

Potential of Fruit Plants in the Yard to Support Urban Farming and Agroindustry in Madiun-City, East Java, Indonesia

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Abstract— Utilization of yard land is a management effort through an integrated approach to planting various types of plants, cultivating livestock and fish to ensure the continuous availability of diverse materials, and fulfilling family nutrition. Many fruit trees planted in the yard can manage more intensively to ensure the availability of raw materials for agro-industry development. The study aimed to identify the potential of fruit plants in the yard as agro-industry raw materials and to analyze the added value of processed products made from fruit plants. The method used in this study was a descriptive method carried out in three districts of Madiun-City, which empowered the yard as a provider of agro-industrial raw materials. The data analysis method uses the Value-Added Analysis method. The results obtained from the study showed that there were eight types of fruit plants planted in the yard in Madiun-City. Only four fruit plants were used as raw materials for processed products, namely Mango (*Mangifera indica*), Banana (*Musa sp*), Papaya (*Carica papaya*), and Guava (*Psidium guajava*). These are processed into Mango Syrup, Banana Chips, Papaya Sauce, and Guava Juice. The added value obtained by the Mango Syrup product is Rp.12500,-/kg (39.06%), Banana Chips Rp.23228.57/kg (50.03%), Papaya Sauce Rp.4452.14/kg (49, 10%), and Guava Juice Rp.21130,-/kg (58.29%).

I. INTRODUCTION

Urban yards as urban farming areas have great potential if managed more intensively. Through the concept of the Sustainable Food House Area ("KRPL: Kawasan Rumah Pangan Lestari"), the potential for optimally utilized yard land will be able to support the fulfillment of household food needs as well as raw materials for supporting the urban agro-industry. The basic principles of KRPL are: (1) environmental utilization and designed for food security and independence, (2) food diversification based on local resources, (3) conservation of food genetic resources (plants, livestock, fish), and (4)

maintaining sustainability through village nurseries, (5) increasing community income and welfare [1]. The research results by Indah et al., 2020 also show that the empowerment variables (capacity, authority, empowerment) of urban farming community members have a real influence on increasing food security in Gending Village, Gresik Regency [2]. It is also stated that the community can take advantage of empty or abandoned yards combined with livestock/fish cultivation to obtain family nutrition and economic resources [3]

The utilization of the yard has many functions, especially in increasing family income. It needs to be

developed intensively in exploring its potential to become a profitable business, mainly if the types of plants cultivated can be used as raw materials for the agro-industry. It takes a strong will, patience, skill, and exceptional knowledge is needed to manage it. Daliani (2014) said that household knowledge of the cultivation of garden plants is still low, especially about cultivation techniques and the manufacture of planting media for nurseries [4]. As mentioned by the other researcher that using the yard through hydroponic cultivation, fresh vegetables will be produced continuously, on a scheduled basis, and add value to the community's income [5]. Another research conducted by Rahardjo et al. (2022) shows that yardland in Kuaken Village, North Central Timor Regency, has created independent food for families, has more diverse activities as housewives, saves time and energy can process rice husk and cow dung waste for household purposes. A mixture of planting media and making the yard has an aesthetic value [6].

Efforts to optimize the use of yardland to develop diversification of processed products as agroindustry have begun, but the continuity of supply of raw materials using local resources is inadequate. Following Wardhani's research which says that 20.3% of raw materials come from farmers in agro-industrial areas while 79.7% of raw materials come from traders outside the agro-industrial area [7].

As is the case in India, processed fruit and vegetable products are oriented for export, and dried & preserved processed fruit and vegetable products make up the largest share (47%). To achieve this export goal, companies must be innovative and need to anticipate and respond to consumer needs for survival and sustainable growth [8]. (Goyal, 2006). , The fruit agroindustry is gaining importance with the consumption and processing of exotic fruits increasing worldwide due to improvements in preservation techniques, transportation, marketing systems, and consumer awareness of the health benefits. All parts of exotic tropical fruits are rich in bioactive compounds, such as phenolic constituents, carotenoids, vitamins, and dietary fiber [9]. Maulaa's research (2021) in the Development of Urban Farming in the Railroad Border of Bangetayu Wetan Village, Genuk District, Semarang City, showed that the obstacles experienced were: the presence of pests, diseases, and weeds, as well as a lack of public knowledge. Meanwhile, the urban farming activities help meet food, ecological, economic, social, health, aesthetic, educational, and tourism needs [10].

