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DETERMINING FACTORS AND INDICATORS FOR ALTERNATIVE MODEL OF NATIONAL SOYBEAN PRODUCTION ENHANCEMENT

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Abstract

This research surveys, interviews and Questionnaire were conducted by relevant agencies. Data was analyzed by calculating the cumulative frequency distribution and the average value (Mean) to 5 Likert scale, Validation, reliability, Pattern Model and Hypothesis were analyzed by SPSS 17 software for Windows. Validity model and the Measurement Model were examined by using Smart software PLS. The results show that the mean was 3.98 for Product Cost Appropriate and Stable Factor, 4.39 for High Productivity Factor, 4.36 for Enough Capital Factor, 3.73 for Character Farmers Factor, 4.28 for Information Access Factor, and 4.44 for High Production Factor. The data were valid and reliable. The relationship between the factors and indicators show strong correlation with an average of 0.96 with model pattern Quadratic and Cubic. Test Goodness of Fit model was fit. Hypothesis test results with five independent variables and one dependent variables were significant, excepted Character Farmers Factor and Information Access Factor were not significant to High Production Factor. Model was able to explain the phenomenon of high production by 91.7%, while the rest (8.3%) was explained by other variables not included in the model under studied. Enhancement production of national soybean would be affected dominantly by sufficient capital (97%).

Keywords: Factors, Indicators, Model, Alternative, Production, Enhancement, National soybean.

1. Introduction

Food Policy Analysis is an important step for researchers, policy makers and stakeholder to determine how to get better understanding of obstacles to food

Nomenclatures

Communality	The contribution of each indicator against the factor
df	Degree of fredom
Mean	Average value
N	Sample amount
Outer Loading	Contributing an indicator reflective to variable
Outer Weight	Contributing an indicator formative to variable
PLS	The name of software for model analize and hipotesis
Prokema	The name of a program to increase the production of soy
R	Relationship between each independent on dependent variable
Reliable	Able to trusted
Rupiahs	Indonesian currency
Significant	Factor influence toanother factor
SPSS	The name of software for data analyze
Valid	Able to be accepted
X1	Product Cost Appropriate (HPP) and Stable Factor (Independent Variabel)
X2	High Productivity Factor (Independent Variabel)
X3	Enough Capital Factor (Independent Variabel)
X4	Character Farmers Factor (Independent Variabel)
X5	Information Access Factor (Independent Variabel)
Y	High Production Factor (Dependent Variable)

Abbreviations

AVE	Average Variance Extract in variable
Gapoktan	Association of Farmers group leader
HPP	Cost of Sold Product
Kapoktan	Chairman of Farmers Group
PLS	Partial Least Square
SPSS	Statistical Package for the Social Sciences

security in region, by taking appropriate policies [1]. Soybean is a strategic food commodity In Indonesia, at third rank below rice and maize, because every day it is consumed by almost all communities. Approximately 50% soybean is used as raw material for tempeh, 33% as raw material of tofu that well-known in Indonesia society and used for other production, such as animal feed, milk, taco, soy, and other foods [2].

Various policies had been carried out as National Soybean Prokema 2000, Soybeans Rose Program National 2008, the Strategic Plan of Ministry of Agriculture from 2010 to 2014 regarding the achievement of self-sufficiency in soybeans in 2014, protection policy and the basic price as well as the price of soybean import tariff policies, the impact were not significant to the dependence soybean imports [3]. When the program increased production of soybeans was not responded by the farmer, the national soybean production would continue to decline, but the need would increase from 2 million tons in 2008 become about 2.6 million tons in 2020 [4].

