Analysis of development factors of jasmine flower (*Jasminum sambac L.*) commodity on farmers in Batang Regency, Central Java

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Abstract. This research aims to: 1) analyze productivity level of jasmine flower agribusiness, and 2) analyze factors which influence the development of jasmine flower agribusiness in Batang Regency.
The research was conducted by survey and observation methods. The research sites were determined by purposive sampling method, based on the regional potential of the district which develops jasmine flower agribusiness, namely Kandeman district and Batang district. 63 farmers were selected as respondents by quota sampling. Primary data were collected by interview based on the prepared questionnaire. Secondary data were obtained from Agencies and other Offices which are related to the subject of the research.
The data in this study are presented in descriptive and statistical analysis. The productivity of jasmine flower was analyzed based on the average land area and production, whereas the analysis of development factors of jasmine flower agribusiness was analyzed using multiple linear regression model with production of jasmine flower as the dependent variable (Y) and age (X1), education background (X2), number of dependents (X3), business experience (X4) of farmers, land area (X5), cropping pattern (X6), land status (X7), production goal (X8), production period (X9), and selling price (X10) as independent factors. The results showed that the average land area was 0.499 ha/farmer with production capacity of 2,793.86 kg/annum, or a productivity rate of 5,598.92 kg/ha. Taken together, factor (X1) to factor (X10) has a very significant effect ($P < 0.01$) on the development of jasmine flower agribusiness, while the land area ($P < 0.01$) and the selling price of jasmine flowers ($P < 0 , 10$) has a partial influence on the development of jasmine flower agribusiness. These results indicate that the development of jasmine flower agribusiness needs to take into account technical, social and economic factors.

Keywords: jasmine flower, development factor, productivity.

1 Introduction

Jasmine flowers are horticultural commodities with the potential for profitable development. The development of jasmine flower commodities needs to be encouraged in the hope that this agribusiness can increase the income and welfare of farmers. At present, many jasmine flower farms are carried out by farmers in a traditional way. Lack of understanding and application in aspects of cultivation and information technology result in low production, both in terms of quantity and quality (Hayati and Sugiati, 2009).

Jasmine is included in the group of shrub plants, which thrive at an altitude of 10 - 1,600 masl. Jasmine flower plants have very good adaptability to different environments. Arabian jasmine (*J. Sambac*) ideal planted in the lowlands to a height of 600 m above sea level, while star jasmine (*J. Multiflorum*) can adapt well in altitude of up to 1,600 masl. Jasmine flowers in Central Java grow well on land up to 700 masl. Jasmine flower plants are included in the *Oleaceae* family, which many also grow in the forests because the social and economic potential of this plant has not been widely revealed.

Among the benefits of using jasmine flower plants include sowing flowers, raw materials for the perfume industry, tea flavoring, cosmetics, pharmaceuticals, as a flower arrangement and air freshener. Demand for jasmine flowers continues to increase over time, mainly as a non-oil and gas export commodity. However, to date, the export market demand has still not been fully fulfilled due to low production capacity.

Jasmine flower, particularly arabian jasmine (*Jasminum Sambac (L.) Aiton)* Is widely known for its specific aroma compared to other species of flowers. Arabic jasmine flowers have a very fragrant aroma and are categorized into a group of ornamental plants that also function as biopharmaceutical plants, namely plants that are used for drugs, cosmetics, and health and whose parts such as leaves, stems, fruit, tubers (rhizomes) or roots are consumed or used and have economic value.

The flower horticulture or ornamental plants business, especially jasmine flowers, is a source of cash income for the farming community, given the high selling value of the harvest, the availability of land resources and technology, and the increasing potential of market absorption at home and abroad. The large market demand for jasmine flowers is evidence of the magnitude of the commodity's agribusiness potential. A study by Shinta and Ainiyah (2010) found that, from its financial aspects, jasmine flower agribusiness is worthy of being developed. The results of the study stated that the OCC was 12%, produced a positive NPV, IRR 60.5% and B / C ratio 2.85 and PP (payback period) of 3 years 5 months. According to Hayati and Sugiarti (2009) jasmine flower farming is viable to be developed both intensively and extensively. Jasmine flower agribusiness development can improve the welfare of farmers.

