the longest chain is in channel IV which involves all parties. In the distribution of gedong gincu mangoes from farmers to consumers requires distribution costs. The distribution fee for each channel is different, on the fourth channel the lowest distribution fee is Rp 29,000 and the highest fee is Rp 74. 000/kg. In channel I, it does not perform cost optimization calculations because it does not make shipments out of town, for optimization in channel II it is Rp 13,950,000, channel III is Rp 249,100,000 and channel IV is Rp 250,980,000. Thus, the lowest cost is on ordinary channel II. Further research is recommended to perform optimal testing by means of a stepping stone.

REFERENCES

Ardhyani, I. W. (2017). Mengoptimalkan Biaya Distribusi Pakan Ternak Dengan Menggunakan Metode Transportasi (Studi Kasus Di PT.X Krian). Teknika: Engineering and Sains Journal Vol.1. No.2. Hal 96.

Basriati, S., Andriati, R., and Safitri, E. (2018). Penyelesaiaan Model Transshipment dengan Metode Least Cost, North West Corner, dan Vogel's Approximation Method. Seminar Nasional Teknologi Informasi, Komunikasi dan Industri(SNTIKI-10). Hal 726-727.

BPS. (2019b). Provinsi Jawa Barat Dalam Angka 2019. Bandung: Badan Pusat Statistik Provinsi Jawa Barat.

BPS. (2022). Provinsi Jawa Barat Dalam Angka 2022. Majalengka: Badan Pusat Statistik Kabupaten Majalengka.

Dimyati, T. and Dimyati A. (2015). Operation Research Model – Model Pengambilan Keputusan. Bandung: Sinar Baru Algensindo.

Dinar. (2014). Kajian Pola Kemitraan Agribisnis Mangga Gedong Gincu. Seminar Nasional Pembangunan Inklusif Di Sektor Pertanian, 73–77.

Erwansyah, K., Nugroho, N.B., and Jaya, H. (2017). Penerapan Metode Vogel's Approximation Untuk Efesiensi Biaya Pengiriman Barang Pada TIKI (Titipan Kilat). Jurnal Ilmiah SAINTIKOM Vol.16. No.3. Hal 325.

Fahmi, F. O. (2017). Penerapan Metode Stepping Stone Untuk Transportasi Pengiriman Barang Pada CV. Mitra Logistic. Majalah Ilmiah INTI Vol. 12. No.2. Hal 173-174.

Fathanah, N., Sungkawa, I., and Sunaryo, Y. (2018). Analisis Kelayakan Usahatani Pada Pemeliharaan Mangga Gedong Gincu (Mangifera Indica L.) Di Kelompok Tani Sukamulya Desa Sedong Lor Kecamatan Sedong. Jurnal Agrijati, 32(2), 76–88.

Karo, N. Br. (2016). Analisis Optimasi Distribusi Beras Bulog Di Provinsi Jawa Barat. Jurnal MIX, Vol VII, No.1.

Nirwansah, H. and Widowati. (2016). Efesiensi Biaya Distribusi Dengan Metode Transportasi. Jurusan Matematika FMIPA UNDIP Semarang. Hal 1-3.

Pranati, N. M. A., Jaya, A. I., and Sahari, A. (2018). Optimalisasi Biaya Transportasi Pendistribusian Keramik Menggunakan Model Tansportasi Metode Stepping Stone (Studi Kasus: PT. Indah Bangunan). Jurnal Ilmiah Matematika dan TerapanVol. 15 No1. Hal 49.

Ramadhani, W. and Rasmikayati, E. (2017). Dinamika Agribisnis Petani Mangga Di Kecamatan Majalengka Kabupaten Majalengka Provinsi Jawa Barat. Jurnal Ilmiah Mahasiswa Agroinfo Galuh, 4(3), 498–505.

Salim. (2023). Optimization Of Manage Fertilizer Media And Liquid Organic Fertilizer Of Lamtoro Leaves Leaves On Vanilla Seed Plant. Jurnal Penelitian Pertanian Terapan Vol. 23 (1): 47-54

Subagyo, P., Marwan, A., Handoko, and T. Hani. (2000) Dasar-Dasar Operations Research. Edisi kedua. Yogyakarta: BPFE.

Taha, H. (1996). Riset Operasi Jilid 1. Jakarta: Bina Rupa Aksara.

ISSN 2580-0566; E-ISSN 2621-9778
http://ejournal2.undip.ac.id/index.php/agrisocionomics
Vol 8 (1): 288-309, March 2024

Taufiq, A. (2017). Penerapan Metode Modified Distribution (MODI) DalamMeminimalisasi Biaya Transportasi Pengiriman Barang Di PT. Tirta Makmur Perkasa. Jurusan Matematika Fakultas Sains dan Teknologi UIN ALAUDDIN Makasar.

Yahya, Y. A. S. (2014). Solusi Optimum Model Transportasi Pada CV. Manurindo. Jurusan Matematika Fakultas Sains dan Teknologi UIN ALAUDDIN Makasar.

Wijayanto, P. (2017). Panduan Program Aplikasi QM for Windows Versi 2.0. Edisi 2. Salatiga: Fakultas Ekonomi Universitas Kristen Satya Wacana.

Ramadhani, W. and Rasmikayati, E. (2017). Dinamika Agribisnis Petani Mangga Di Kecamatan Panyingkiran Kabupaten Majalengka Provinsi Jawa Barat. Jurnal Ilmiah Mahasiswa Agroinfo Galuh, 4(3), 498–505.

Feriza, Y. and Murni, D. (2020). Optimasi Biaya Distribusi Pengiriman Beras Sejahtera pada Perum Bulog Divisi Regional Sumatera Barat dengan Kombinasi North West Corner Method (NWCM) dan Stepping Stone Method (SSM). 3(1), 95–100.

Murgani, R. (2019). Optimasi Biaya Pengiriman Buah Kelapa Sawit. Jurnal Optimasi Teknik Industri, 1(2), 35–41.

Nugraha, E. and R. M. Sari. (2019). Efektifitas Biaya Pengiriman pada Perusahaan Roti dengan Menggunakan Metode Transportasi. Jurnal Competitive, 14(2), 21 – 26.