2. Experimental Procedure

The study was conducted by surveys, interviews and questionnaire. Samples were taken from the relevant agencies, namely the Department of Agriculture crop, Soybean Farming Group of Jember and Banyuwangi in the form of primary data. Samples for Banyuwangi were 12 persons and for Jember were 15 persons, where 1 Gapoktan (Association of Farmers group leader) has the responsibility to 10 Kapoktan (Chairman of Farmers Group) and Kapoktan have responsibility to at least 50 farmers in the village. Research was conducted in September until December 2014. Secondary data was obtained from the road map and previous relevant research, among others, from the Central Bureau of Statistics and the Ministry of good agricultural field crops at the district, provincial and national levels as well as their respective web agencies and public web. Factors and related indicators were analyzed with fish bone diagram as the result of research or recommendation of previous researchers. The data was analyzed with 5 Likert scale by calculating the cumulative frequency distribution and average value (Mean), Validation and reliability test, and hypothesis test was conducted by using SPSS 17 software for Windows to test the measurement model. The model validity was tested by Smart PLS ver. 2.0 M3 software.

3. Theory

The model was defined as a representation or manifestation of a series objects or ideas in form of certain mathematical or logical relationship [5]. A model was defined as a representation of a system for the purpose of learning the system [6]. The production aims to meet human needs in order to achieve prosperity. Prosperity can be achieved if goods and services are available in sufficient quantities [7].

4. Result and Discussion

4.1. The model

The model proposed of fish bone diagram as analysis results of factors and indicators was described in Fig. 1.

4.2. Descriptive analysis results

4.2.1. Product cost appropriate and stable factors (HPP / X1)

Table 1 shows the results of respondents' answers value for frequency distribution of each indicator and mean value. The total average value was 3.98. It means the respondent agrees that four indicators of HPP factors were stable and appropriate.

4.2.2. High productivity factor (X2)

Table 2 shows the results of respondents' answers value for frequency distribution of each indicator and mean value. The total average value was 4.39. It means the respondents agree that four indicators of productivity variable were high.

4.2.3. Enough capital factor (X3)

Table 3 shows the results of respondents' answers value for frequency distribution of each indicator and mean value. Total average value was 4.36. It means the

respondents agree that five indicators of variable capital sufficient were high.

