Farming schemes and characteristics of Kalibening Avocado in Kebondalem Village, Semarang Regency, Central Java

S S Tan¹, R Indrasti¹, S Handoko¹, A Malik² and I G Cempaka²

¹ Indonesia Center for Agricultural Technology Assessment and Development, Indonesia
² Central Java Assessment Institute for Agricultural Technology, Indonesia

E-mail: sititan2010@gmail.com

Abstract. One of the plants that have high economic prospects is the avocado plant. In addition to its various benefits, from fruit to leaves, avocado also has a high economic value and has the potential to be developed in Indonesia. One of the avocados that have good prospects is the Kalibening avocado in Kalibening Hamlet, Kebondalem Village, Jambu District, Semarang Regency, Central Java. This study aims to determine the characteristics and income level of Kalibening avocado farmers which is carried out using two farming schemes, seedling nursery scheme and avocado fruit farming scheme. The results of the study can be used for the development of avocado plants in other areas in Indonesia to meet market demand for avocados. This study uses a survey method, namely taking samples or respondents from a population using a questionnaire as a data collection tool. Observations of plant characters and the results of Kalibening Avocado descriptions were analyzed qualitatively and tabulated according to predetermined parameters, then presented in tabular form. The results of the study show that one of Kalibening avocado characters is its capability to grow and develop very well in various topographies, either in the highlands or in the lowlands. Furthermore, the results of farming analysis show that the sales of seeds and fruit are profitable so that they are feasible to be developed in various regions in Indonesia.

1. Introduction

Indonesia is a country that is rich in plants, especially plants that have great potential to be exploited and developed and have high economic value. One of the plants that have high economic prospects is the avocado plant, widely spread throughout Indonesia and is one of the horticultural commodities which have been cultivated for a long time. The avocado plant tastes great and has numerous health benefits. Fresh and starchy avocados are high in nutrients such as carbohydrates, fats, protein, vitamins and minerals, rich in fatty acids such as oleic, palmitic, linoleic, capric, stearate and myristic acid [1, 2]. In addition, avocado contains omega fatty acids, phytosterols, and squalene and in dried avocado seeds contains higher tannins than fresh avocado seeds [3]. Thus, consuming avocado is a healthy diet because it can reduce total cholesterol and bad LDL [4]. In addition to its various benefits, from fruit to leaves, avocado also has a high economic value and has a great potential to be developed in Indonesia [5].

Avocado production in Indonesia is fluctuated. However, there is a tendency to increase. Based on data from the Central Statistics Agency (2016), avocado production was 382,537 tonnes with a harvest area of 24,352 ha, the production growth rate from 2014 to 2015 was 24.48% [6]. In 2017, the
avocado production was 363,157 tonnes, and it is increased in 2018 to 410,094 tonnes. In other words, the avocado production growth is 12.92% [7]. One of the avocado producer provinces is Central Java. Central Java BPS data (2020) revealed that avocado production in Central Java Province in 2019 amounted to 601,450 quintals, this production increased 35.09% from 2018 (445,218 quintals) [8]. The highest production comes from East Java and West Java, while Central Java ranks third in terms of the number of plants that produce, but fourth in production [7]. In other words, the productivity of avocado plants in Central Java is relatively lower than that of North Sumatra Province.

According to [9] avocado production in Semarang Regency in 2019 was 212,252 quintals, this production increased by 15.51% from 2018 (183,752 quintals) [9]. The highest production is in Bandungan District (130,1850 quintals). The highest production comes from Semarang Regency, followed by Boyolali, Temanggung and Kendal Regencies [8]. The avocado varieties are quite diverse in this region. Kalibening avocado is a type of avocado produced by farmers in Kalibening Hamlet, Kebondalem Village, Jambu District, Semarang Regency.

The government continues to make efforts to develop avocado plants through various activities, such as efforts to improve product quality (intensification) and expansion of planting areas (extensification). In the fruit trade in the world, avocado ranks fifth after oranges, bananas, pineapples and mango. Even though it is included in the fifth most produced fruit, avocado produced in Indonesia has also begun to be exported to international markets. In 2018, the number of avocados exported reached 205.55 tonnes with a value of US $ 172,393 [7].

The importance of avocado fruit provides very profitable business opportunities for avocado farmers. The Indonesian people have realized that avocado fruit provides health benefits because of its very high nutritional value, and the price tends to be economically stable, which according to Indonesian society’s standards is quite expensive, so that if the plant is cultivated it can provide financial benefits. This study aims to determine the characteristics and income level of Kalibening avocado farmers in Kebondalem Village, Semarang Regency, which is carried out using two farming scenarios. The results of the study can be used for the development of avocado plants in other areas in Indonesia to meet the market demand for avocados.