Jasmine flower cultivation business is a profitable economic opportunity, considering that jasmine flowers can be harvested every day and have a long life cycle. Due to the profitable selling price of jasmine and the increasing demand of the commodity, a study is needed regarding the development of jasmine flower agribusiness which includes factors that influence production. The results of this study are expected to provide data and information about the model of jasmine flower agribusiness development through various approaches; socially, technically and economically. In addition, this research is expected to be able to produce comprehensive information about the development of jasmine flower agribusiness as one of the potential sources of regional income in Batang Regency.

2 Research method

Research on the analysis of factors that influence the production of jasmine flower agribusiness in Batang Regency was carried out by survey methods (Singarimbun and Effendi, 1989). Subdistricts that were the location of the study were determined by purposive sampling method, by taking 2 districts that have jasmine flower agribusiness, namely Batang district and Kandeman district. Several villages from each sub-district with jasmine flower agribusiness were sampled purposively. The sample quota was 63 respondents, with a distribution of 36 respondents from Kandeman district and 27 respondents from Batang district. The data and information in this study were collected from primary and secondary sources. Primary data was collected through interviews based on prepared questionnaires.

The primary data collected includes the identity of the respondent, the level of production and productivity of jasmine flowers, technical, social and economic variables and problems related to jasmine flower cultivation and agribusiness. While secondary data is collected from various sources (research results, reports, literature, and other relevant information).

Data analysis was carried out using quantitative descriptive, qualitative descriptive, and statistical methods. The level of productivity is analyzed based on the average area of land that is the place of business multiplied by the production produced. The factors that influence the development of jasmine flower agribusiness are analyzed using multiple linear regression models (Ghozali, 2005), with an dependent variable (Y) jasmine flower production, and independent variables consisting of age (X1), educational background (X2), number of dependents (X3), business experience (X4), land area (X5), cropping pattern (X6), land status (X7), production goal (X8), production period (X9), selling price (X10). The equation model used is formulated mathematically as follows:

$$Y = a + b1x1 + b2x2 + b3x3 + \ldots + b10x10 + e \qquad (1)$$

where:
Y = Jasmine flower production
a = constant
b1, *b2*, *b3* = coefficient of regression
x1, *x2*, *x3* and *xn* = social, technical, and economical variables.
The F and t tests were employed to determine the significance of the model with a confidence level of 1% and 10%.

3 Results and discussions

3.1 General Description of Research Site

Batang is one of the regencies in Central Java Province. Batang regency is bordered by Java Sea to the north, Wonosobo regency and Banjarnegara regency to the south, Pekalongan regency and Pekalongan city to the west, and Kendal regency tp the east. The total area of the regency consists of 22,003.80 Ha (27.91%) of rice fields and 56,860.36 Ha (72.09%) of non-rice fields. Of the total rice field area, 90.86% are irrigated rice fields, while the rest are rain-fed rice fields. The land that is not used for rice fields is mostly moor/newly-opened rice field of 21,977.20 Ha, and the remainder is used for plantations, state forests, and non-agricultural uses. The total area of Batang Regency is 78,864.16 Ha. The total area of the regency consists of 22,003.80 Ha (27.91%) of rice fields and 56,860.36 Ha (72.09%) of non-rice fields. Of the total rice field area, 90.86% are irrigated rice fields, while the rest are rain-fed rice fields. 21,977.20 ha of non-rice fields are mostly used for moor, the rest are plantations, state forests, non-agricultural uses and others. (Badan Pusat Statistik, 2017).