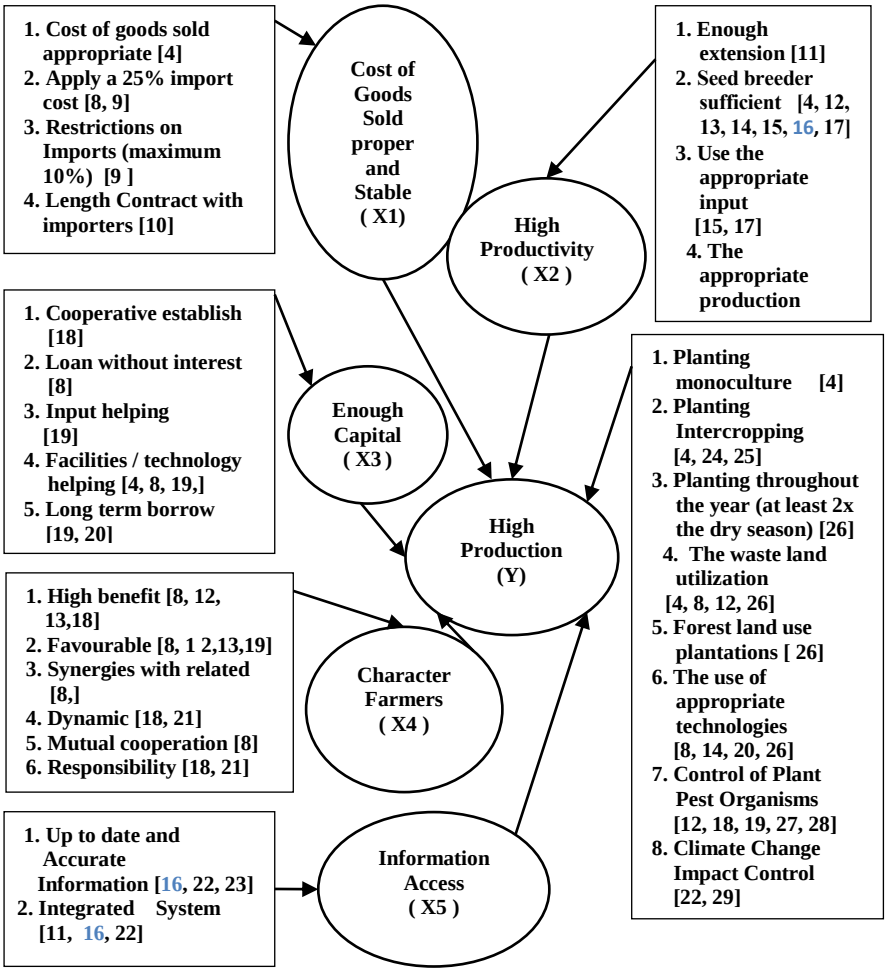

Fig. 1. Alternative model of national soybean production enhancement.

Table 1. Indicators description of product cost appropriate and stable factor.

X1	Respondent's Answer										Mean
	1		2		3		4		5		
	f	%	f	%	f	%	f	%	f	%	
X1.1	0	0	1	2.381	1	2.381	14	33.33	26	61.9	4.55
X1.2	0	0	7	16.67	4	9.524	13	30.95	18	42.86	4
X1.3	0	0	0	0	4	9.524	12	28.57	25	59.52	4.4
X1.4	0	0	16	38.1	16	38.1	5	11.9	5	11.9	2.98
Mean of HPP Appropriate & Stable											**3.983**

Table 2. Indicators description of high productivity factor.

X2	Respondent Answer										Mean %
	1		2		3		4		5		
	f	%	f	%	f	%	f	%	f	%	
X2.1	0	0	1	2.381	3	7.143	16	38.1	22	52.38	4.4
X2.2	0	0	1	2.381	5	11.9	15	35.71	21	50	4.33
X2.3	0	0	1	2.381	6	14.29	12	28.57	23	54.76	4.36
X2.4	0	0	0	0	6	14.29	10	23.81	26	61.9	4.48
Mean high productivity											**4.393**

Table 3. Indicators description of enough capital factor.

X3	Respondent Answer										Mean %
	1		2		3		4		5		
	f	%	f	%	f	%	f	%	f	%	
X3.1	0	0	1	2.381	9	21.43	9	21.43	23	54.76	4.29
X3.2	0	0	1	2.381	5	11.9	14	33.33	22	52.38	4.36
X3.3	0	0	1	2.381	4	9.524	11	26.19	26	61.9	4.48
X3.4	0	0	2	4.762	5	11.9	13	30.95	22	52.38	4.31
X3.5	0	0	1	2.381	3	7.143	13	30.95	25	59.52	4.48
Mean of enough capital											**4.36**

4.2.4. Soybean farmer character factor (X4)

Table 4 shows the results of respondents' answers value for frequency distribution of each indicator and mean value. The average total value was 3.73. It means the respondents agreed that six indicators of Character Farmers factor were high.

Table 4. Indicators description of factor character farmers.

X4	Respondent Answer										Mean %
	1		2		3		4		5		
	f	%	f	%	f	%	f	%	f	%	
X4.1	0	0	2	4.762	4	9.524	7	16.67	29	69.05	4.5
X4.2	0	0	2	4.762	4	9.524	6	14.29	30	71.43	4.52
X4.3	0	0	27	64.29	7	16.67	4	9.524	4	9.524	2.64
X4.4	0	0	14	33.33	11	26.19	8	19.05	9	21.43	3.29
X4.5	0	0	2	4.762	2	4.762	11	26.19	27	64.29	4.5
X4.6	0	0	0	0	3	7.143	12	28.57	27	64.29	4.57
Mean of farmer character											**3.738**

4.2.5. Soybean information access (X5)

Table 5 shows the results of respondents' answers value for frequency distribution of each indicator and mean value. The total average value was 4.28. It means the respondent agree that two indicators of Information Access were high.

