# Exploration of Cultivation Systems and Marketing Channels in order to Increase Arabic Coffee Farmers' Income in West Java


## ABSTRACT

Coffee is a product that continues to be in demand by the public. Indonesia is one of the coffee-producing countries, with production in 2020 amounting to 744,000 tons. Arabica coffee is the most popular type of coffee. The area of Arabica coffee plantations in West Java reaches 27,757 ha. To find out the optimization strategy for coffee production, it is necessary to conduct an exploratory study related to the cultivation system and marketing channels for Arabica coffee in West Bandung Regency. The research method uses a survey with path analysis. The variables observed were the cultivation system used, the marketing channels used and the performance results of Arabica coffee farmers. The results showed that the variable cultivation system and marketing channels affect the productivity and profits of farmers with the equation Y = 0.417 X1 + 0.465 X2 + €. Partially, the cultivation system and marketing channels have an effect on performance, while correlation analysis shows that there is no correlation between the cultivation system and marketing channels. The strategy conveyed was the improvement of the cultivation system, namely the provision of fertilizers or hormones that stimulate flowering, the use of protective trees, the processing of coffee beans and market information. The suggestion is that there is a need for government involvement in coffee management from upstream to downstream.



*Keywords: arabica coffee cultivation system, marketing channels, productivity*


## 1. INTRODUCTION

The main producer of world coffee in 2020 ii Brazil with a total production of 4,140,000 tons or 39 percent of the total world coffee production.Meanwhile, coffee production from other countries, namely Vietnam, amounted to 1,740,000 tons (17 percent), Colombia at 858,000 tons (8 percent), Indonesia at 744,000 tons (7 percent), andEthiopia at 442,500 tons (4 percent), Honduras at 366,000 tons.(4 percent), India 342,000 tons (3 percent), Uganda 337,000 tons (3 percent), Mexico 240,000 tons (2 percent), Peru 228,000 tons (2 percent) At the global level coffee is one of the most influential export cropswith positive and significant impact on economic growth and on Gross Domestic Product (GDP) for most producing countries, in particular, developing and least developed countries (Al-Abdulkader et al., 2018).

The world's largest coffee consumption is the European Union 2,415,060 or 24 percent of the world's total coffee consumption, United States 1,618,920 (16 percent), Brazil 1,344,000 (14 percent), Japan 443,160 tons (5 percent), Indonesia 300,000 tons (3 percent), Russia 280,680 tons (3 percent), Canada 240,660

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tons (2 percent) and Ethiopia 227,800 tons (2 percent).While coffee consumption in exporting countries is Brazil 1,344,000 tons or 52 percent of the total consumption of exporting countries, Indonesia 300,000 tons (11 percent), Ethiopia 227,880 tons (9 percent), Philippines 198,720 tons (8 percent), Vietnam 162,000 tons (6 percent), Mexico 145,200 tons (6 percent), Colombia 122,700 tons (5 percent), India 89,100 tons (3 percent), thus coffee cultivation is still a great opportunity in its development.

The area of coffee plantations in Indonesia in 2021 is 1,249,615 ha, while in West Java an area of 46,125 ha consists of Arabica and Robusta coffee plantations. West Java province has an area of coffee reaching 46,125 ha consisting of 27,757 ha of Arabica coffee and 18,368 ha of Robusta coffee, with a production of 11,253 tons and 9,616 tons, respectively. This production potential can still be improved by improving cultivation systems and marketing channels in coffee sales that have an impact on increasing the income of coffee farmers.

Indonesia's coffee production in 2020 reached 753,491 tons from an area of 1.2 million hectares of land, Indonesian coffee production consisted of 72 percent robusta, 27 percent arabica and 1 percent liberika. Export volume in 2020 reached 379,354 tons with a value of USD 821,937,000, this can still be increased which has an impact on increasing the device.The result value shows that RSCA (Revealed Symmetric Comparative Advantage) Indonesia is 0.87, where RSCA > 0. This shows that Indonesia still has competitiveness, although it is lower than Brazil0.95, Colombia, 0.96, and Guatemala, 0.97, and Indonesia are still superior to Vietnam equivalent. 0,79(Fatimah et al., 2021).

The challenges faced today are that human resources and coffee institutions in Indonesia are still weak which can be overcome by increasing the capabilities and capacity of farmers through technical guidance and training. The condition of many old / damaged plants,and low productivity efforts to overcome with the use of superior seeds and GAP. The problem with financing is limited access to financing and financing regulations that have not been supported. Market access and promotion the problem is tariff and non-tariff barriers, efforts to overcome them with promotion, standardization of product quality/branding, supply chain/ marketing, distribution and logistics.