2. Research methods

This study uses a survey method, which is taking samples or respondents from a population using a questionnaire as a data collection tool [10]. The selection of respondents using a purposive method is chosen deliberately. Respondents were avocado farmers in Kebondalem Village, Semarang Regency in Central Java Province, with a total of 20 respondents. The study was carried out in August 2020. As they were conducted the avocado farm in the same area, then the state of the agro ecosystem as well as the technology used by the farmers is considered the same. The input and output prices during the study period are considered constant and calculated based on the price level prevailing at that time.

Data collection is carried out through; (1) the observation technique which the data is collected by making direct observations on the object under study, namely by means of visual observation of all qualitative and quantitative parameters. Observations were made on predetermined parameters (2) through interviews with avocado farmers using a prepared questionnaire, and (3) recording or collecting data by recording all secondary data relevant to the study.

The observed data on plant character and descriptions of the Kalibening avocado were analyzed qualitatively and tabulated according to predetermined parameters, then presented in tabular form. To find out the farmer’s income, the results of the interview were tabulated and analyzed to determine the cost of acceptance and income of avocado farming which were made in two farming schemes. Farming costs in this study include: Labor costs, fertilizers, seeds, pesticides, maintenance costs and harvest costs in one planting and harvest season. To calculate farm income, the difference between revenue and total expenditure is calculated using the following formula:

\[
NR = TR - TC
\]

Where:
\[
NR = \text{Net Revenue}
\]
Furthermore, the R/C ratio analysis is carried out to determine the feasibility of farming. This analysis is carried out to compare between revenues and costs, using the following formula:

\[
\text{R/C Ratio} = \frac{\text{TR}}{\text{TC}}
\]

Where:
- TR = Total Revenue
- TC = Total Cost

The criteria:
- R/C > 1 means that the farm is profitable and feasible to develop
- R/C < 1 means that the farm is not profitable and not feasible to be developed

3. Results and discussion

3.1. Characteristics of kalibening avocado

In general, avocado plants can grow either in the lowlands or the highlands, which is 5-1,500 m above sea level. However, this plant will thrive with satisfactory results at an altitude of 200-1,000 m above sea level. Kalibening avocado can grow and develop very well in a variety of topography, from the highlands to the lowlands. The qualitative and quantitative characteristics of candidates for Kalibening avocado varieties in 2018 and 2019 can be shown in table 1 and table 2.

**Table 1.** Observation results of qualitative characteristics of candidates for Kalibening avocado varieties in 2018 and 2019.

