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The Influence of Farmers Satisfaction on Fertilizer Distribution, Production Factor, Production and Farmers Income in Supporting Food Security Systems in Pinrang District, South Sulawesi

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ABSTRACT: Fertilizer is the main agricultural production facility needed by farmers in carrying out farming activities. This study aims to determine whether the satisfaction of rice farmers with: Accuracy of Fertilizer Distribution, Farm Production Factors, Production and Farmers' Income has been fulfilled properly in supporting the Food Security System in Pinrang Regency. This research is intended to obtain a description (descriptive), to determine the relationship between variables through hypothesis testing (verification) on the satisfaction of rice farmers. The method used is a descriptive survey and an explanatory survey. Primary data totaling 200 (two hundred) respondent farmers and secondary data sourced from various agencies in the agricultural sector. From the results of statistical tests and according to the existing models, simultaneously the hypotheses H1, H2 and H4 are proven to be quite strong and the H3 hypothesis is not strong enough to meet farmers' satisfaction in supporting the Food Security System. It is concluded that, the effect of farmer satisfaction on the accuracy of distribution of fertilizers has a strong enough effect in supporting the Food Security System, has a strong enough effect on the Farm Production Factor, is not strong on the Farm Production Factor and the Food Security System. This is due to the influence of other production factors such as weather conditions, capital, agricultural equipment (error variance) which were not tested in this study. So it is necessary to optimize fertilizer distribution services and increase the availability of other production factors in supporting the Food Security System.

KEYWORDS: Farmer Satisfaction, Distribution of Fertilizer, Food Security System.

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I. INTRODUCTION

A. Background

Indonesia is an agricultural country with the majority of the population carrying out activities in the agricultural sector. This is supported by adequate natural resources reach agricultural land of 13 million hectares. The number of farmers is 36 million people out of 267 million population or as much as 13.5% and it is the fourth most populous country out of 7.7 billion people in the world present. Agricultural development has an important and strategic role, especially in the field of food crops that can support the life of the population. With a large population and a growth rate of 1.3% per year and a rice consumption rate of around 139 kg per capita, it requires a fairly large demand for rice, more than 35 million tons/year. Thus, increasing rice production must be carried out in order to ensure food availability through a strong food security system. So important is the rice commodity that it has become the government's main policy in achieving national development goals. Indonesia was a pioneer in the green revolution that boosted rice production in the 1960s. As a result, it was able to improve the welfare of the population and reduce the poverty rate significantly and food security also continued to increase until rice self-sufficiency was achieved in 1984 (Salama A, 2018: 2).

The distribution of fertilizer in South Sulawesi began to develop in 1979 and in 2013 with the existence of "Regulation of the Minister of Trade of the Republic of Indonesia No. 15/M-DAG/PER/4/2013, concerning: Procurement and Distribution of Subsidized Fertilizer for the Agricultural Sector ", the government appointed PT. Pupuk Indonesia Holding Company (PIHC) is responsible for distributing subsidized fertilizers through authorized distributors and retailers in districts and sub-districts based on the fertilizer sale and purchase agreement (SPJB) and according to the Group Needs Basic Plan. Fertilizer retailers are responsible for distributing subsidized fertilizers below the Highest Retail Price received by farmers. With a distribution system regulated through producers, it is hoped that farmers will be able to increase their production.

South Sulawesi Province is known as a national food storage area and the largest contributor to the national rice stock. Rice production continues to increase, in 2014 as much as 5.3 million tons of milled dry unhulled rice, higher than in 2013 which was 4.9 million tons. This production was obtained from the harvest area of 1,001,761 hectares in 2014, an increase from the harvest area in 2013 of 952,048 ha, with an average productivity of 5.2 tonnes / ha. The eastern sector includes the regency of: Bone, Soppeng, Wajo, Sidrap, Pinrang and Luwu (Bosowasipilu) which provide the largest contribution to rice production with a land area of 399,180 hectares from 613,580 hectares of total irrigated productive rice fields. The potential for rice production and productivity is shown in the following table:

