



## Prospects of Avocado Cultivation in Lebong Regency

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**Keywords:** *Avocado, cultivation, feasibility analysis*

**Abstract:** *Avocados have significant potential to be developed as a leading commodity. A feasibility analysis is an important approach in evaluating the prospects of avocado farming. This study aims to analyze the prospects of avocado cultivation from a business feasibility perspective as well as from the aspect of nutritional content. The analytical methods used to evaluate the business prospects of avocado cultivation include cost analysis, revenue analysis, and the R/C ratio. The analysis of avocado prospects from a nutritional content aspect is conducted through a literature review. From a nutritional standpoint, avocados have excellent content, being rich in healthy fats, fiber, vitamins, and minerals; they also serve as antioxidants and sources of folic acid. Avocados are considered to have various advantages, including high market value, diverse varieties, availability of land and technological resources, and potential market absorption in both fresh and processed forms domestically and internationally.*

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## Introduction

Agriculture is a vital sector in a country's economy. In Indonesia, the agricultural sector significantly contributes to the Gross Domestic Product (GDP) and employment (Septiadi & Joka, 2019). Fruits are a type of horticultural crop with high economic value (Ulfa, 2019). In recent years, avocados (*Persea americana*) have become increasingly popular among farmers and investors in Indonesia. Avocados are nutritionally rich fruits with growing demand both in local and international markets (Directorate General of Horticulture, Ministry of Agriculture, 2022).

The avocado, scientifically known as *Persea americana*, is native to the tropical regions of the Americas. It originally comes from Mexico and Central America, likely from several different wild species. Early records by Spanish explorers noted that avocados were cultivated from Mexico to Peru, though they were not found in the West Indies at that time. The spread of avocados included Jamaica around 1650 and southern Spain in 1601. In Africa, the first report of avocados was from Zanzibar in 1892. In the United States, avocados were first recorded in Florida in 1833 and in California in 1856. In India, the plant was introduced in the early nineteenth century.

Avocados are known as one of the most nutritious fruits. Their flesh is rich in protein (up to

4%) and fat (up to 30%), yet low in carbohydrates. The fat composition is similar to olive oil, making avocados often used in cosmetic products. Avocados also have the highest energy value (245 calories/100 g) compared to other fruits and are a source of several essential vitamins and minerals.

This fruit is rich in copper and iron, essential minerals for antioxidant enzymes. The high potassium content in avocados also makes them beneficial for maintaining blood pressure due to their high monounsaturated fat content. All amino acids required by the body can also be found in avocados. Avocados have been shown to help maintain good cholesterol levels and lower bad cholesterol.

Avocados are commonly consumed fresh, used as fillings in sandwiches or salads. They can also be used in making ice cream and milkshakes, and their pulp can be preserved by freezing. Several antifungal compounds have been isolated from extracts of unripe avocado peels. Nutritionally, avocados have a high protein content, with caloric values ranging from 1500 to 2250 calories per kilogram. According to our food analysis, the protein content in avocados is three times that of apples, nearly the same as local plantains, and slightly less than olives.

**Table 1. Chemical Composition of Avocado Fruit (per 100g Edible Portion)**

Nutrients	Quantity	Nutrients	Quantity
Protein	1.7 g	Calcium	10.00 mg
Fat	26.4 g	Chlorine	11.00 mg
Total carbohydrates	5.1 g	Copper	0.45 mg
Crude fibre	1.8 g	Iron	0.60 mg
Vitamin A as carotene	0.17 mg	Magnesium	35.00 mg
Ascorbic acid	16.00 mg	Manganese	4.21 mg
Niacin	1.10 mg	Phosphorus	38.00 mg
Riboflavin	0.13 mg	Sodium	368.00 mg
Thiamine	0.06 mg	Sulphur	28.50 mg

Source: Madhav Rao and Abdul Khader, 1977

Avocados require specific growing conditions, including a minimum annual rainfall of 750 – 1000 mm, light requirements for growth ranging from 40% to 80%, and an optimal temperature range of 12.8 – 28.3°C. Avocado plants thrive best in clay loam, sandy loam, and alluvial loam soils with a slightly acidic to neutral pH (5.6 – 6.4). Avocados are suitable for planting in drylands and can grow in lowland to highland areas, ranging from 5 to 1500 meters above sea level. Avocado trees can continue to produce fruit for around 25 years, as they are classified as perennial plants (Rahmawati, 2010).