Based on the description, it can be researched how the cultivation system and coffee marketing channels in West Java, and how the proposed strategies should be implemented in order to increase the production and income of coffee farmers.

## 2. RESEARCH METHODS

This research was conducted in Bandung Regency, West Java, Indonesia, with a survey approach, taking random sampling with a rate of 10%, obtained 60 coffee farmers as respondents in this study.The research instrument is a questionnaire with operational variables of theArabica coffee cultivation system and marketing channels currently used, so that it is known its influence on the income of coffee farmers and the strategies proposed for its development.The next process is an interview and distributing questionnaires directly with farmers who are respondents.The analytical method used is path analysis, either one-way model path or one-way path analysis.Together (simultaneously) using the F test and partially using the t-test.

## 3. RESULT AND DISCUSSIONS

### 3.1. Arabica coffee cultivation system

#### 3.1.1 Land preparation

There are starts from activities: land clearing, production road making, and terracing manufacturing. Furthermore, land processing includes a series of sequential and integrated activities, namely: the deed of planting holes made 3 months before planting.Hole size 50 x 50 x 50 cm, 60 x 60 x 60 cm, 75 x 75 x 75 cm or 1 x 1 x 1 m for heavy soil and holes left open for 3 months.When entering 2-3 weeks will be planted, the planting hole is given manure as much as 15-20 gr/ hole.The planting distance system for arabica coffee include: quadrangle : 2.5 x 2.5 m, fence : 1.5 x 1.5 m, double fence : 1.5 x 1.5 x 3 cm. The survey results related to processing are as follows:

**Figure 1. Process in land preparation**

Overall achievement in land preparation is 74.44% of the good criteria. The results showed the number of farmers who carried out land clearing first before planting as much as 73.75%, who made production roads as much as 74.17% and who made terracing first was 75.42%. From this, it can be said that almost 25% of farmers do not do this, the impact of which will affect the production and quality of coffee produced .For optimal growth of soil retention properties, atmospheric moisture and cloud cover, as well as optimal cultivation practices, the annual rainfall range is 1200-1800 mm for arabica coffee(Henson, 2011).

### 3.1.2 Planting of protective trees

The types of protective trees planted in the area are lamtoro (*Leucaena leucocephala*) , dadap (*Erythrina variegate*) , and sengon ( *Paraserianthesfalcataria*) , which the wood takes after old enough. Protective plants are needed so that coffee plants are protected from the scorching sun directly that effectsrespiration and evaporation, and withstand continuous soil erosion. There are a variety of reasons for planting a protective tree, the results showed :

**Figure 2. Planting of protective trees**

Overall the achievement of planting protective trees is 73.75% entering the good criteria. The results of the study showed that they have not utilized the protective tree optimally in terms of the benefits and types of protective trees used. The protective tree used is a type of tree that is productive and fixed so that it can be more efficient and increase farmers' income.Fruits, firewood and wood produce, can be planted as protective treesthe are more economically viable more environmentally sustainable.(Imru et al., 2015).

### 3.1.3 Selection of coffee seeds

Certified coffee seeds have seed requirements: age 8-12 months, height 20-40 cm, theminimum number of leaves of old leaves 5-7 sheets, number of primary branches 1, and diameter stem 5-6 cm. The need for seedlings per hectare is 6,400 plants, with a planting distance of 1.25 m X 1.25 m, the results of research on the utilization of seedlings are as follows :

**Figure 3. Seed cultivation**

The overall average yield of seed maintenance is 71.0% which falls into the good criteria, which shows that 71% of farmers make their own seedlings. Plant seedlings play an important role in cultivation, and maintenance when seedlings affect the readiness of seedlings planted in the field or in the garden.

### 3.1.4 Coffee seed planting

The planting of coffee seedlings needs to be arranged so that the growth of coffee trees is optimal. In general, the stage of planting coffee biit is the creation of planting holes 60cm x 60 cm x 40 cm in atrapezium shape, seedlings are planted after the protective tree can pass on light 30-50% of direct light, the root mount has reached 2-3 cm, embroidery is done during the rainy season, to maintain the survival of coffee seedlings  Research results show:

**Figure 4. Planting seeds**

Overall, the achievement of the dimension value of seed planting is 71.56% which is included in the good criteria, and is done by farmers. Farmers use self-rejuvenated seedlings, and are used for embroidery. To impove the life rate of seedlings can be used ready-to-plant seeds that have been 6 months old.