Table 1. Area of Harvest, Production and Productivity of Rice in the Bosowasipilu Area, South Sulawesi in 2017

No	Regency / City	Harvested Area/ha	Production/ton	Productivity/ha
1.	Bone Regency	170.238	809.402	4.755
2.	Soppeng Regency	38.568	225.248	5.840
3.	Wajo Regency	124.739	619.693	4.968
4.	Sidrap Regency	83.075	534.473	6.434
5.	**Pinrang Regency**	**101.384**	**654.290**	**6.454**
6.	Luwu Regency	61.898	305.151	4.930
7.	North Luwu Regency	38.940	178.243	4.577
8.	East Luwu Regency	23.264	102.913	4.424
	Total	**642.106**	**3.429.413**	**5.340**

(Source: BPS-South Sulawesi Province, 2018)

(Source: South Sulawesi Provincial Agriculture Office, 2020)

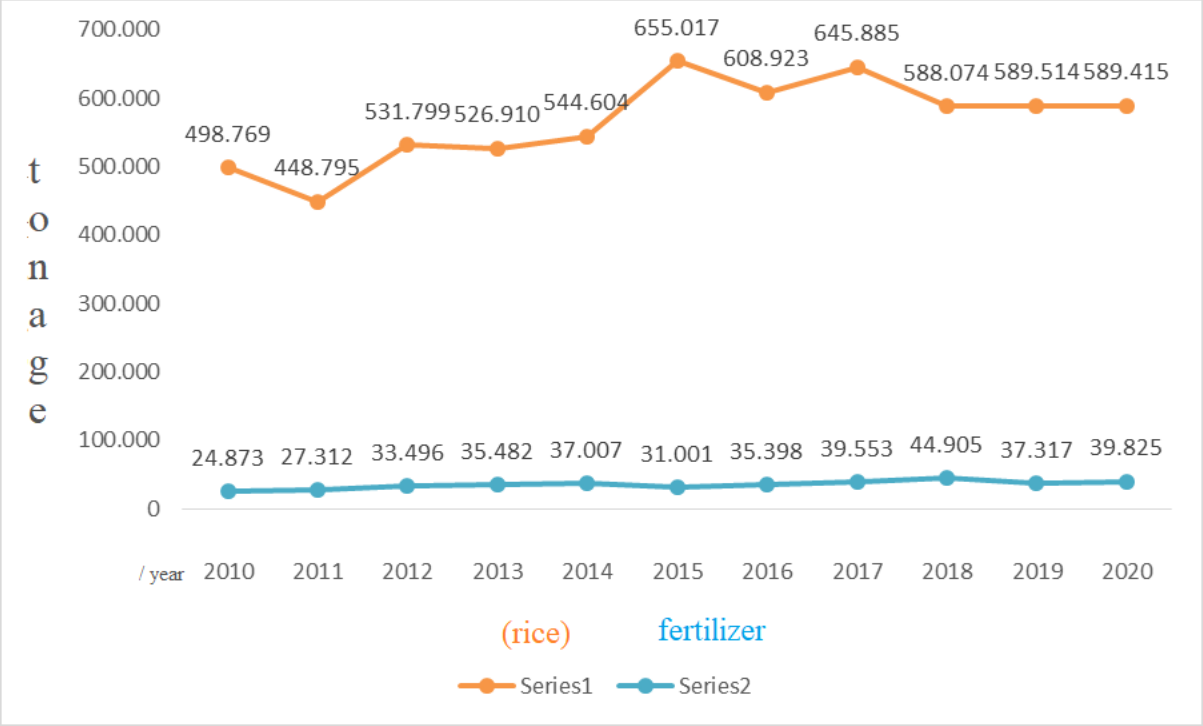

Fig. 1 Distribution of Fertilizer and Rice Production in Pinrang District 2010 – 2020

B. Problem Formulation

The main problems with the implementation of the fertilizer subsidized program by the government are: Whether the satisfaction of rice farmers with Fertilizer Distribution, Farm Production Factors, Production and Farmers' Income, been fulfilled properly in supporting the Food Security System in Pinrang Regency, South Sulawesi?