Avocado varieties have three ancestral races based on their ecological characteristics: the Mexican race, weighing 100g – 225g; the Guatemalan race, weighing 200g – 2300g; and the West Indian race, weighing 400g – 2300g. In Indonesia, avocados are classified into two groups: the superior varieties, which include long green avocados and round green avocados, and other varieties, such as long red avocados, round red avocados, Mega Murapi avocados, Mega Peninggahan avocados, Mega Gagauan avocados, and hybrids of the three other groups (Sadwiyanti et al., 2009).

Avocado cultivation involves several techniques, starting from seedling preparation, planting, maintenance, and harvesting. The first technique is seedling preparation. Good avocado seedlings come from sufficiently mature fruits that have not fallen and cracked, and the seeds should come from more than one type. Avocado seedlings can be obtained through generative and vegetative methods, but vegetative seedlings bear fruit faster ( $\pm 4$  years) and the fruit retains the characteristics of the parent plant (Rahmawati, 2010).

Avocado planting techniques include a planting pattern that combines different varieties to aid in pollination, making planting holes, and planting seedlings (Rahmawati, 2010). The best time for planting avocados is at the beginning of the rainy season to facilitate irrigation. The soil used for planting holes should be higher than the surrounding ground to prevent waterlogging during rainfall (Rivaldi, 2013).

Maintenance techniques include weeding, soil loosening, watering, pruning, pest and disease control, and fertilization (Rahmawati, 2010). Common pests and diseases affecting avocados include leaf pests like caterpillars and red mites, fruit pests like fruit flies and bats, and branch pests like powder beetles. Diseases include fungal infections such as leaf spots, root and fruit rot, stem cankers, and anthracnose (Rivaldi, 2013).

Avocado harvesting in Indonesia can occur monthly, with peak harvest times varying by region but generally occurring during the rainy season. Avocados can be harvested at 6 – 7 months old when the skin color darkens, the seed shakes inside, and it produces a clear sound when tapped. During harvest, the fruit should be picked with a short stem (3 – 5 cm) to prevent bruising. A well-growing and fruiting tree yields an average of 70-80 kg/tree/year (Ardiansyah, 2010). Post-harvest handling includes washing, sorting by quality, ripening within seven days after picking, packaging, and transporting (Rahmawati, 2010).

Avocados have significant potential to be developed as a leading commodity. Several factors support the prospects of avocado farming, including increasing market demand, stable prices, and high export demand. Additionally, avocados have a longer lifecycle compared to some other crops, offering long-term income potential for farmers.

The success of avocado farming is influenced by various factors, including economic aspects. Feasibility analysis is an important approach in evaluating the prospects of avocado farming. Through economic feasibility analysis, farmers and investors can gain a better understanding of the financial aspects of avocado farming. This analysis involves assessing various factors, such as production costs, expected revenue, and business viability. In this context, this study aims to analyze the prospects of avocado cultivation from the perspective of business feasibility as well as nutritional content. By analyzing the key aspects that influence the success of avocado farming, this research is expected to provide valuable insights for farmers and investors in making decisions related to the development of avocado farming.

## **Research Methods**

This study employs a descriptive-quantitative approach. Avocado farmers in Pringgasela Subdistrict, East Lombok Regency, serve as the unit of analysis for this research. Data collection was conducted using direct interview techniques with a list of questions. Fourteen farmers from Topos Subdistrict, Lebong Regency, and Padang Ulak Tanding Subdistrict, Rejang Lebong Regency, were selected as respondents using Slovin's formula. Simple random sampling was used to choose the

respondents.