The agro-industry is one of the agricultural development strategies is a significant effort to achieve several goals. These goals are attracting and encouraging new industries in the agricultural sector, creating a robust,

efficient, and flexible economic structure, creating value-added, increasing income foreign exchange, creating jobs, and improving income distribution [11]. The development of the agro-industry is an effort to increase the added value of primary products of agricultural commodities, which at the same time can change the traditional farming system to be more advanced. As stated by the other that various sizes and shapes of yards can be used to grow healthy fruits, such as longan [12]. The existence of agro-industry at this time is increasingly expected to play a role in improving the family economy and driving industrialization in the region. Many hopes are placed on the agro-industry, but the empowerment of existing potentials constrains its success. Utilization of the yard is expected to be a provider of agro-industry raw materials. In addition to increasing the community's entrepreneurial spirit, it also increases family income with commodities that support agro-industry as processed products. In general, the obstacles faced by the agro-industry are a) availability of raw materials that are not continuous, (b) processing processes that use simple technology so that they are not durable, and (c) limited capital of artisans for the provision of raw materials. Besides it, marketing is only done locally because artisans have not been able to expand the market because they cannot maintain production continuity.

From the above problems, to overcome the availability of raw materials for urban agro-industry development to maintain continuity. More serious attention is needed to empower commodities that support it through the use of yards around the house to create an adequate agribusiness and agro-industry structure through sustainable urban farming.

II. METHOD

2.1. Place and Time

The research was conducted in Madiun-City, East Java, Indonesia, from July to September 2021. The climate is tropical, with an average daily temperature of 24-32°C and an average rainy day per year of about 100 days. A rainfall of 2000 mm per year. Generally, there are 4-5 dry months in a year, 2-3 wet months, and 5-6 wet months. The cardinal directions in Madiun-City are from south to north, an average of 78%.

2.2. Sampling Method

The research area was chosen purposively in Madiun-City, which consists of 3 sub-districts, namely Taman, Kartoharjo, and Manguharjo sub-districts, considering that each of these sub-districts has an agro-industry business. The determination of respondents was carried out by purposive random sampling. Each sub-district was taken

with a sample of 20 respondents at random who cultivate fruit plants in the yard, ensuring that segments of the population represented in 10 samples of 10% of the existing population.

a. Interviews technique

Interviews were conducted with questions and answers between researchers and farmers to obtain the necessary data based on direct answers from respondents using prepared questionnaires.

b. Data Recording

The recording is done to obtain data by recording information from various agencies from the sub-district level to respondents based on existing reports and records to get secondary data

c. Observation Technique

Observation aims to collect data without asking questions by observing the object under study. The observation here aims to match the data obtained from the interview with the previous situation and can be used to complement the existing data

2.3. Data Source.

Primary data is data obtained directly from respondents or people who grow fruit trees in their yards. The tools used are questionnaires or questions posed to respondents.

Secondary data is relevant documented data obtained from various sources that are trusted and can be accounted for starting from the sub-district level to the people who grow fruit trees in their yards.

2.4. Analysis Method.

The data analysis method uses the Value-Added analysis method using the Hayami method (1987), which helps know how much-added value is contained in one kilogram of processed products. This figure can be calculated how much income (labor income) shows how much one kilogram of a processed product provides revenue for its workers. If work income to value added (%) is high, then such agro-industry plays more in providing pay for its workers. Meanwhile, the remaining value-added, which is not used as a labor reward, is part of the profit of the artisans [13].

III. RESULT AND DISCUSSION

3.1. Overview of the Research Site

Madiun-City is a lowland area with an average height of 70 meters above sea level, located at a position of 70-80 south latitude and 1110-1120 east longitude. Based on the geographical position, Madiun-City is surrounded by Madiun Regency with the following boundaries:

- Madiun sub-district in the north
- Geger sub-district in the south
- Jiwan sub-district in the west
- Wungu sub-district in the east

Madiun City is an urban area, so the dominance of land use is for built areas consisting of housing, public facilities, and others. The location of this built-up area in 2000 reached 55% of the total area or about 1,860,323 ha. The Madiun City area consists of 3 sub-districts, namely Manguharjo District (10.04 km²), Taman District (12.46 km²), and Kartoharjo District (10.73 km²) [14].