### 3.1.5 Fertilization

Fertilization is the part of cultivation that determines the growth rate and production of plants. The type and way and time of fertilization affect the growth stages of the coffee tree, therefore this stage needs to be analyzed. The results of the fertilization dimension research are as follows:

**Figure 5. Fertilizer dimension**

Overall the value of the achievement dimension of fertilization of plants is 71.56 percent, which means that the implementation of organic fertilizer delivery, inorganic fertilizer delivery, fertilization time and fertilization methods have been done asgood criteria Conventional farmers need information for cultivation and entrepreneurial development opportunities that can be done in order to increase production and income (Etriya et al., 2019)

### 3.1.6 Pruning

Pruning on coffee trees is one of the efforts to reduce vegetative growth and stimulate generative growth, a type of pruning that is pruning forms, pruning production and pruning rejuvenation of rejuvenation. The overall results of the study are as follows:

**Figure 6. Pruning on coffee trees**

Overall the achievement value of the implementation of the cut is 72.08% which belongs to the good criteria. Pruning is essential to stimulate the vegetative and generative growth of the coffee tree, reducing ~~of~~less efficient leaves.

### 3.1.7 Plant pest control

The distribution of plants with pest control of plant diseases is carried out so that plants are not attacked by pests. The results of research on the implementation of pest control of plant diseases are as follows :

**Figure 7. Frequency of plant pest control**

Overall the implementation of plant disease pest control reached 71.25%.Biodiversity control strategies can be implemented together by using Coffee Leaf Rust as an optimal controller(Djuikem et al., 2021), pest control of diseases is carried out so that coffee beans are not maimed by pathogenic and insect attacks(Henson, 2011)

### 3.1.8 Diversification of efforts to increase the income of coffee farmers

Deversification is one way that is done to earn additional income by utilizing land between coffee plants. Plants between coffee plants aim at marginal land use among coffee plants, the overall research results are as follows :

**Figure 8. Plant diversification**

Overall, the value of marginal land use is 70.63% including the good criteria. Knowledge gaps related to the lack of study of ecosystem services and environmental variables related to agricultural intensification.(De Beenhouwer et al., 2013).

### 3.1.9 Post harvest handling

The application of harvest and post-harvest technology in the arabica coffee farming business includes determining the harvest time that has matured red color and post-harvest handling is drying coffee fruit. The results of the overall interview application of harvest and post-harvest are as follows:

**Figure 9. Post harvest handling**

Overall the value of the ability of harvest and post-harvest implementation is 72.29% which includes good criteria.
Harvest and post-harvest determine the quality of coffee beans produced after roasting. For export needs, the quality of coffee is very decisive because each importing country has the required quality. When harvesting is selected that ripe red, has an impact on the quality of the drink(Henson, 2011). The next stage is washing, and stripping coffee beans which can be done with a machine (Mawardi et al., 2019).Primary coffee processing, with all the environmental impacts that come with it, occurs at the end of the producer, it is necessary to think about the waste of coffee processing pollution (Asioli et al., 2016). Coffee husks are low-cost residues(De Oliveira et al., 2013)
The results of the exploration of dementia implementation of coffee plant cultivation are carried out as follows :

**Figure 10. Inplementation of coffee cultivation**

Overall the durable value was 72.26 % which belonged to the good category. The use of superior seedlings, which are disease resistant, fertilization, pruning, shade trees and eradication of disease pests

is a condition for coffee growth in addition to climate and soil conditions.(Siahaan, 2018). Coffee cultivation determines the caffeine content and 5-CQA (5-caffeoylquinic acid) in raw coffee beans and roasted coffee beans decreases as the height of the growing place for all varieties, the highest concentrations of caffeine content and 5-CQA are recorded in low-lying coffee beans.(Girma et al., 2020). Coffee productivity is influenced by the adoption of intercrops and protective trees with coffee, planting density, access to irrigation facilities, farmer coffee cultivation experience, ownership of transportation vehicles and participation in training programs related to coffee production and marketing having a positive and significant relationship.(Prasad et al., 2019)

*a. Arabica Coffee Marketing Channels*

Marketing channels are the marketing links carried out in the sale of coffee, the selected marketing channels are done so that marketing does not stop so that wet or dried coffee fruit can be sold immediately. The marketing channel carried out in thearabica coffee business is a partnership, through influencers, involving employees and keeping customers to keep buying coffee in their place. The study found highly endogenous and interrelated non-linear subsystemsincludimg the structure of online/offline retail channels, the structure of retail/wholesale channels, the ratio of import to consumption and the competitive dynamics of the economic system. (Dost, 2015).