The analytical methods used to analyze the business prospects of avocado cultivation include cost analysis, revenue analysis, and the R/C ratio. According to Ibrahim et al. (2021), total costs comprise all expenses, including fixed and variable costs, incurred to produce output. The formula for calculating the total production cost of avocado farming is:

$$TC = FC + VC$$

where:

- TC = Total cost (Rp)
- FC = Fixed cost (Rp)
- VC = Variable cost (Rp)

The total revenue received by farmers from selling the avocados they produce is termed total revenue (Wulandari, Tajidan, & Septiadi, 2022). The formula for total revenue is as follows:

$$TR = Q \times P$$

where:

- TR = Total revenue (Rp)
- Q = Quantity of avocados produced (Kg)
- P = Price (Rp)

Income is the difference between total revenue and total cost in the production process. The avocado farmers' income can be mathematically formulated as follows (Septiadi & Nursan, 2021):

$$I = TR - TC$$

where:

- I = Income from avocado farming (Rp)
- TR = Total revenue (Rp)
- TC = Total cost (Rp)

The feasibility analysis of avocado cultivation is conducted using the R/C ratio formula as follows (Septiadi, Rosmilawati, Usman, & Hidayati, 2021):

$$R/C \text{ ratio} = \frac{TR}{TC}$$

where:

- TR = Total revenue (Rp)
- TC = Total cost (Rp)

The analysis of avocados from a nutritional content perspective was conducted using a literature

review.

## **Discussion**

### **A. General Overview of Avocado Farming in Topos District, Lebong Regency**

Avocados originate from Central America, which has a tropical climate, and they are now grown in almost all subtropical and tropical countries, including Indonesia. Everyone recognizes avocados for their high nutritional content. Avocado seeds contain a lot of protein, similar to the flesh of the fruit (Mill, 2010).

If avocado trees are planted from seeds, they will begin to bear fruit after approximately ten to fifteen years. If avocado plants are cultivated using vegetative methods, they generally start bearing fruit after around five to eight years, depending on the maintenance provided. The fruit can typically be harvested six to seven months after flowering. Farmers in Pringgasela District intercrop avocado plants with other crops such as tomatoes and chili peppers because avocados take relatively long from flowering to harvest. Additionally, many farmers engage in side jobs such as raising livestock while waiting for their avocado plants to harvest.

The techniques for avocado cultivation are as follows (Farida, 2010):

#### **1. Land Preparation/Preparation of the Land**

The land must be cleared of shrubs and residual roots from previous plants before planting avocado seedlings. Planting holes are made with a depth of 70 cm and a width of 70x70 cm. For about two weeks, these holes are left open. When digging, the top and bottom soil are separated. The topsoil is mixed with 25 kilograms of manure. Next, the planting hole is refilled with soil and marked with a stake to ensure proper planting position. Land preparation should be carried out during the dry season to plant avocado seedlings at the beginning of the rainy season.

#### **2. Planting**

All respondent farmers plant seedlings simply by making a hole and then planting one seedling per hole at a distance of 5-7 meters. Farmers usually use vegetative seedlings, which are grafted and attached to old pruned stems. The seedlings used should be healthy, with thick, full leaves, and free from pests and diseases to ensure optimal growth.

#### **3. Fertilization**

On average, respondent farmers use manure for fertilization. All respondent farmers fertilize avocado plants once a year.

#### **4. Harvesting**

All respondent farmers hire others for the harvesting and selling of avocado production. The harvesting process is sometimes carried out directly by buyers (contractors) who harvest the avocados themselves at a price agreed upon by the farmers as producers and the buyers as consumers.

### **B. Prospects of Avocado Cultivation in Topos District, Lebong Regency**

#### **1. Cost Analysis of Avocado Cultivation**

Based on cost analysis, the total production cost is IDR 187,478,000 per hectare up to around three years of age, with the average variable cost incurred by farmers for avocado cultivation activities amounting to IDR 96,346,000 per hectare for the first year. The variable costs in this study include labor wages and the cost of agricultural inputs, which consist of seedling purchases and basic fertilizers. According to field findings, all avocado farmers use both organic and non-organic fertilizers in their cultivation activities. These costs also cover equipment depreciation, land tax, and land rental.

The cost analysis results show that the largest expenditure is for land rental and seedling purchases, contributing up to 53.63% of the total production costs of avocado farming. The contributions of labor wages and agricultural inputs are relatively small, at 11.02% and 4.14% of the total production costs, respectively. This result is due to the lack of serious avocado cultivation activities at the research location, where most farmers are not diligent in maintenance, such as infrequent fertilization and pesticide application, resulting in land rental being the largest expenditure. Farmers primarily perform leaf pruning as their main maintenance activity, so maintenance costs are relatively low.