Table 5. Indicators description of factor information access.

X5	Respondent Answer										Mean %
	1		2		3		4		5		
	f	%	f	%	f	%	f	%	f	%	
X5.1	0	0	0	0	3	7.143	13	30.95	26	61.9	4.55
X5.2	0	0	5	11.9	6	14.29	14	33.33	17	40.48	4.02
Mean of formation access											**4.285**

4.2.6. High production (Y)

Table 6 shows the results of respondents' answers value for frequency distribution of each indicator and mean value. The total average value was 4.44. It means the respondent agree that eight indicators of high production variable were high.

Table 6. Indicators description of high production factor.

Y	Respondent Answer										Mean %
	1		2		3		4		5		
	f	%	f	%	f	%	f	%	f	%	
Y1.1	0	0	0	0	0	0	17	40.48	25	59.52	4.6
Y1.2	0	0	0	0	0	0	23	54.76	19	45.24	4.45
Y1.3	0	0	0	0	0	0	25	59.52	17	40.48	4.4
Y1.4	0	0	0	0	7	16.67	15	35.71	20	47.62	4.31
Y1.5	0	0	0	0	7	16.67	14	33.33	21	50	4.33
Y1.6	0	0	0	0	4	9.524	7	16.67	31	73.81	4.64
Y1.7	0	0	0	0	6	14.29	15	35.71	21	50	4.36
Y1.8	0	0	0	0	7	16.67	15	35.71	20	47.62	4.31
Mean of high production											**4.44**

4.3. Analysis of results of validity, reliability and trend model

Table 7 describes that all indicators shows the calculated value's correlation r >0.3932. Therefore, all indicators were valid. Cronbach's Alpha values were above 0.60. It means that all instruments were valid and reliable.

R-tables were taken from the table-r (Simple Correlation Coefficient) for the value of N = 42 and df = N - 2 = 40 with error 0.01 (1%).

Table 8 shows that the model follows the non-linear pattern.

Table 7. Result test of validity and reliability.

Factors	Correlation	Validity	Reliability
X1	0.848	Valid	Reliable
X2	0.896	Valid	Reliable
X3	0.967	Valid	Reliable
X4	0.965	Valid	Reliable
X5	0.958	Valid	Reliable
Y	0.959	Valid	Reliable

Table 8. Result test of trend model.

Factors	R Square	Equation
X1	0.902	Compound, Growth, Exponential and Logistic
X2	0.006	Quadratic and Cubic
X3	0.946	Cubic
X4	0.018	Quadratic and Cubic
X5	0.017	Cubic
Y	0.006	Quadratic and Cubic

4.4. Evaluation results measurement model

This research uses 6 latent factors, one was formative (Y Factor) and another five latent factors were reflective (X Factor). Indicators of reflective character were determined by Outer loading measurement, while indicators of formative character were determined by Outer weight measurement. Model measurement was conducted by using Smart PLS software version 2.0 M3.

Table 9 shows that the most dominant indicator as a reflection of appropriate and stable HPP was the imposition of import restrictions (max. 10%), with a value of 0,951 Outer Loading. It means that addition of an indicator towards the latent variable was 95.1% and the weak was the enactment of long-term contracts (5 years) with importers.

Table 10 shows that the high productivity variable was an indicator of counselling to improve the productivity at 0.917. Outer Loading contributed to value of latent variable indicator up to 91.7%.

Table 11 shows that the dominant indicator as a reflection of adequate capital variable was Long-term loans at low interest rates with 0.976 Outer Loading value. It means that the indicator contributed 97.6% towards the latent variable.

Table 9. Outer loading of X1 indicators.

Indicators	Outer Loading
Base Price Market (HPP) appropriate and stable	0.924
imposition of import at least 25	0.935
Imposition of import restrictions (max. 10%)	0.951
Entry contract length (5 years) with importers	0.572

Table 10. Outer loading of X2 indicators.