C. Research Objectives

The purpose of this study was to determine whether the satisfaction of rice farmers with: Fertilizer Distribution Accuracy, Farm Production Factors, Production and Farmers' Income, has been fulfilled properly in supporting the Food Security System in Pinrang Regency, South Sulawesi.

II. LITERATURE REVIEW

A. Farmer Satisfaction and Food Security System

Farmers' satisfaction is the main factor in achieving farming success. To measure the farmer's satisfaction level, it must be holistic, from upstream to downstream of farming activities. To determine the level of farmer satisfaction is to measure the research variables using a Likert's Summated Rating (LSR) scale. This scale consists of the possibility of agreeing and disagreeing answers with more possible answers. This is in order to obtain answers to the level of satisfaction of farmers with what they do from generation to generation in farming activities from small to modern farming activities, strong in supporting the Food Security System.

The Food Security System aims to improve food management which includes: food availability, food accessibility, food acceptance stability for public acceptance and consumption. The Food Security System must be able to realize a developed and rapidly growing market, into a social market economy that can combine commercial needs and the social dimensions of humanity. It is hoped that the growth of Small and Medium Enterprises in rural areas that is fostered by the government. Being able to create an open market, price stability, a strong marketing network, a guaranteed group business, being creative and innovative is an independent local force as well as a strong foundation for the country's economy. Food security is often identified with a state of food available at any time to individuals, both physically and economically. There are three aspects that become indicators of food security in a region, namely the food availability sector, food price stability, and physical and economic access for each individual to get food. With the supporting subsystem, namely the existence of government policies.