| No   | Character                             | Observation Period                  | Temporary description |
|------|---------------------------------------|-------------------------------------|-----------------------|
| 1    | The shape of the plant canopy         | Cylindrical                         | Cylindrical           |
| 2    | The cross-sectional shape of the stem | Round                               | Round                 |
| 3    | Branching                             | Leaning up                           | Leaning up            |
| 4    | Stem colour                           | Brown (RHS 177 C)                   | Brown (RHS 177 C)     |
| 5    | Leaf shape                            | Lengthwise                          | Lengthwise            |
| 6    | Leaf tip shape                        | Pointed                             | Pointed               |
| 7    | Leaf base shape                       | Pointed                             | Pointed               |
| 8    | Upper leaf colour                     | Dark green (RHS NN 137 A)           | Dark green (RHS NN 137 A) |
| 9    | Lower leaf colour                     | Light green (RHS N 138 C)           | Light green (RHS N 138 C) |
| 10   | Flower shape                          | Arranged in a series                | Arranged in a series  |
| 11   | Colour of flower petals               | Yellowish green (RHS 145 C)         | Yellowish green (RHS 145 C) |
| 12   | Flower crown colour                   | Greenish yellow (RHS 145 D)         | Greenish yellow (RHS 145 D) |
| 13   | The colour of the pistil              | Yellow orange (RHS 145 C)           | Yellow orange (RHS 145 C) |
| 14   | Stamens colour                        | Yellow (RHS 16 A)                   | Yellow (RHS 16 A)     |
| 15   | Flowering time                        | May – July                          | May – July            |
| 16   | Harvest time                          | December - January                  | December – January    |
| 17   | Fruit shape                           | Oval                                | Oval                  |
| No. | Character                                      | Observation Period | Temporary description |
|-----|-----------------------------------------------|--------------------|-----------------------|
|     |                                               | 2018               | 2019                  |                      |
| 18. | The shape of the fruit tip                    | Flat               | Flat                  | Flat                 |
| 19. | The shape of the base of the fruit            | Tapered            | Tapered               | Tapered              |
| 20. | The shape of the fruit stalk                  | Round, at the center of the stalk notched | Round, at the center of the stalk notched | Round, at the center of the stalk notched |
| 21. | The thickness of the fruit stalk compared to the peduncle | Thicker            | Thicker               | Thicker              |
| 22. | Ripe fruit skin colour                        | Green (RHS 144 A)  | Green (RHS 144 A)     | Green (RHS 144 A)    |
| 23. | Fruit skin texture                            | A little rough, shiny | A little rough, shiny | A little rough, shiny |
| 24. | The colour of the flesh                       | Yellow (RHS 10 A)  | Yellow (RHS 10 A)     | Yellow (RHS 10 A)    |
| 25. | The texture of the flesh                      | Soft               | Soft                  | soft                 |
| 26. | The taste of the flesh                        | Tasteful           | Tasteful              | Tasteful             |
| 27. | Seed shape                                    | Egg round          | Egg round             | Egg round            |
| 28. | Seed colour                                   | Brown (RHS 173 D)  | Brown (RHS 173 D)     | Brown (RHS 173 D)    |
| 29. | The main feature                              | - Shiny green fruit skin color | - Shiny green fruit skin color | - Shiny green fruit skin colour |
|     |                                               | - The shape of the fruit is oval | - The shape of the fruit is oval | - The shape of the fruit is oval |
|     |                                               | - Round fruit stalk, the center of the stalk notched | - Round fruit stalk, the center of the stalk notched | - Round fruit stalk, the center of the stalk notched |

**Source:** Primary data processed, 2019

**Table 2.** Description of Kalibening avocado varieties.

| No. | Parameter                                           | Description                                                                 |
|-----|-----------------------------------------------------|-----------------------------------------------------------------------------|
| 1.  | Origin                                              | Kalibening Hamlet, Kebondalem Village, Jambu District, Semarang Regency     |
| 2.  | Genealogy                                           | Mother tree selection                                                      |
| 3.  | Group                                               | Clone                                                                      |
| 4.  | Plant height                                        | 13.3 m                                                                     |
| 5.  | The shape of the plant canopy                       | Cylindrical                                                                |
| 6.  | The cross-sectional shape of the stem               | Round                                                                      |
| 7.  | Stem circumference                                  | 107 cm                                                                     |
| 8.  | Branching                                           | Leaning up                                                                 |
| 9.  | Stem color                                          | Brown (RHS 177 C)                                                          |
| 10. | Leaf shape                                          | Lengthwise                                                                 |
| 11. | Leaf tip shape                                      | Pointed                                                                    |
| 12. | Leaf base shape                                     | Pointed                                                                    |
| 13. | Leaf length                                         | 15.0 – 19.0 cm                                                            |
| 14. | Leaf width                                          | 5.6 – 8.6 cm                                                              |
| 15. | The length of the petiole                           | 2.2 – 3.8 cm                                                              |
| 16. | Upper leaf colour                                   | Dark green(RHS NN 137 A)                                                   |
| 17. | Lower leaf colour                                   | Light green (RHS N 138 C)                                                  |
| 18. | Flower shape                                        | Arranged in a series                                                       |
| No  | Parameter                        | Description                                      |
|-----|---------------------------------|--------------------------------------------------|
| 19. | Color of flower petals          | Yellowish green (RHS 145 C)                      |
| 20. | Flower crown colour             | Greenish yellow (RHS 145 D)                      |
| 21. | The colour of the pistil        | Yellow orange (RHS 145 C)                        |
| 22. | Stamens colour                  | Yellow (RHS 16 A)                                |
| 23. | Flowering time                  | May – July                                       |
| 24. | Harvest time                    | December – January                               |
| 25. | Fruit shape                     | Oval                                             |
| 26. | The shape of the fruit tip      | Flat                                             |
| 27. | The shape of the base of the fruit | Tapered                       |
| 28. | The thickness of the fruit stalk compared to the peduncle | Thicker |
| 29. | The shape of the fruit stalk    | Round, at the center of the stalk notched         |
| 30. | Fruit length                    | 16.1 – 19.7 cm                                  |
| 31. | Fruit diameter                  | 8.91 – 10.13 cm                                 |
| 32. | Thick fruit skin                | 0.4 – 0.7 mm                                    |
| 33. | Ripe fruit skin colour          | Green (RHS 144 A)                               |
| 34. | Fruit skin texture              | A little rough and shiny                         |
| 35. | The color of the flesh          | Yellow (RHS 10 A)                               |
| 36. | The texture of the flesh        | Soft                                            |
| 37. | The taste of the flesh          | Tasteful                                        |
| 38. | Seed shape                      | Egg round                                       |
| 39. | Seed color                      | Brown (RHS 173 D)                               |
| 40. | Seed weight                     | 51.4 – 91.1 gr                                  |
| 41. | Seed height                     | 51.4 – 66.99 mm                                 |
| 42. | Seed diameter                   | 37.6 – 45.3 mm                                  |
| 43. | Water content                   | 71.76 – 89.33 %                                 |
| 44. | Sugar content                   | 5.20 – 6.40 % Brix                             |
| 45. | Protein content                 | 0.73 – 1.05 %                                   |
| 46. | Fat level                       | 3.29 – 5.04 %                                   |
| 47. | Fiber content                   | 1.51 – 2.07 %                                   |
| 48. | Weight per piece                | 580 – 840 gr                                    |
| 49. | Number of fruits per plant      | 280 – 335 fruits                                |
| 50. | Part of fruit that can be consumed (%) | 79.58 – 89.63 %                               |
| 51. | Storability life of fruit       | 6 – 7 days                                      |
| 52. | Single parent tree identity     | Candidate for PIT Avocado Kalibening belongs to Mr. Supramono. Kalibening Hamlet, Kebondalem Village, Jambu District, Semarang Regency |
| 53. | Estimated age of a single mother tree | 20 years                                      |
| 54. | The main feature                | - The skin of the fruit is green, the texture of the rind is a bit rough and shiny |
|     |                                 | - The shape of the fruit is oval                 |
|     |                                 | - The shape of the fruit stalk is round, the center of the stalk is notched |
| 55. | Excellence                      | - Large fruit size                               |
|     |                                 | - High part of the fruit that can be consumed    |
| 56. | Adaptation area                 | Medium plains - highlands                        |
3.2. Development prospects and economic value
Kalibening avocado has several advantages over other local avocados. They can be harvested first time at the age of about three years with a plant height ranged of 3–4 meters (figure 1). Initial fruit productivity is around 25-30 kg / tree and will continue to increase as the plant ages.