Marketing channels through partner cooperation with cooperatives show that member education levels, payment systems, average coffee prices, input access, proximity and access to financial services and counseling to cooperative members as the main determinants of coffee marketing channel choice(Fon et al., 2019).
The overall research results of the choice of marketing channels used are as follows:

**Figure 11. The choice of marketing channels**

The selection of marketing channels through partnerships was 79.37%, who chose through working with influencers by 71.46%, who chose marketing channels through involving their own employees to sell as much as 64.17% and who chose marketing channels by keeping customers was 67.29%. Marketing is a crucial issue. In coffee marketing, attributes have real influence, clarity of quality, labels and brands(Asioli et al., 2016). In Brazil, Arabikacoffee (Coffea arabica L.), rioysh, rio dan rio zona classified according to cup quality into seven categories, namely very soft, soft, hardly soft, hard, rioysh, rio and rio zones(Craig et al., 2018). With regard to coffee marketing channels, it is necessary that this general policy is supported by technical policies, namely coffee development, human resource improvement, partnership and institutional development, increased business investment and management information system development(Martauli, 2018).

*b. Performance of arabica coffee farming business*

The results of coffee farming business performance are seen in productivity, profit levels, competitive advantages and market expansion. The overall results of the study can be described in the graph below :

**Figure 12. Coffee farming performance**

Overall the performance of agricultural businesses has a 63.85% level of ability which belongs to the category of enough. This still needs to be improved especially on competitive advantage and market expansion. Competitive advantage is done by improving the quality of coffee produced and the quality of coffee after being cut and ready to be consumed. One of the offers is to give the aroma and taste that is typical of Indonesian coffee so that it has an impact on increasing and expanding coffee exports.

**Table 1. Productivity and Acceptance of Arabica Coffee Business Growing Season 2021**

| No. | Description | Average | |
|---|---|---|---|
| | | **Per area = 0,90 ha** | **Per ha** |
| 1. | Produk (kg) | 2,790 | 3,155 |
| 2. | Price (Rp/kg) | 9,000 | |
| 3. | Revenue (Rp) | **25,557,955** | **28,397,727** |

This total production is already high, which is per ha as much as 3,155 kg, what needs to be done is the improvement of post-harvest handling so that the quality of coffee meets the export level. The process of processing determines the results of the processing according to the quality desired by consumers,

**Table 2. Arabica Coffee Business Income growing season 2021**

| No. | Description | Total | |
|---|---|---|---|
| | | **Per 0.90 ha (Rp)** | **Per hectare (Rp)** |
| 1. | Revenue | 25,557,955 | 28,397,727 |
| 2. | Total cost | 11,874,007 | 13,193,341 |
| 3. | Income | 13,683,948 | 15,204,386 |
| 4 | R/C | 2.18 | |

In Bengkulu Province, coffee productivity of 740.67 kg / ha / year with a downward trend, this productivity is still below the optimal average potential that can reach 2 tons / ha.(Dewi et al., 2021).In Karo Regency, cultivating coffee is a modern farmer who applies practical culture well producing up to 1,757.5 kg / ha, semi-modern system 763.5 kg / ha, and the traditional system only 519.8 kg/ha(Dahang & Quality, 2020).

c. *Relationship of the level of implementation of cultivation techniques, marketing channels and business performance of arabica coffee farmers*

To analyze ofthe relationships to the three variables above is done by analysis of one-way model path or one way path analysis, simultaneously or partially. Simultaneously using the F test and partially using the t test.

*1) Simultaneous influence*

The results of the F test on the influence of cultivation techniques and marketing channels on the performance of farmers simultaneously obtained equation Y = 0.417 X1 + 0.465 X2 + €
This means that each increase of one unit of arabica coffee cultivation technique will provide the additional performance of 0.417 units while each addition of one unit of marketing channel will increase performance by 0.465 units, from this it is seen that the factor of cultivation techniques and marketing channel factors affect the performance of arabica coffee farming business. The results of the analysis $R^2$ = 0.566 which means there are other factors that affect the performance of arabica coffee farming business that has not been studied. Related to this study some factors that can still be studied are post-harvest handling so that it is sold in the form of coffee beans, market information, and government assistance in helping the marketing of processed coffee. Practical agricultural precision can maximize the potential of each region, make crops more productive and support cost reductions.(Santana et al., 2021)