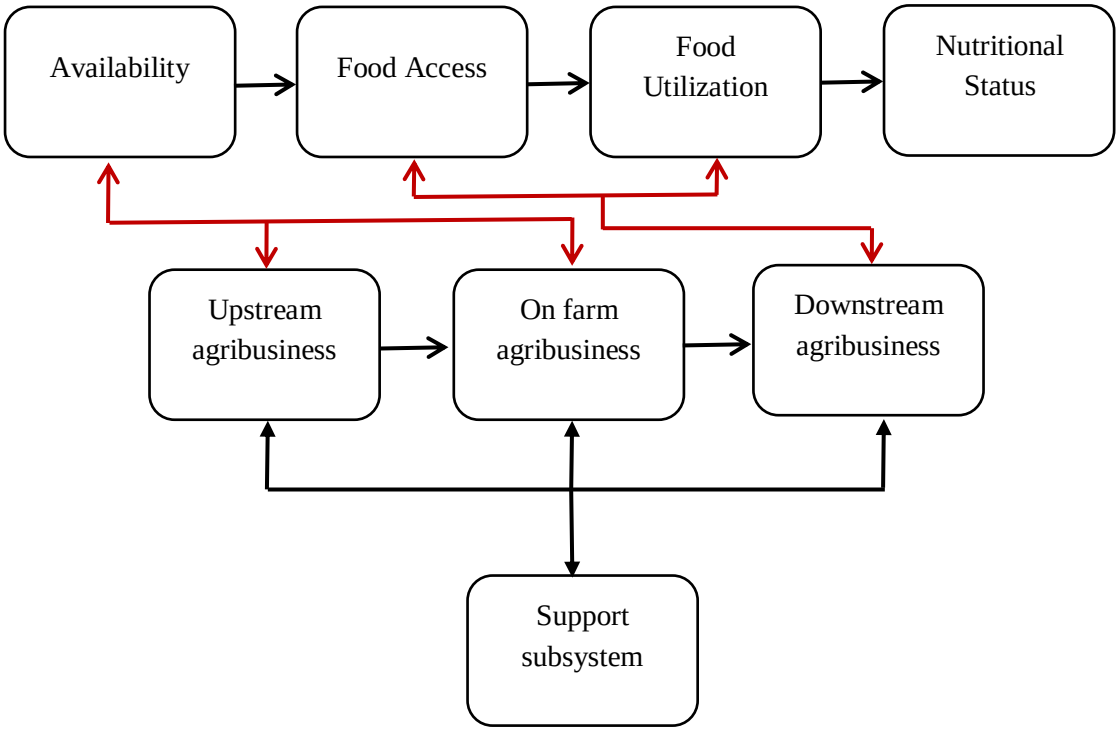

Figure 2. Integration of Farming Systems and Food Security Systems

B. Previous Study

1. Iskandar A.A, (2001) -Unhas, Research title: "Analysis of the Effectiveness and Efficiency of Fertilizer Distribution in Wajo Regency, South Sulawesi". The purpose of this study was to determine the effectiveness and efficiency of fertilizer distribution in Wajo Regency. The research method is to conduct a survey to farmers purposively, analysis with the transportation model and linear programming. The results showed that the distribution of fertilizers was not going well so that the distribution pattern needed to be changed by appointing official distributors and retailers to serve farmers and not through intermediary traders who distributed fertilizers in Line II (Province). It is necessary to rearrange the distribution of Line III (Regency) fertilizer so that it is effective, orderly and the distribution costs are more efficient and affordable to

farmers. It is recommended that fertilizer producers concentrate on the procurement of fertilizers and not act as distributors as well to farmers. Running a marketing mix that is oriented towards farmers so that the distribution pattern of fertilizer is better and benefits for farmers.

2. Supriadi Rusli (2010) -Unhalu, Research title: "The Influence of Government Policy on Production and Revenue of Rice Farming in the Bosowasipilu Region, South Sulawesi Province". The research objective was to find an increase in sub-optimal rice production, land use by farmers, farming activities, marketing and value-added processes and absorption of farm labor. The results showed that the opportunity to use the right policies would be of great benefit when compared to imported rice, because it was able to absorb labor, farmers were not responsive to changes in rice prices, their income was not maximized due to excessive agricultural input.

3. Arsal Salama (2018) -Unhas, Research title: "Analysis of the Profitability and Competitiveness of Rice Farming in Pinrang Regency, South Sulawesi. Research objectives: 1. Knowing the profitability level of rice farming in Pinrang Regency, South Sulawesi, 2. Knowing the competitiveness rice farming in Pinrang Regency, South Sulawesi. The results showed that farming in Pinrang Regency was profitable, feasible and efficient. It has private and social advantages as well as competitive and comparative advantages as well as government policies and protection for farming activities.

Based on the study of the results of previous research which only examined one sub-system, the difference in this study examined three sub-systems: Upstream, middle and downstream farming including Production Facilities (Agro Input), Farm Production (Agro System) and Production Results (Agro Output) insupport the progress of the Food Security System.

C. Hypothesis

The hypothesis of this research is "The effect of satisfaction of rice farmers in Pinrang Regency, South Sulawesi has not been fulfilled properly in supporting the Food Security System", namely:

1) Accuracy of Fertilizer Distribution and Farm Production Factors on Farmers' Production and Income - Direct and indirect effects (H1),
2) Accuracy of Fertilizer Distribution and Farm Production Factors to the Food Security System - Direct Effect (H2),
3) Accuracy of Fertilizer Distribution and Farm Production Factors on Food Security Systems through Production and Farmers' Income - Indirect Effect (H3),
4) Accuracy of Fertilizer Distribution and Farm Production Factors and Farmers' Production and Income to the Food Security System - Indirect Effect (H4).