Currently the productivity of the oldest plants (mother trees) is around 133–281 kg / tree / season, with a total of 230-335 fruits / tree with a weight per fruit of 580–840 grams. The price of Kalibening Avocado fruit is very competitive compared to other local avocados. Currently the price of Kalibening Avocado fruit ranges from IDR 30,000 - 35,000 / kg, while other local avocados are around IDR 20,000 - IDR 25,000 / kg. The high price of this Kalibening avocado is due to the character of the thick flesh, sweet and savoury taste and fluffier flesh texture.

There are quite a lot of local avocado varieties that have been developed by farmers in Semarang Regency, so it is difficult to calculate the distribution of the Kalibening avocado seeds. According to the Kalibening Avocado seed breeders in Kalibening Hamlet, Kebun Dalem Village, Jambu District, the production of Kalibening Avocado seeds has produced around 48,000 culms and has spread to several sub-districts in Semarang Regency and has even spread to surrounding Regencies / Cities such as Semarang City, Salatiga City, Boyolali Regency, Bajarnegara Regency and Wonosobo Regency and Tegal Regency. As much as 87% of Kebondalem people have had developed and cultivated the Kalibening Avocado seed. To gain more positive impact on incomes, revenues, prices, and labor inputs, participating in avocado export markets is one of the options [11].

3.3. Avocado seedling nursery scheme
Avocado Kalibening in Kebondalem Village is still being cultivated in a small-scale business; however, the farmers have high motivation to improve the cultivation technology and expanding the market. Avocado price is relatively stable and the marketing that have been initiated make Avocado Kalibening excellent in Central Java and outside Java.

Based on the results of observations and interviews with avocado farmers, the selling price of avocado fruit every year does not change significantly, which might due to the great taste and the large percentage of meat that can be consumed (79.58 - 89.63%). The price of avocado per kg is competitive.
The starting process from the seedling nursery to the maintenance process is an important factor to produce a weighty avocado. The giant avocado that develops in Indonesia weighs 400-1200 grams / fruit [12]. When compared to Vienna avocado, which is 800-1000 grams / fruit, Muria and beautiful avocados 400-600 grams / fruit with each selling price ranging from IDR 18,000 - IDR 25,000 / kg, Kalibening avocado is one of Indonesia's superior avocados.