The population of Batang district in 2017 reached 756,079 people. The population growth rate in 2017 was 0.85%. The number of workforce in Batang Regency was 388,307 people with the unemployment rate reaching up to 5.83%. The livelihoods of the Batang regency residents are varied, ranging from civil servants, medical / health personnel, teachers, to traders, farmers and fishermen. The number of civil servants is 6,977 people, and the number of medical/health care workers is 5,669 people. The number of fishery households is 1,455. The number of agricultural and forestry industry groups is 7,967. The number of metals, machine and chemical industry groups is 657. Batang Regency, especially Kandeman Subdistrict and Batang Subdistrict, is the largest center for the production and trade of jasmine flower commodities. Jasmine commodities in Batang Regency account for 42.7% of national production, so that jasmine commodities have a very promising future for development (Direkotrat Jenderal Hortikultutra, 2017).

3.2 Identity of Respondents

63 jasmine farmers from 2 districts, namely Kandeman district and Batang district, were respondents in this study. Respondents were taken from Kandeman Subdistrict as many as 36 people and from Batang Subdistrict as many as 27 people. Respondents were farmers who directly and actively worked in jasmine flower cultivation activities. Identity of respondents taken included age, level of education possessed, farming experience and land area used to cultivate jasmine flower plants. Respondent identity is presented in Table 1, as follows:

Table 1. Identity of Jasmine Flower Farmers in Batang Regency

No	Component	Note	Count	Percentage
		-----Year-----	----Person----	-----%-----
1.		20 - 29	2	3.17
2.		30 - 39	5	7.94
3.	Age	40 - 49	18	28.57
4.		50 - 59	12	19.05
5.		60 - 69	23	36.51
6.		> 70	3	4.76
		----- Level -----	----Person----	-----%-----
1.		High school	5	7.944
2.		Junior high school	6	9.52
3.	Education Level	Elementary school	36	57.14
4.		Elementary drop out	11	17.46
5.		No formal education	5	7.94
		------Year-----	----Person----	-----%-----
1.		< 10	5	7.94
2.		10 - 19	10	15.87
3.	Experience in Agribusiness	20 - 29	16	25.40
4.		30 - 39	17	26.98
5.		> 40	15	23.81

Source: Primary Research Data, 2018.

Based on the table above, the majority of farmers' ages are 60 - 69 years old, or elderly farmers. Farmers of this age generally do not have other employment choices, and must meet the needs of their lives and families. According to Dewi *et al*. (2017) farmers continue to work in old age because they have no pension (retirement) funds. The majority of the education levels of jasmine farmers are low, namely graduating from elementary school (SD). Lack of knowledge makes it difficult for farmers to deal with problems such as effective and efficient cultivation methods, handling irrigation, processing post-flash flood land, post-harvest handling and the mechanism of the sales process. Most of the respondents have carried out jasmine flower farming activities for 30 - 39 years. The main reason for jasmine flower farmers to run their business for a long time is because from an early age these farmers have helped their parents manage jasmine flower fields and later become successors.

3.3 Production and Productivity of Jasmine Flower

Batang Regency is the center of jasmine flowers production and production in Central Java and in Indonesia. Data on production and harvested area of jasmine flowers in Batang, Central Java, and Indonesia in the years between 2015 and 2017 are presented in Table 2.

Table 1. Crop Area and Production of Jasmine Flower, 2015-2017

No.	Crop Area/Year	Batang	Central Java	Indonesia
1.	Crop area (m^2):			
	1915	3,999,960	15,600,293	16,195,126
	1916	3,717,460	14,715,183	15,196,235
	1917	3,514,999	11,998,387	12,836,607
2.	Production (kg):			
	1915	13,487,431	27,790,759	31,597,698
	1916	12,046,047	27,521,237	31,183,991
	1917	8,347,438	20,600,849	24,514,175

Source: BPS Provinsi Jawa Tengah, 2018.