III. RESEARCH METHODS

A. Research Location and Sample Determination

The location of the research was carried out in Pinrang Regency, which is a rice producing area with the highest productivity in South Sulawesi. Of the twelve Districts, 4 (four) districts are defined: Mattiro Bulu, Tiroang, Patampanua, Duampanua which are the largest areas of rice fields. The total population of the district is 45,721 households or 3,810 farmer households per district so that the population (N) is 3,810 / 8 villages and 476 farmers are obtained randomly in Tier (Stratified Random Sampling). With the Slovin method: n = N / 1+ (N.e2) obtained a sample of n = 476/1 + (476 x 0.052) = 217 farmers. It is estimated that 90% of all farmers are rounded up to a sample of 200 respondents. The time of research was three months: October to December 2019, during the rice planting season.

B. Methods Used

This research is intended to obtain descriptive, understanding the relationship between variables through hypothesis testing (verification) on farmer satisfaction in the implementation of rice farming activities. The methods used are: Research sampling (descriptive survey) and explanatory research (explanatory survey). Primary data is rice farmers as respondents and secondary data is from Fertilizer and Rice Producers, Agriculture Service, Food Security Service and Central Bureau of Statistics.

C. Data Analysis

To measure the research variables used a Likerts scale. This scale consists of agreeing and disagreeing answers with many possible answers on the same balance. The score determination consists of five answer choice scales, namely Strongly Agree (Score 5), Agree (Score 4), Enough (Score 3), Disagree (Score 2), and Disagree (Score 1). The structural equation is:

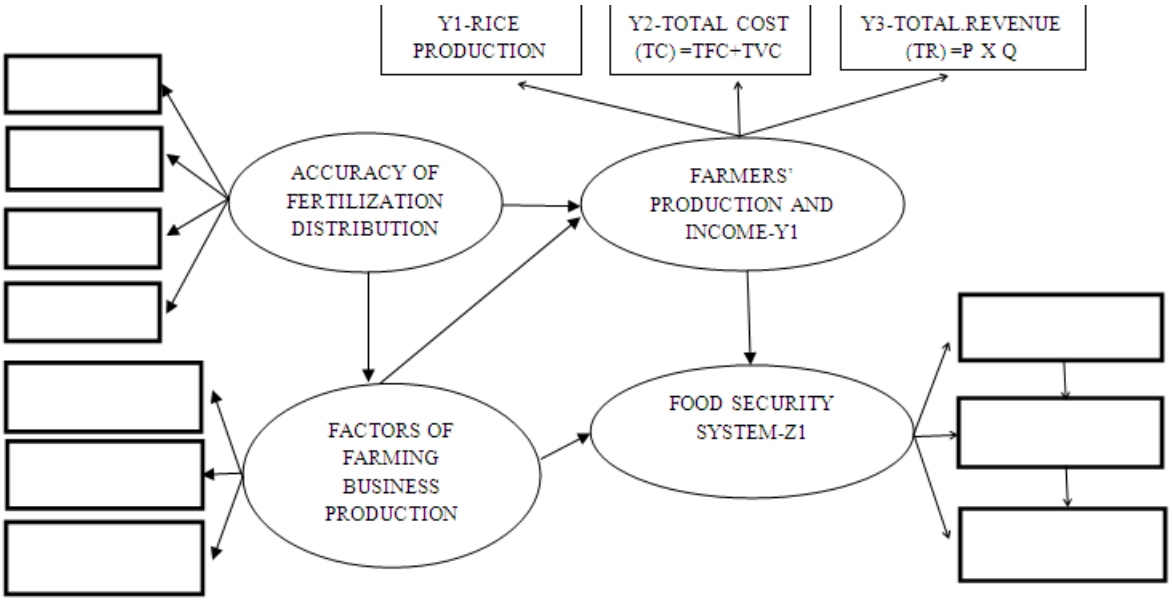

Fig. 3 The Structural Equation

IV. RESULT AND DISCUSSION

1. Discussion of Research Variable Data Analysis Results - SEM:

The analysis model in the Structural Equation Model (SEM) is based on two models, namely the Measurement Equations and the Structural Equations.