Another interesting finding is the contribution of labor wages, amounting to IDR 18,871,000 per hectare. This value is relatively small, considering it is for a one-hectare plot of land. Based on the HKO (workday) analysis, labor absorption is 4.56 HKO per hectare per planting season. This further clarifies that avocado cultivation activities at the research location are not managed seriously, given the very low labor absorption.

The average total revenue from avocado farming in the first harvest year at three years after planting is IDR 50,000,000 per hectare, IDR 110,000,000 in the second year, and stabilizes at IDR 127,000,000 per hectare per season in the third year. These results align with research by Tamalia (2017), which reveals that avocado farming income per planting season is IDR 76,396,666 per hectare per season. Similar results are also reported by Andajani and Rahardjo (2020), concluding that avocado farmers' income in one planting season is IDR 39,624,550 per hectare.

## 2. Growth Requirements for Avocado Plants in Indonesia

Avocado (*Persea americana*) has become an important commodity in Indonesia, both for the domestic and export markets. To ensure optimal growth, certain environmental conditions must be met. By understanding these requirements, farmers can improve harvest yields and avocado fruit quality. The following are the growth requirements for avocado plants in Indonesia:

### a. Climate

Avocado plants require a warm climate with sufficient rainfall. In Indonesia, they grow well in tropical and subtropical climates, such as in Java, Bali, Sumatra, and Sulawesi. The optimal temperature for avocado growth ranges between 20°C and 30°C.

### b. Soil

The ideal soil for avocado plants is fertile, loose, and well-drained. Sandy soil with good drainage will reduce the risk of root rot. Avocado plants also need a soil pH between 5.5 and 7.0 for optimal growth.

### c. Lighting

Avocados require direct sunlight for good growth. Therefore, they should be planted in locations

that receive full sun exposure. Adequate lighting helps in the photosynthesis process and the formation of good quality fruit.

d. Altitude

Although avocados can grow in both lowland and highland areas, they prefer altitudes between 400 and 1,200 meters above sea level. In higher areas, avocado plants tend to grow slower but produce higher quality fruit.

e. **Irrigation**

Adequate water supply is crucial for the growth of avocado plants, especially during the fruit formation period. Regular irrigation helps maintain soil moisture and prevents drought. However, it is important not to overwater, as this can cause root rot.

### **3. Methods for Cultivating Avocado Plants**

Avocado cultivation (*Persea americana*) in Indonesia offers promising opportunities for farmers due to the increasing demand in both domestic and international markets. Here is a complete guide on how to cultivate avocado plants in Indonesia:

a. Seedling Selection

Choose healthy and high-quality avocado seedlings from reputable sellers. Select varieties that match the climate and altitude conditions of your cultivation area.

b. Land Preparation

1. Select land with good drainage that is free from standing water.
2. Perform thorough soil preparation, including fertilization and the addition of organic matter to improve soil fertility.

c. Planting

1. Plant during the rainy season or early dry season to minimize the risk of drought.
2. Space the plants about 8-10 meters apart for large varieties and 5-6 meters for smaller varieties.
3. Provide supports such as bamboo stakes for young plants to prevent wind damage.

d. Plant Maintenance

1. Prune regularly to maintain plant shape and improve air circulation.
2. Fertilize regularly with the correct dosage according to plant and soil conditions.
3. Arrange regular irrigation, especially during the dry season, to maintain optimal soil moisture.

e. Pest and Disease Control

1. Regularly monitor plants for signs of pest or disease attacks.
2. Apply integrated pest and disease control, including the use of organic insecticides and fungicides if needed.

f. Harvest and Post-Harvest

1. Harvest carefully by selecting optimally ripe fruits.
2. After harvesting, store avocados at the appropriate temperature and avoid excessive stacking or pressure to prevent damage.

#### 4. Popular Avocado Varieties in Indonesia

There are various types of avocados worldwide, and several are popular for independent cultivation in Indonesia. Avocados belong to the Lauraceae family and originate from the highlands and lowlands of Central America.

According to a scientific article by Lestari et al. (2016), the native habitat of avocados is typically moist areas, such as tropical forests in highlands with cool conditions. In 1750, avocados were first introduced to Indonesia by Spanish traders and later spread and became widely cultivated.