Table 2 shows that the contribution of jasmine flower production in Batang Regency to jasmine flower production in Central Java Province from 2015 to 2017 was 48.53%, 43.77%, 40.52% respectively, while the contribution to Indonesian production was 42 , 68%, 38.63% and 34.05% respectively. The data in the table shows that the proportion of Jasmine flower production in Kabupaten Batang has declined over time, due to the increasing production of jasmine flowers originating from outside the Batang Regency. Of the 15 districts in Batang Regency, two districts, namely Batang and Kandeman districts, are the biggest contributors of jasmine flower crops. Jasmine flower farming in Batang Regency, viewed from a technological aspect, still uses traditional cultivation methods. In traditional cropping patterns, the principles of economic principles have not been implemented optimally, while on the other hand the position and bargaining power of farmers in the marketing system of their products are still relatively weak. In general, jasmine flower farmers still sell their crops to the market through intermediary traders, and very rarely deal directly with consumers. This condition results in low income obtained by jasmine flower farmers.

Based on the results of the study, the average scale of jasmine flower farming in Batang Regency is 0.499 ha/farmer with jasmine flower productivity of 2.793.86 kg/year, which is equivalent to 5,598.92 kg/ha/year. These values are higher compared to the results of research conducted by the Institute of Agricultural Technology Assessment (2012) which states that jasmine flower production in Batang Regency is 5-6 tons/ha.

3.4 Factors Affecting Jasmine Flower Agribusiness Production in Batang Regency

Factors affecting jasmine flower production were analyzed by multiple linear regression models, with dependent factors (Y = jasmine flower production) and independent variables consisting of age (X1), educational background (X2), number of family dependents (X3), business experience (X4), land area (X5), cropping pattern (X6), land status (X7), production goal (X8), production period (X9), selling price (X10). Classic assumption test consisting of normality test, autocorrelation, multicollinearity and heteroscedasticity carried out prior to conducting factor analysis.

3.5 Classical Assumptions

The classic assumption is an assumption that must be fulfilled in order to meet the BLUE (Best Linear Unbiased Estimator) criteria in the use of multiple linear regression models. The classic assumption is made to ensure that data is not biased. The classic assumptions consist of:

3.5.1 Normality Test

Normality test is a test used to determine whether the variables used in the regression have been normally distributed or not. Based on the normality test with *Kolmogorov-Smirnov* (K-S) method, it can be seen that the value of Asymp.Sig. (2-tailed) is 0.066, which indicates that the variables used in the study had been normally distributed. This is in accordance with Santoso (2010) statement, that any data can be declared normal if the significance value is> 0.05.

3.5.2 Autocorrelation Test

Autocorrelation test of research data using SPSS produces the following output:

Table 1. Durbin Watson, Durbin Upper and Durbin Lower Values

No.	Subject	Value
1.	Durbin Watson (DW) Value	1.880
2.	Durbin Upper (dU) Value	1.971
3.	Durbin Lower (dL) Value	1.249

Source: Primary Research Data (Processed), 2018.

The autocorrelation test was used to test whether there was a correlation between error interference in period I and in the t-I period. The parameter used in the autocorrelation test is Durbin Watson (DW). Based on the table above, the Durbin Watson (DW) value obtained is 1.880, while the dU value is 1.971, the value of dL is 1.249 and the value (4 - DW) = 2.12. From the determination of the autocorrelation test, a value (4 - DW)> dU is produced; 2.12> 1.971, which indicates a situation where there is no negative autocorrelation.

3.5.3 Multicollinearity Test

Multicollinearity test of research data using SPSS produces the following output:

Table 2. Tolerance and VIF Values

No.	Variables	*Tolerance*	VIF
1.	Age	0,585	1,710
2.	Education background	0,822	1,217
3.	Number of dependents	0,784	1,275
4.	Experience in agribusiness	0,575	1,740
5.	Land area	0,760	1,316
6.	Cropping pattern	0,884	1,131
7.	Land status	0,852	1,174
8.	Production goal	0,931	1,074
9.	Production period	0,907	1,103
10.	Selling price	0,762	1,312

Source: Primary Research Data (Processed), 2018.