Initially, Kalibening avocado seeds were sown for 10 months, and then planted. The Kalibening avocado plants that are being propagated are currently the result of continuous propagation with good physical quality. These avocado seedlings were sold to the market or replanted after at least 3 months since grafting. Seedlings are sold at an average price of IDR 75,000 per plant, and an average of 300 seedlings was sold per month. The four labors were required to handle the 300 plants propagation with the total cost approximately IDR 80,000,000 per year (table 3).

**Table 3.** The economic feasibility of Kalibening avocado seedling nursery per year

| No | Description                        | Amount of Farming (IDR) |
|----|------------------------------------|-------------------------|
| 1. | Labor cost                         | 80,000,000              |
| 2. | Production Cost                    |                         |
|    | - Fertilizer                       | 4,000,000               |
|    | - Water                            | 2,000,000               |
|    | - Medicine                         | 1,000,000               |
|    | Total Cost (TC)                    | 84,000,000              |
| 4. | Total Revenue (TR)                 | 225,000,000             |
| 5. | Net Revenue (NR)                   | 141,000,000             |
|    | R/C                                | 2.68                    |

The cost of production facilities is obtained based on the calculation of the farmer, where the costs of fertilizers, medicines (including fungicides, etc.) and the use of water for spraying crops are for one year. Generally, fungicide, fertilizer, and mow are the main operational cost in avocado farming [13]. Based on the above calculations, the amount of income in avocado seedling nursery is much influenced by the work ethic in managing the seed farming and the market that Kalibening avocado farmers have in Kalibening Village. This advantage motivates farmers to continue to improve their business and innovate in making improvements in continuous propagation technology.

3.4. *Avocado fruit farming scheme*

Generally, the result of avocado cultivation will be gain after being over 3 years old, but still in a small amount. At this time, avocado plant combination can be considered to maintain the farmer revenue [14]. Ideally the avocado will bear fruit when it is 4 years old with a yield of ± 50 kg per tree. As the avocado trees aged, fruit productivity increases by 40%, assuming the avocado tree comes from superior seeds and in a well-managed farming. The percentage of fruit will be good until the tree is 10 years old. Assumption of Kalibening avocado fruit productivity and sales profits per season per 50 trees population as presented on table 4.

**Table 4.** Assumption of Kalibening avocado fruit productivity and sales profits per season per 50 trees population

| No | Tree Age | Productivity (Kg) | Price/Kg (IDR) | Income per Plant | Farm Income | Average per Month |
|----|----------|-------------------|----------------|------------------|-------------|-------------------|
| 1. | 1 Year   | -                 | -              | -                | -           | -                 |
| 2. | 2 Years  | -                 | -              | -                | -           | -                 |
| 3. | 3 Years  | 30                | 15,000         | 450,000          | 11,250,000  | 3,750,000         |
| 4. | 4 Years  | 50                | 15,000         | 750,000          | 37,500,000  | 6,250,000         |
| 5. | 5 Years  | 70                | 15,000         | 1,050,000        | 52,500,000  | 8,750,000         |
| 6. | 6 Years  | 98                | 15,000         | 1,470,000        | 73,500,000  | 12,250,000        |
Kalibening avocado plants are harvested every 8 months, which means that the above benefits can be obtained every 8 months. The profit from the sale of the avocado is assumed to be a stable price every year and the avocado plant remains in good condition; thus it can produce fruits with premium quality (good).

When viewed from the sales results of Kalibening avocado each season, the benefits obtained are quite large. However, the costs incurred during the treatment process and other input costs are also quite large, and the time to produce fruit is quite long, as long as 3 years (Table 5). Thus, initial capital and patience are needed in the cultivation of avocado plants.

**Table 5.** The economic feasibility of Kalibening Avocado fruit farming.

| No  | Description                              | Amount per Farming (IDR) |
|-----|------------------------------------------|--------------------------|
| 1.  | Total Revenue (TR) per 50 trees/season   | 91,702,500               |
| 2.  | Total Cost (TC)                          | 25,500,000               |
| 3.  | Net Revenue (NR)                         | 66,202,500               |
| R/C |                                          | 3.60                     |

The calculation above is an assumption if the price of avocado fruit does not change and the plant can produce and the production increase until the age of 10 years. In fact, in the field, Kalibening avocado on the market ranges from IDR 15,000 to IDR 35,000 and the average price is over IDR 30,000. Thus profit value is still far above the calculations being carried out.