Avocados can be used for various purposes, from food such as healthy salads, juice, ice cream, cosmetics, to medicines. The flesh, which accounts for 65-75% of the fruit, contains several nutrients, including:

- 65-86 grams of water,
- 104 grams of protein,
- 5.80-23 grams of fat,
- 0.8 - 1 gram of iron,
- 75-135 IU of vitamin A,
- 1.5 - 3.2 mg of B-complex vitamins,
- 600-800 Kcal of energy.

Besides these nutrients, avocados also contain Vitamin K, Vitamin C, Potassium, Vitamin B5, Vitamin B6, and Vitamin E. Additionally, avocados have more potassium than bananas. Avocados are also known for their high content of monounsaturated fats, with 77% of their calories coming from good fats. Most of the fat in avocados is oleic acid, a fatty acid that is a major component of olive oil.

However, each type of avocado has different contents. For instance, Hass avocados contain more fatty acids and calories compared to other types. The taste also varies, with some being sour, bland, sweet, or even bitter. Lestari et al. (2016) state that avocado plants are horticulturally divided into three races: Mexican, Guatemalan, and West Indian.

##### Mexican Race Avocados

These avocados adapt well to highlands and are cold-resistant. They have smooth, shiny, and thin skins. The seeds are large and loose in the cavity. The fruit is small with high-fat content and has a nutty flavor.

##### Guatemalan Race Avocados

These avocados easily adapt to highlands with cool temperatures. Their skins are thick and generally rough/woody/stiff. The seeds are small, tight, and in a cavity. The fruit is large, takes a long



time to mature, and has a slightly savory taste.

#### West Indian Race Avocados

Unlike the Mexican and Guatemalan races, these avocados can grow in lowlands and are not cold-resistant. The skin is smooth, elastic, and can be green, yellowish, or even reddish. The seeds are large and slightly rough, loose from the surface. The fruit has a low-fat content.

In Indonesia, the common types of avocados are from the West Indian race, though some are crosses between the Mexican and Guatemalan races. Crossbreeding between these races and others has produced diverse avocado varieties. According to the University of Florida's blog, there are 500 avocado varieties worldwide. Here are seven popular and delicious avocado varieties:

##### a. Butter Avocado

A very popular variety in Indonesia, known for its thick, elastic, and non-watery flesh. The name "butter avocado" comes from the texture of the ripe fruit, which is soft like butter. The skin turns greenish-brown when ripe, and the flesh is tender and can be eaten directly.

##### b. Miki Avocado

A smaller avocado variety, weighing only about 300-400 grams. Despite its size, Miki avocado is known for its sweet, delicious taste, thick yellowish-white flesh, and soft, non-fibrous texture. The fruit's skin turns glossy green when ripe.

##### c. Alligator Avocado

Named for its unique shape, this variety is large, reaching 70-80 cm in length. The bottom is relatively larger and tapers towards the top. The flesh is soft and non-fibrous, with a sweet taste and distinctive aroma.

##### d. Wina Avocado

Known for its delicious taste, this variety is relatively large, weighing up to 1.3-2 kilograms. The thick, soft flesh is yellow, and the taste is rich, making it suitable for direct consumption or various dishes. It is widely cultivated in Central Java.

##### e. Pluwang Avocado

The largest avocado variety, with an average weight of over 2 kilograms. The flesh is thick and dense, with a soft, slightly sticky texture. It is sweet and savory, often served as juice to refresh and fill.

##### f. Hass Avocado

This popular variety turns brownish-black when ripe. It is round and large, with thick, dense flesh. The unique taste is sweet and slightly sticky.

##### g. Kendil Avocado

Named for its shape, which resembles a kendil (a traditional pot), it is relatively large, weighing up to 2 kilograms. The thick flesh, small seed, and delicious taste make it a great side dish.

Each avocado type has distinct characteristics, from fruit shape, texture, to taste. These are the seven popular and delicious avocado varieties worldwide.

## Conclusion

Avocado cultivation holds promising prospects for development due to its profitable income aspect, where the revenue value per planting season in the third year after planting reaches Rp. 76,376,000/ha/year. From a business feasibility perspective, avocado cultivation in the research location is deemed viable to pursue, as the R/C ratio value is  $5.92 > 1$ . Avocado cultivation also boasts good nutritional content in its fruit, being rich in healthy fats, fiber, vitamins, and minerals; serving as antioxidants, as well as containing folic acid.

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