1.1 Measurement Equations

This research is not intended to create a new model, only to optimize the current model in supporting the Food Security System. Then the suitability of the measurement model (Mesurement Equations) is in accordance with the results of field research. The measurement model describes the proportion of the variance of each manifest (indicator) variable in the latent variable. In addition to testing the significance of the manifest variable, the measurement model can also calculate the Construct Reliability (CR) value indicating whether simultaneously the manifest variable has a high degree of conformity in the form of latent variables. The lowest acceptable limit is 0.7 and the accepted limit for the Variance Extracted (VE) value is 0.5 (Romansyah S, 2012: 39). The results of the model suitability test are described in the following table:

Table 2. Model of Goodness of Fit Measures

GOF Measures	**Line of Cut-off**	**Amount**	**Description**
-Chi-Square (P)	Min. Fit; 2065,8264 (P > 0,05)	1659,5994	Marginal Fit
-RMSEA	RMSEA ≤ 0,08	0,08341	Good Fit
p (close fit)	RMSEA < 0,05	0,0000	Good Fit
-ECVI	Model < Saturated & Independence	9,1839	Good Fit
-AIC	Model < Saturated & Independence	1827,5994	Good Fit
-CAIC	Model < Saturated & Independence	2188,6581	Good Fit
-NFI	0 < NFI < 1 ; NFI ≥ 0,90 = Good Fit	0,5254	Good Fit
-NNFI	0 < NNFI < 1 ; NNFI ≥ 0,90 = Good Fit	0,5962	Good Fit
-CFI	0 < CFI < 1 ; CFI ≥ 0,90 = Good Fit	0,6207	Good Fit
-IFI	0 < IFI < 1 ; IFI ≥ 0,90 = Good Fit	0,6254	Good Fit
-RFI	0 < RFI < 1 ; RFI ≥ 0,90 = Good Fit	0,4947	Good Fit
-GFI	0 < GFI < 1 ; GFI ≥ 0,90 = Good Fit	0,7004	Good Fit
-AGFI	0 < AGFI < 1 ; AGFI ≥ 0,90 = Good Fit	0,6643	Good Fit
-RMR	RMR ≥ 0,90 = Good Fit	0,09168	Good Fit

Source: Lisrel Data Program Results, 2020.

The results of the model suitability test show that:

- The RMSEA (Root Mean Square Error of Approximation) value of the model studied was 0.08341 which met the criteria where the required RMSEA value was ≤ 0.08.
- The GFI (Goodness of Fit Index) value for the model studied was 0.7004 according to the required criteria, namely 0 <GFI <1; GFI ≥ 0.90.

The results of the measurement of the suitability of the model table above generally meet the criteria of Good Fit, only Chi Square (X2) is less good (Marginal Fit). This is because this study adjusts to the existing model, also because the nature of the data must be normally distributed in order to have a Good Fit. The model tested was 39 indicator variables from 200 samples. Meeting the best linear unbiased estimation, the empirical model obtained is in accordance with the theoretical model (Siswoyo H, 2016: 93). The SEM Full Model Path Diagram is:

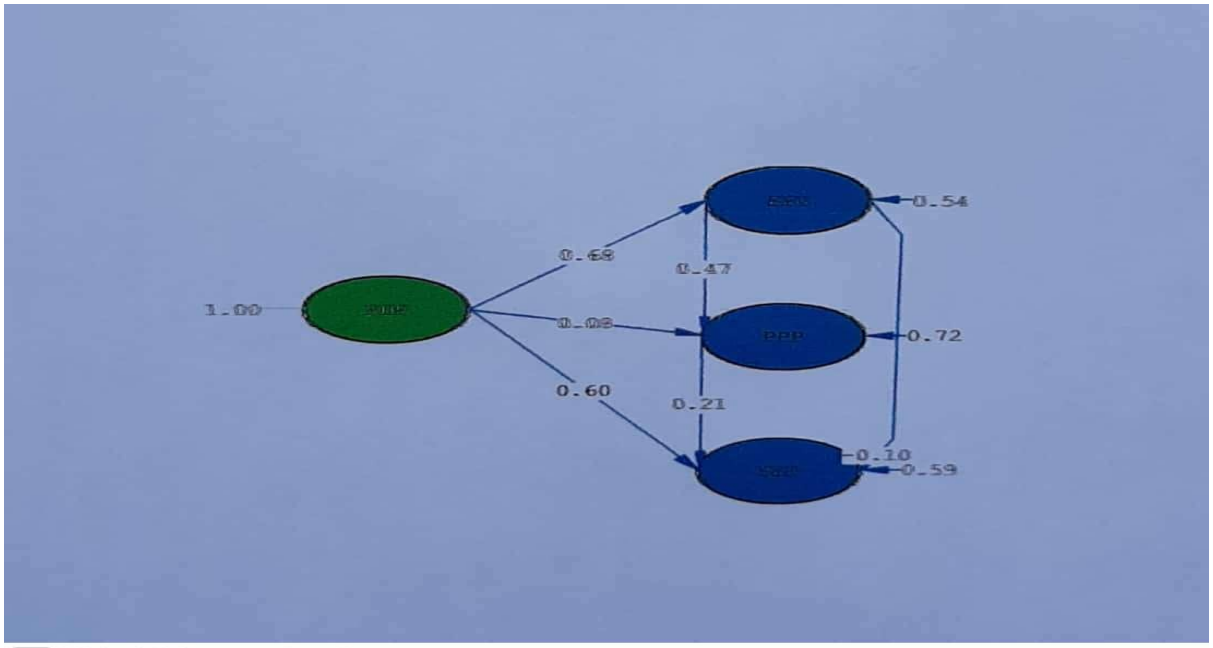

Fig. 4 SEM Diagram Structural Model (Chi Square = 1659.60, d*f* = 696, P-value = 0,00000, RMSEA = 0.083)

Statistic test :

1). The t test (for the effect significance of the independent variable on dependent) is:

Table 3 Test Results of Variable Influence Accuracy of Fertilizer Distribution, Farming Production Factors, Production and Farmers' Income on Food Security Systems

Independent Variable	**T.H**	**ß**	**t ht**	**Sig.**
Fertilizer Distribution	+	0,385	5,268*	0,000
Farming Production Factors	+	0,059	0,737	0,462
Production and Farmers' Income	+	0,130	1,722	0,087
Intercept	8,870			
F count	19,686*			
R^2	0,232*			
N	196			

Source: SPSS Data Processing Results, 2020

Information: 95% confidence level, * = significance error rate 5% (0.05), T.H =a sign of hope. Regression Equation: Z1 = 8.870+0.385X1+0.059X2+0.130Y1

From the table above, individually (partially) independent variables of Fertilizer Distribution Accuracy (X1) and Farm Production Factor (X2) and Production and Farmers' Income (Y1) give a positive value, in line with the Food Security system (Z1). The significance of the independent variable Fertilizer Distribution Accuracy (X1) is 0.000 <0.05 (α = 5%) and has a significant and supportive effect on the Food Security System (Z1) with t count 5.268> 2.61 (t table).

2). F test

F test is to determine the effect of the independent variable on the dependent variable together (simultaneously). From the table above shows that simultaneously (F test), the independent variables consisting

of: Fertilizer Distribution Accuracy (X1), Farm Production Factor (X2) and Production and Farmers' Income (Y1), affect the Food Security system (Z1) at the level of 95% confidence, the significance of the error rate α = 5%. The probability value of significance F is 0.000 <0.05 from the number of degrees of residual freedom (df) of 196 with a calculated F value of 19.686> 3.89 (F table).

3). Hypothesis test

Hypothesis Testing: The accuracy of Fertilizer Distribution (X1) is a positive effect on the Food Security System (Z1) and all independent variables give a positive value to the dependent variable based on the t-test table (Coefficients) and the F test (Annova) above. Thus the hypothesis can be accepted and influenced partially or simultaneously.