Multicolonierity test was used to ascertain the existence of intercorrelation or colinearity between independent variables used in multiple linear regression tests. Based on the tests that have been done, the output is obtained that all variables have a tolerance value of 1 0.1 and VIF value ≤ 10, which indicates that multicollinearity does not occur.
This is in accordance with the explanation of Supriyadi *et al.* (2014) which states that the identification of multicollinearity can be seen from the value of VIF; if the VIF value is <10, it can be concluded that multicollinearity does not occur.

3.5.4 Heteroscedasticity Test

Based on heteroscedasticity test, it is known that the points inside it spread randomly on the X axis and Y axis without forming a certain pattern, so it can be concluded that heteroscedasticity does not occur. This is in accordance with the explanation of Supriyadi *et al.* (2014) which states that if on a scatterplot graph the spread of data points does not form a certain pattern and data points spread above and below or close to 0, and data points do not gather just above or below, then it can be concluded that heteroscedasticity does not occur on the data.

3.6 Multiple Linear Regression Test Results

Multiple linear regression test is a test conducted to determine the influence between the independent variable and the dependent variable. According to Janie (2012), multiple linear regression models assume the existence of a single or line relationship between the dependent variable and each of its predictor.

Based on multiple linear regression tests, the independent variables include age (X1), education level (X2), number of family dependents (X3), farming experience (X4), land area (X5), cropping pattern (X6), land status (X7) , produciton goal (X8), production period (X9) and selling price (X10) with the yield of jasmine flower (Y) having the effect described in the following equation:

$$Y = -11{,}060 - 0{,}290\,X_1 + 0{,}103\,X_2 + 0{,}105\,X_3 + 0{,}144\,X_4 + 0{,}550\,X_5 - 0{,}123\,X_6 + 0{,}156\,X_7 - 1{,}075\,X_8 + 0{,}485\,X_9 + 1{,}933X_{10} \quad (1)$$

Based on the equation above, it can be seen that the variable level of education, number of family dependents, farming experience, land area, land status, planting period and selling price have positive coefficient values, so if the use of variables is increased by one unit the production will also increase by 0.103 kg, 0.105 kg, 0.144 kg, 0.550 kg and 0.156 kg, 0.485 and 1.933 for each variable respectively. Age, cropping pattern and production goal have a negative coefficient value, so that if there is an increase of 1 unit on each variable, it will reduce the yield of 0.290 kg, 0.123 kg and 1.075 kg for each variable respectively.

3.7 F Test Results

The F test is used to determine the effect of all independent variables on the dependent variable simultaneously. Based on the multiple linear regression test that has been done, the output value of F calculated is 10,567 with (F count> F table = 10,567> 2,02) at the level and significance value of 0,000 with (sig. F < α = 0,000 < 0,05), so that it can be said that there is a simultaneous influence between age, education, number of family dependents, farming experience, land area, cropping pattern, land status, production goal, production period and selling price of production received by farmers. These results are in line with the elaboration of Alfiani et al. (2018) regarding the decision-making criteria for the F test, which states that if the significance level is F <0.05, it is concluded that simultaneously there is a significant effect between the independent variables and the dependent variable.

3.8 t Test Results

The research data was put into t test using SPSS and produces the following output:

Table 2. T Test Results

No.	T Test Component	T Count	Significance
1.	Contant	-1,580	0,120
2.	Age	-0,753	0,455
3.	Education background	0,766	0,447
4.	Number of dependents	0,660	0,512
5.	Experience in agribusiness	1,153	0,254
6.	Land area	6,405	0.000*
7.	Cropping pattern	-0,365	0,717
8.	Land status	0,623	0,536
9.	Production goal	-0,718	0,476
10.	Production period	1,515	0,136
11.	Selling price	2,857	0.006**