The price can still be increased if farmers are able to have a fixed market, so that there is no exploitation of farmers [15]. In other words, insufficient market information results in farmer exploitation, which means that the price is determined by the market. Furthermore, in order for sales to be more attractive and to have higher selling value, farmers need to pay attention to the packaging and transportation of avocados to the market. Other important factors in increasing farmers’ profits are land area, education and technology improvement and participation in training programs [16].

### 4. Conclusion

The Kalibening avocado has unique characteristics, being able to grow and develop in a variety of topographies, from the highlands to the lowlands. Apart from its adaptability, the price of Kalibening avocado is very competitive compared to other local avocados. The high price of Kalibening avocado is due to the characteristics of the thick flesh, sweet and savory taste and fluffier flesh texture. Based on the results of the observation, there were two schemes of avocado agribusinesses in Kebondalem, either the avocado seedling nursery scheme or the avocado fruit farming scheme. It was found that the production of avocado seedlings around 300 seedlings per month and their sales had penetrated the market outside the Central Java region at a high and profitable price. The income of Kalibening avocado fruit farming in Kebondalem is influenced by the production, costs and selling prices. Production is affected by the quality of the seed and the cost of proper management. The costs are mainly influenced by labor wages, whereas the fruit prices are mainly influenced by the fruit quality.

### References

[1] Arukwe U, Amadi B A, Duru M K C, Agomuo E N, Adindu E A, Odika P C, Lele K C, Egejuru L and Anudike J 2012 Chemical composition of Persea americana leaf, fruit and seed *Ijrras* **11** 346–9

[2] Dreher M L and Davenport A J 2013 Hass avocado composition and potential health effects *Crit. Rev. Food Sci. Nutr.* **53** 738–50
[3] Malangngi L, Sangi M and Paendong J 2012 Penentuan kandungan tanin dan uji aktivitas antioksidan ekstrak biji buah alpukat (Persea americana Mill.) J. Mipa 15–10
[4] Wang L, Bordi P L, Fleming J A, Hill A M and Kris-Etherton P M 2015 Effect of a moderate fat diet with and without avocados on lipoprotein particle number, size and subclasses in overweight and obese adults: a randomized, controlled trial J. Am. Heart Assoc. 4 e001355
[5] Tamalia D I, Santoso S I and Budihajo K 2019 Analisis tingkat pendapatan usahatani alpukat di Kelompok Tani Kabupaten Semarang MEDIAGRO 14
[6] Badan Pusat Statistik (BPS) 2016 Statistik Produksi Hortikultura (Horticultural Production Statistics) 2015
[7] Badan Pusat Statistik (BPS) 2018 Statistik Tanaman Buah-Buahan dan Sayuran Tahunan Indonesia (Indonesian Annual Fruit and Vegetable Crop Statistics) 2017
[8] BPS Jawa Tengah 2020 Jawa Tengah dalam Angka (Central Java in Numbers)
[9] BPS Kabupaten Semarang 2020 Kabupaten Semarang dalam Angka (Semarang Regency In Numbers)
[10] Effendi S 2012 Metode Penelitian Survei (Jakarta Pusat: LP3S)
[11] Amare M, Mariara J, Oostendorp R and Pradhan M 2019 The impact of smallholder farmers’ participation in avocado export markets on the labor market, farm yields, sales prices, and incomes in Kenya Land use policy 88 104168
[12] Rahmawati R 2010 Khasiat Dan Cara Olah Alpukat
[13] Evans E A and Nalampang S 2010 Sample avocado production costs and profitability analysis for Florida EDIS 2010
[14] Rahman M 2016 Analisis kelayakan finansial agroforestri alpukat dan kontribusinya terhadap pendapatan rumah tangga petani di Desa Ranubedali, Kecamatan Ranuyoso, Kabupaten Lumajang
[15] Omolo P, Tana P, Mutebi C, Okwach E, Onyango H and Okach K O 2011 Analysis of avocado marketing in Trans-Nzoia district, Kenya . J. Dev. Agric. Econ. 3 312–7
[16] Dang N H 2017 Profitability and profit efficiency of rice farming in Tra Vinh province, Vietnam Rev. Integr. Bus. Econ. Res. 6 191