Indicators	Outer Loading
Counseling can increase productivity	0.917
Sufficient availability of seed of improved seed and will increase productivity	0.495
Use of inputs (types of seeds, fertilizers and pesticides) which accordingly will improve productivity	0.284
Production engineering (soil treatment, drainage channels, plant spacing, fertilization, pest control and weeding) is right and appropriate to increase productivity	0.770

Table 11. Outer loading of X3 indicators.

Indicators	Outer Loading
Cooperatives can add capital	0.960
Long-term borrowing at low interest rates can raise capital	0.976
Input subsidies can reduce production costs	0.964
Subsidies facilities / production technology can reduce the cost of production	0.972
Loan without interest can raise capital	0.964

Table 12 shows that the most dominant indicator as a reflection of soybean farmer's character was farmer's willingness to plant soybeans because it's dynamic with 0.930 as the value of Outer Loading. It means that the indicator contributed 93.0% towards the latent variable.

Table 13 shows that the most dominant indicator as a reflection of information access variable was access to integrated system information to facilitate farming industry with 0.983 as the value of Outer Loading. IT means that the indicator contributed 98.3% towards the latent variable.

Table 14 shows that the most dominant indicator of high production variable were plant throughout the year toincrease production with 0.110 as the value of Outer Weight. It means that the indicator contributed 89% towards the latent variable.

Table 12. Outer loading of X4 indicators.

Indicators	Outer Loading
Farmers want to plant soybeans because many benefits	0.873
Farmers want to plant soybeans because quite profitable	0.849
Farmers want to plant soybeans because it can synergize	0.734
Farmers want to plant soybeans because of dynamic	0.930
Farmers want to plant soybeans because it can work together	0.889
Farmers want to plant soybeans because it is responsible.	0.911

Table 13. Outer loading of X5 indicators.

Indicators	Outer Loading
Information up to date/date and accurate will facilitate farming	0.928
The integrated system will facilitate farming	0.983

4.5. Model validation

To understand the validity of a model, because it was formed by the indicator correlation of a factor with the other factor, it was necessary to do Cross Loading by eliminating the invalid indicators then executing the variables through the PLS-Algorithm.

Table 15 shows that AVE value for 5 reflective factors were above 0.5. These mean that the model was quite good. The results are shown in the following table:

Table 14. Outer weight of Y indicators.

Indicators	Outer Weight	*p value*
Planting monoculture / single will generate high production.	0.137	0.000
Planting intercropping /at least 2 will increase production	0.118	0.000
Plant throughout the year will increase production	0.110	0.000
Utilization of abandoned land will increase production	0.145	0.000
Land use forestry, plantation and others will increase production	0.147	0.000
The use of technology on the right to be able to increase production	0,140	0.000
Control of plant pests can increase production	0.149	0.000
Controlling the impact of climate change could increase production	0.149	0.000

Table 15. Value of average variance extract (AVE) in variable.

Factor	AVE
HPP appropriate and stable	0.740
High productivity	0.439
Sufficient capital	0.936
Character soybean farmers	0.751
Information Access	0.915
High production	0.829

4.6. Goodness of fit test results

The study model was fit. It was supported by empirical data. Structural models was tested by looking at the percentage of explained variants, that is by looking at the R-square value of dependent latent variables and by using the size Stone-Geisses Q square test for predictive relevance and goodness of fit (GoF). The values of R for the endogenous variables were shown in Table below.

Table 16 shows that the model was able to be explained the phenomenon of high production by 91.7%, while the rest (8.3%) was explained by other variables was not included in the model under study.

Table 16. Value of R square.

Endogen Variable	R Square (R^2)
High production	**0.917**
Predictive-relevance *(Q^2)*	**0.917**

Table 17 shows the results of average communality and the average R^2. The numbers were entered into the formula with the following results: $GoF = \sqrt{}$ (0.917 x 0.755) = 0.832. In accordance with the calculation results at the top, obtained by 0,832. GoF value means that this study model was consistent with the required index value, ie 0 < GoF <1. **So the model was declared fit.**

Table 17. Goodness of fit model test.