4). Coefficient of Determination (R2)

To find the regression coefficient used the least squares method which will produce a linear regression coefficient. R2 is the determinant coefficient, to find out what percentage of the influence of the independent variable is on the dependent variable and what percentage of other factors are outside the study. The coefficient of determination (R2) is between 0 and 1 (0 <R2 <1). The small value of R2 means that the ability of the independent variable to explain the dependent variable is very limited. With the R2 value of 0.232 above, the independent variable is able to explain the dependent variable by 23% and the presence of 77% other factors affecting, namely the independent variable that is not studied.

1.2. Fertilizer Distribution Accuracy Measurement Model:

Table 4 Evaluation Results of Construct Reliability (CR) and Variance Extracted (VE) of SEM Model

No.	Measurement Model	**CR ≥ 0,70**	**VE ≥ 0,50**
1.	Latent Variable of Fertilizer Distribution	0,73	0,17
2.	Accuracy	0,91	0,52
3.	Latent Variable of Production Factors	0,83	0,35
4.	Farming	0,82	0,32
	Latent Variables of Production and Farmer's Income		
	Latent Variable of Food Security System		
	Average	82 %	34 %

From the Statistical Equation Model (SEM) above, it has a Construct Reliability (CR) value with a very strong influence, namely CR ≥ 0.70 with an average value of 82% and the value of Variance Extracted (VE): 52 ≥ 50 ≥ 17 is less strong. The extract variable is only able to explain information on latent variables with an average value of 34%, so this research model has a fairly good reliability.

1.3. Structural Model of Fertilizer Distribution Accuracy:

Table. 5 Evaluation of the Path Coefficient and Determinant Coefficient of Latent Variables with Research Hypotheses

Hypothesis (H)	**Latent Variables**	**R^2 Value (%)**	**SEM Value (%)**	**Influence**	**Information**
1	Fertilizer Distribution Accuracy &Production Factors Farming → Production and Farmer's Income	30	68	Direct&Indirect	Strong
2	Fertilizer Distribution Accuracy &Production Factors Farming → Food Security System	37	47	Direct	Strong
3	Fertilizer Distribution Accuracy &Production Factors Farming → Food Security System ←Production and Farmer's Income	3	-10	Indirect	Less Strong
4	Fertilizer Distribution Accuracy, Production Factors Farming &Production and Farmer's Income → Food Security System	44	60	Direct &Indirect	Strong

Based on table 5 above, it can be seen that the level of satisfaction of farmers in carrying out farming activities is strong enough to meet the suitability of the current model. The result is the Fertilizer Distribution Accuracy with a coefficient value of 68% with R2 of 30% is the main factor in the availability of Farm Production Factors in supporting the success of the Food Security System with a value of 60% with R2 of 44%. Optimization efforts are needed in increasing the production and income of farmers whose coefficient value is -10% with R2 of 3% is less strong. Optimization efforts are carried out, namely agricultural modernization and mechanization programs, technological and information innovation, strengthening capital, and other infrastructure so that it becomes very strong in supporting the Food Security System in Pinrang Regency, South Sulawesi.

V. CONCLUSION

Based on the results of research and discussion, the results of hypothesis testing are in accordance with the model: Simultaneously the hypotheses H1, H2 and H4 are proven to be strong and hypothesis H3 is not strong enough to meet farmers' satisfaction in supporting the Food Security System. It can be concluded that the effect of farmer satisfaction on the accuracy of the distribution of fertilizers has a strong enough effect in supporting the Food Security System, has a strong enough effect on the Farm Production Factor, is not strong on the Farm Production Factor and the Food Security System. This is due to the influence of other production factors such as weather conditions, capital, agricultural equipment (error variance) which were not tested in this study. It is necessary to optimize services in fertilizer distribution and increase the availability of other production factors to support the Food Security System.

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