3.2. Cultivated Fruit Plants

The production of fruit crops in Madiun City in 2020 from 3 Districts is 9116 kg [15]. Fruit plants cultivated in their gardens by 20 respondents who grow fruit trees in Manguharjo, Taman, and Kartoharjo Districts can be seen in the picture 1-3.

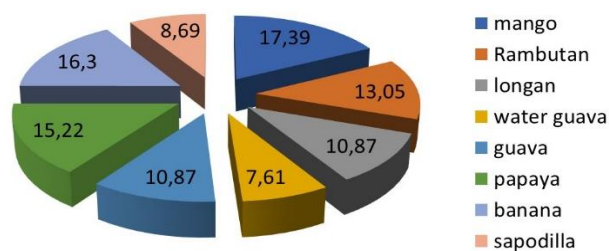


Fig.1. Percentage of Fruit Plants in Manguharjo District, Madiun City

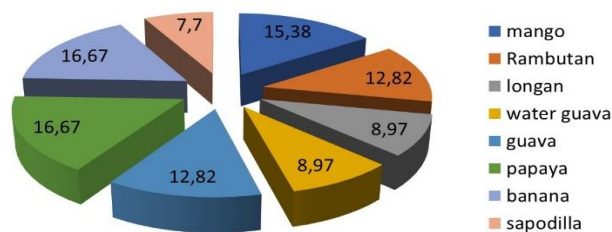


Figure 2: Percentage of Fruit Plants in Taman District Madiun-City

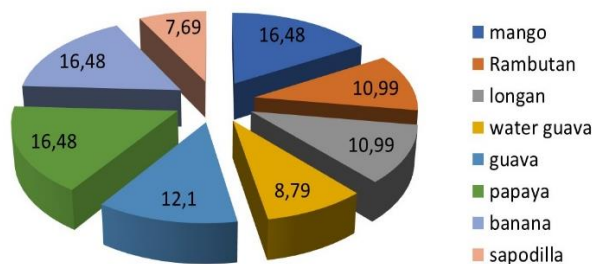


Fig.3: Percentage of Fruit Plants in Kartoharjo District, Madiun-City

Figure 1-3 shows that in three sub-districts in Madiun City (Manguharjo, Taman, Kartoharjo) there are 8 types of fruit plants planted, namely Mango, Rambutan, Longan, Guava, Guava, Papaya, Banana and Sawo. Of the eight types of fruit plants planted in the yard, there are four types plants, namely Mango (*Mangifera indica*), Banana (*Musa sp*), Papaya (*Carica papaya*), and Guava (*Psidium guajava*), which have the highest percentage in the number of plants and production. As for producing these fruit crops, some are sold in fresh form, and some are used as raw materials for processed products. This program is under the government's program by optimizing the use of yardland to develop diversification of processed products through programs such as P2KP ("Percepatan Penganekaragaman Konsumsi Pangan" / Acceleration of Food Consumption Diversification) and GPOT ("Gerakan Perempuan Optimalisasi Pekarangan"/Women's Movement for Garden Optimization). In addition, this program was developing MKRPL ("Model Kawasan Rumah Pangan Lestari"/Model for Sustainable Food House Areas). However, the results have not been satisfactory because, according to Ashari et al. (2012), the use of the yard is still part-time and not market-oriented yet [15].

3.2. Number of Agroindustry in Madiun-city

In Madiun-City, several home industries, both food and beverage industries, as processed product businesses utilize local resources and their surroundings. The following table shows the number of companies, workforce, and production value (thousand rupiahs) according to the industrial classification in Madiun-City

Table 1. Number of companies, employee, and production value by industry classification in Madiun-City.

No	Industry category	Number of establishment	Employee (person)	Production value (Rp.,000)
1	Food	43	355	11.089.829
2	Beverage	10	39	1024

Source : Madiun-City Departemen of Agriculture

Fruit crops are agricultural crop commodities that can be used as raw materials for processed products, such as mango syrup, banana chips, papaya sauce, and guava juice which have good market prospects as food substitutes in the future. As raw material for processed products, it is necessary to continue the availability of these fruit plants. With the existence of a food and beverage industry company in Madiun-City, it is a processed product business utilizing fruit plant resources around it. Increasing the cultivation of fruit crops in Madiun is expected to increase the development of existing industries because the food and beverage industry is highly dependent on the continuity of available raw materials.