*2) Partially the results of the analysis using the t test are as follows :*

**Table 3. Results of Analysis on path coefficients X and P against Y partially**

| No | Path coefficient | $t_{Count}$ | $t_{Tabel}$ | Sig | Conclusion |
|---|---|---|---|---|---|
| 1 | pyx = 0,417 | 4,262 | 1,96 | ..000 | Ho accepted |
| 2 | pyp = 0,465 | 4,746 | 1,96 | .000 | Ho rejected |

From the table above it can be said that cultivation techniques affect the performance of arabica coffee farming business, while marketing channels have no effect on the performance of arabica coffee farming business, this happens because marketing channels still use local channels so that sales are reviewed in terms of price and demand has not promised to increase coffee production. Diversification of Indonesian coffee products from green bean to coffee extract according to the needs of the destination country, the top three destination countries for Indonesian coffee extract, namely the Philippines, China and Lebanon(Sahat et al., 2018). The price of coffee exports is negatively related to the number of Indonesian coffee exports with the elasticity of export supply to export prices of 2.04, this means that at a time when export prices increase the quantity of Indonesian coffee exports decreases. This situation is caused because the quality of Indonesian coffee is still low so ~~tha~~t it does not meet the quality demanded by foreign consumers. (Widayanti, sri ; Kiptiyah, 2009)

*3) Correlation relationship*

The results of the correlation analysis between coffee cultivation techniques and coffee marketing channels are as follows:

**Table 4. Correlation Between Free Variables X and P**

| | | X | P |
|---|---|---|---|
| X | Pearson Correlation | 1 | .455** |
| | Sig. (2-tailed) | | ,000 |
| | N | 60 | 60 |
| P | Pearson Correlation | .455** | 1 |
| | Sig. (2-tailed) | ,000 | |
| | N | 60 | 60 |

| | | | |
|---|---|---|---|
| | | | |

Obtained F count = 0.455 which is greater than F table = 0.207, then reject H0 or accept H1. Conclusion: There is a real relationship between arabica coffee farming techniques and marketing channels, the better the cultivation, the better the distribution channel.

*4) Proposed strategy*

Based on the results of observation and analysis of data, recomendationsthat can be proposed :

a) Improve the cultivation system by adding fertilizers or hormones that stimulate flowering to generative growth
b) Land use between coffee trees with protective plants as well as income enhancers are towering plants and followed by vines in protective trees.
c) Coaching the processing of coffee fruit into coffee beans that are ready to be consumed with various aroma and flavor variants that improve the quality of coffee beans.
d) Market information and proper marketing strategies, so that farmers continuously sell coffee bean products to profitable markets
e) Government policies that favor farmers related to the construction and access to sales markets.

The development of science in precision coffee cultivation contributed to the advancement of the development and implementation of new management systems providing valuable information for farmers, policymakers, and researchers.(Santana et al., 2021). Recommended to the government to increase domestic coffee production by increasing land productivity, the use of superior varieties, strengthening institutional farmers, and improving domestic coffee price policies(Agribisnis et al., 2021).Efforts that can be taken in order to improve the competitiveness of Indonesian coffee are to increase productivity and quality based on certain coffee peculiarities, Indonesian coffee(Jamil, 2019).
Indonesia has the potential to expand the coffee trade to destination countries in the future because Indonesia's coffee trade in the destination country is still under trade. The policy implication is that Indonesia should increase market share by prioritizing exporting coffee to Egypt and Algeria because both countries have high real GDP/capita growth and Indonesia's coffee trade in Egypt and Algeria is still under trade.(Meiri et al., 2014)

## 4. CONCLUSION

Based on the results of the study can be concluded as follows:

1) Cultivation systems and marketing channels used in arabica coffee farming businesses have an effect of 0.556 on productivity, profit and expansion of the arabica coffee business market.
2) The cultivation system carried out affects the performance of the agricultural business, while the marketing channel has no effect on the performance of arabica coffee farming business.
3) There is a relationship between the cultivation system and the marketing channels of arabica coffee farming business.

## 5. SUGGESTION

1) It is necessary to conduct coaching on coffee farmers related to the improvement of the cultivation system so that optimal production will be achieved.Coaching can be done in the form of extension.
2) Government policies need to help marketing channels that are part of marketing strategies to be more developed and promising
3) It is necessary to build coffee fruit processing so that it can add value and increase the income of arabica coffee farmers.

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