Variable	Communality	Communality Average	*R Square*
HPP appropriate and stable	0.739	0.755	
High productivity	0.437		
Sufficient capital	0.935		
Character soybean farmers	0.751		
Access to information	0.913		
High production			0.917

4.7. Hypothesis test results

Ho: There was a relationship between High Production (Y) and variables (Xn).
Ha: There was no relationship between High Production (Y) and variables (Xn).

Null hypothesis (Ho) was accepted if the significance of chi-square value <0.05 or the chi-square value is greater (>) than chi-square value in tables. Hypothesis testing results with a confidence level of 95% were shown below.

1. Reasonable and stable sales prices affect the amount of farmer production.
2. High productivity affects on the production amount.
3. Sufficient capital affects the production amount.
4. The character of national soybean farmers (Indonesia) did not affect on production amount.
5. Access to information did not affect on production amount.

Table 18. Testing results of direct impact.

	X^2Count	X^2Table	Information
HPP appropriate stable → high production	196.463	113,1427	significant
High productivity->High production	152.114	106,395	significant
Sufficient capital->High production	237.417	135,480	significant
Character soybean farmers -> High production	117.686	157,610	Not significant
Access to information->High production	76.738	79,082	Not significant

4.8. Discussion

Table 18 indicates that the Farmers character and access information variable did not affect on high production result although each indicators individually showed a great contribution, as indicated on table 12 and 13. The test results Character Farmer Variable (X4) and Access to Information Variable (X5) against High production Variable (Y) show higher contribution, respectively 86% and 96%, but if X4 and X5 variables were coupled with other variables (X1, X2 and X3) , these were impact / contribute to high production variable

(Y). The model, according to an analysis of researchers, is in accordance with the conditions on the ground / real statement diverse farmer from to 6 indicators for farmers character variable character variable Soybean Farmer (X4), in order to obtain the average value of only 3, 73 compared with other variables above the value of 4.3, this was in accordance with the .conditions that existed at the soybean farmers, for the character it means that the farmers planting soybean was a choice and for information access (X5) as has been stated on the previous page to access information even while the average farmer statement in writing the average value of 4.2 but verbally farmers said that they already feeling smoothly with existing information systems by using letters, phone calls and short messages (SMS). The dominant influence on the national soybean production was enough capital (X3), these were in accordance with the conditions that existed at the soybean farmers, that they needed cooperative establish, loan without interest, input helping, Facilities / technology helping and long term loan. In the previous research studies had not been done in an integrated manner for each factor as well as for each of indicators, but research carried out partially and even then for each indicator.

5. Conclusion

This research had been conducted by five independent variables with 21 indicators and one dependent variable with 8 indicators. This study found a model to increase the national soybean production (Indonesia). This model used of names of variables and indicators that had not been used in industrial engineering disciplines for this research was based on the real conditions in agriculture, especially national soybean (Indonesia). Armed with the science which studied industrial engineering an integrated system, researchers develop theoretical modeling of system to solve the problems of increased production, especially national soybean production (Indonesia). The research results can be summarized below.

- Respondents agree and strongly agree that six factors with 29 indicators can be used for production model to increase national soybean.
- Data declared valid and reliable. The correlation of each factor and indicator were very strong with average value of 0.96.
- Each factors and indicators have a pattern/trend Quadratic and Cubic except X1 follows the pattern of Compound, Growth, Exponential and Logistic.
- Three factors (independent variables X1, X2 and X3) had a relationship with the dependent variable Y and the two factors (X4 and X5) did not have a relationship with the dependent variable (Y).
- Model was able to explain the phenomenon of high production by 91.7%, while the rest (8.3%) was explained by other variables outside the model under study.
- Sufficient capital (X3) was dominant (97%) to affect production enhancement of national soybean.

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