Table 2. value added Analysis of the fruit plants. Raw

No	Value added component	Mango Syrup	Banana Chips	Papaya Sauce	Guava Juice
	Output, input and price				
1	Output result (kg/production process)	20	32	22	30
2	Raw material input (kg/production process)	50	44,8	84	60
3	Labor input (working days)	4	6	6	3
4	Conversion factor (kg output/kg raw material)	0,400	0,714	0,262	0,500
5	Labor conversion (working days/kg raw material)	0,080	0,134	0,071	0,050
6	Output Price (Rp/kg)	80000	65000	34620	72500

7	Wage mean of labor (Rp/production process)	25000	25000	20000	20000
	income and profit				
8	Raw material input price (Rp/kg)	17500	20000	4500	15000
9	Other contribution input Rp/kg)	2000	3200	115	120
10	Output price (Rp/kg)	32000	46428,57	9067,14	36250
11	Value added (Rp/kg)	12500	23228,57	4452,14	21130
	Value added ratio (%)	39,06	50,03	49,10	58,29
12	Labor benefit (Rp/kg)	2000	3348,21	1428,57	1000
	Labor share (Rp/kg)	16,00	14,41	32,09	4,73
13	Profit (Rp/kg)	10500,00	19880,36	3023,57	20130
	Profit share (%)	32,81	42,82	33,35	55,53
	Remuneration for Factors of Production Margin (Rp/kg)				
14	Margin (Rp/kg)	14500,00	26428,57	4567,14	21250
	a. Labor income (%)	13,79	12,67	31,28	4,71
	b. Other input contribution (%)	5120,00	6396,06	234,21	205,87
	c. Profit (%)	72,41	75,22	66,20	94,73

Source : Primary data analysis

3.4. Value-Added from fruit plants as processed products

The value-added of raw materials with fruit plants into processed products of Mango Syrup, Banana Chips, Papaya Sauce, and Guava Juice is presented in table 2. Shows that each raw material from fruit plants can be processed products with different added values. This case can be seen from the raw material of mango, which is used as mango juice with an added value of Rp. 12,500 - with an added value ratio of 39.06% of the processed raw materials. The raw material for Bananas which is used as a Banana Chips product, obtains an added value of Rp.23228.57/kg with an added value ratio of 50.03%. The raw materials from the Papaya plant can be used as Papaya Sauce products to obtain an added value of Rp.4452.14/kg, with a value-added ratio of 49.10%. Meanwhile, the raw material of guava, which is used as a guava juice product, gets an added value of Rp.21130-/kg, with an added value ratio of 58.29%. Following the opinion of Siebert J.W et al. (1997) suggests that the added value category, namely the added value, is said to be low if the ratio value is < 15%, moderate if the ratio value is 15 -40%, and high if the ratio value is > 40% [16]. However, according to

Wardhani (2017), the production of agroindustry capacity is strongly influenced by the availability of raw materials. The availability of raw materials is limited and discontinuous due to minimal raw material storage technology. As a result, in the months of the harvest season, the harvest will accumulate in the market [17].

From the table above, it can also be seen that the share of labor in the agro-industry obtained the highest percentage of fruit plants, namely papaya plants which are processed into papaya sauce by 32.09%, followed by mango plants which are processed into mango syrup, which is 16%, then banana plants. which is processed into banana chips by 14.41%, then guava plants which are processed into guava juice only provide a share of labor of 4.73%. This shows that the higher the percentage means the greater the share of the workforce in the agro-industry business.

IV. CONCLUSION

From the research, it can conclude that the potential of fruit plants cultivated in Madiun-City are eight types of

plants, namely, Mango 16.48%, Bananas 16.48%, Papaya 16.1%, Rambutan 12.2%, Guava 11.9%, Longan 10.34%, Water guava 8.4%, and Sapodilla 8.1%. Therefore, the fruit plants used as raw materials for processed products are Mango, Banana, Papaya, and Guava. Meanwhile, the added value of the processed fruit trees are as follows: Mango syrup product Rp.12500,-/kg (39.06%), Banana Chips Rp.23228.57/kg (50.03%), Papaya Sauce Rp. 4452.14/kg (49.10%), and Guava Juice Rp.21130,-/kg (58.29%).

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