Source: Primary Research Data (Processed), 2018.
Note:
* = 0.01 significance
** = 0.1 significance

The t test aims to determine the partial influence of the independent variable on the dependent variable. Based on Table 4, the results of the t test for each variable are as follows:

- Age variable (X1) has a value of t count - 0.753 (t count> t table = - 0.753 <1.675) and a significance value of 0.455 (p <0.1 = 0.455> 0.1), which indicates that the age of the farmer has no influence significant to the yield of jasmine flowers.
- The education level variable (X2) has a t count of 0.766 (t count> t table = 0.766 <1.675) and a significance value of 0.447 (p <0.1 = 0.447> 0.1), which indicates that the level of education does not have a significant effect towards production.
- The variable number of family dependents (X3) has a value of t count 0.660 (t count> t table = 0.660 <1.675) and a significance value of 0.512 (p <0.1 = 0.512> 0.1), which indicates that the number of family dependents has no influence which is significant for the yield of jasmine flowers.
- Farming experience variable (X4) has a value of t count 1.153 (t count> t table = 1.153 <1.675) and a significance value of 0.254 (p <0.1 = 0.254> 0.1), which indicates that farming experience has no significant effect towards the yield of jasmine flowers.
- The land area variable (X5) has a t count of 6.405 (t count> t table = 6.405> 2.674) and a significance value of 0.000 (p <0.01 = 0,000> 0.01), which indicates that the land area has a significant effect on jasmine flower production results, so the more land area used, the higher the yield of jasmine flowers. The above results are in line with the findings of Andrias *et al.* (2017) which states that the land area is equivalent to the yield and farm income.

- Cropping pattern variable (X6) has a value of t count - 0.365 (t count> t table = - 0.365 <1.675) and a significance value of 0.717 (p <0.1 = 0.717> 0.1), which indicates that cropping patterns does not have a significant for production.
- The land status variable (X7) has a value of t count 0.623 (t count> t table = 0.623 <1.675) and a significance value of 0.536 (p <0.1 = 0.536> 0.1), which indicates that the status of the land does not have a significant effect on production yield.
- The production objective variable (X8) has a value of t count - 0.718 (t count> t table = - 0,718 <1,675) and a significance value of 0.476 (p <0.1 = 0.476> 0.1), which indicates that the production goal does not have a significant effect on the yield of jasmine flowers.
- The planting period variable (X9) has a value of 1.515 t (t count> t table = 1.515 <1.675) and a significance value of 0.136 (p <0.1 = 0.136> 0.1), which indicates that the planting period does not have a significant effect towards production.
- The selling price variable (X10) has a value of t count 2.857 (t count> t table = 2.857> 1.675) and a significance value of 0.006 (p <0.1 = 0.006 <0.1), which indicates that the selling price has a significant effect on the production of jasmine flowers. This is because the selling price of jasmine flowers often fluctuates. Price changes are related to seasonal changes, religious anniversary days and the time for the holding of traditional activities such as celebrations.

3.9 Determination Coefficient Results

The coefficient of determination test is used to determine the magnitude of the influence between independent variables and the dependent variable. Based on the tests that have been done, the output coefficient of determination (Adjusted R square) is 0.67, which means that as much as 67% of the dependent variable, the level of jasmine flower production, is influenced by independent variables (age, education level, number of family dependents, land area, crop pattern, land status, production goal, planting period and selling price). Another factor affects the dependent factor by 33%.

4 Conclusions

Based on the results and discussion, it can be concluded as follows:

1. The average scale of jasmine flower farming in Batang Regency is 0.499 ha/farmer, with a productivity level of 2.793.86 kg/year, equivalent to 5,598.92 kg/ha/year.
2. Age, educational background, number of family dependents, farming experience of farmers as well as land area, cropping pattern, land status, production goals, production period and selling prices of production together have a very significant effect on jasmine flower production in Batang Regency.

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