Factors Affecting the Productivity of Rice Farmers in Pinrang Regency

Andi Ahmad Taqwa[1], Paulus Uppun[2], and Sabir[3]

[1,2]Economic resources department, Business and Economic Faculty, Hasanuddin University

Email: [1]jietaqwa2008@gmail.com

***Abstract*—** Based on the formulation of the problem stated earlier, the objectives of this study are:1. To analyze the effect of education on the productivity of rice farmers in Pinrang Regency.2. To analyze the health of rice farmers' productivity in Pinrang Regency.3. To analyze the effect of land area on the productivity of rice farmers in Pinrang Regency.4. To analyze technology on the productivity of rice farmers in Pinrang Regency. The results of the regression analysis explain the factors that significantly affect the productivity of farmers in Pinrang Regency, including health variables, land area, technology. While the education variable is not significant to the productivity of farmers in Pinrang Regency. Overall, the regression model is used to explain the factors that affect the productivity of rice farmers in Pinrang Regency. This shows that education in this study does not have a significant effect on farmer productivity in Pinrang Regency.

***Keywords*—** productivity, education, health, land area, technology.

I. INTRODUCTION

The agricultural sector plays a dominant role in the economy of a country as well as complements the socio-economic structure of a country. The agricultural sector in addition to providing nutritional needs for the community, is also a source of raw materials for the development of other sectors, such as the manufacturing sector, especially food processing. Therefore, the agricultural sector plays an important role in the economic structure of a country.

In developing countries such as Indonesia, the agricultural sector is still dominant in the economic structure, this can be seen from the contribution of the agricultural sector which is still relatively large in the formation of gross domestic product. Pinrang Regency is one of the regions in Indonesia that has a large potential for the agricultural sector, this can be seen from the contribution of the agricultural sector in the formation of gross regional domestic product which is relatively high compared to other sectors. The agricultural sector in Pinrang Regency makes a major contribution to the formation of GDP and employment.

the agricultural sector ranks highest with the largest GRDP reaching Rp 5.7 billion and contributing 44.64% in the formation of GRDP in Pinrang Regency. Although the agricultural sector contributes significantly to the economy of Pinrang Regency, this sector is still facing a major problem, namely the low productivity of farmers in the agricultural sector as a result of the ability of most farmers to adopt agricultural technology is still minimal and in turn will have an impact on the low production of agricultural products.

that the production of rice plants in Pinrang Regency during 2013-2019 still fluctuated and had not shown a consistent increase every year. In 2013 rice production reached 604,975 tons increased to 662,420 tons in 2015 then decreased slowly until 2018 amounted to 629,909 tons.

The fluctuating production of rice crops in Pinrang Regency seems to be followed by the labor used which fluctuated during 2013-2018. In 2013 the number of workers working in the rice sub-sector was 599 people, increased to 1,407 people in 2015 and decreased slowly until 2018 to 337 people.

The decline in rice productivity in Pinrang district gives an indication that there is inefficiency in the use of inputs, resulting in a decrease in production. This can be due to the limited knowledge of farmers in utilizing agricultural technology that will facilitate production activities. Harvested area is not an obstacle if farmers are able to maximize the use of agricultural technology, such as the use of superior seeds to the use of agricultural machinery in every production activity.

According to Junankar (2016) in order for production and productivity of the agricultural sector to increase, modernization in production methods is needed. This can be achieved by increasing human resources such as improvements in education will help farmers in increasing knowledge about better farming techniques. Mellor (2017) argues that education and health are as important as physical infrastructure that contributes to increasing farmer productivity. Education influences in many ways on the modernization of production as well as broadening the understanding of farmers' technical problems.

Based on the author's initial observations, most of the farmers in Pinrang district still focus on past traditions in carrying out agricultural practices, in the sense that

the willingness of farmers to apply agricultural technology is still minimal. The lack of use of modern technology is the main factor that agriculture is said to be still traditional. In addition, in the current era of economic digitalization, agricultural technology in Indonesia is still lagging behind this is because technology awareness among farmers is still low.

Based on the phenomena that have been stated previously related to the problem of productivity in the agricultural sector which is still low, as a result of the level of education of farmers who are still relatively low, the area of agricultural land is decreasing, the adoption of agricultural technology is still minimal in Pinrang Regency, prompting the author to conduct a research with the title "The Influence of Education, Health, Land Area, and Technology on the Productivity of Rice Farmers in Pinrang Regency".

II. LITERATURE RIVIEW

Productivity Theory

According to the International Labor Organization (2019), labor productivity is an important indicator that is closely related to economic growth, competitiveness, and living standards in an economy. Labor productivity represents the total volume of output (measured in gross domestic product) per unit of labor (measured in terms of the number of people employed) over a certain period of time.

Economic growth in a country can be ascribed to an increase in employment. Labor productivity is the main measure of economic performance. The driving forces behind it are the accumulation of machinery and equipment, improvement of the organization and physical and institutional infrastructure, improvement of health and work skills (human capital) and the generation of new technologies. Labor productivity can support the formulation of labor market policies. For example, high labor productivity is often associated with human resources indicating a priority for education and skills training policies.

According to Ryan (2015) the measure of labor productivity describes the relationship between industrial output and the working time involved in its production. They show changes from period to period in the quantity of goods and services produced per hour. Although labor productivity measures relate output to hours worked or to everyone in an industry, they do not measure specifically the contribution of labor or other factors of production. They incorporate many aspects including technological change, investment, capacity utilization, energy and materials, managerial skills, and characteristics and efforts of workers.

The Relationship Between Education and Labor Productivity

Increasing human capital through farmer education is important to increase farmer productivity. Farmers with relatively high levels of education tend to adopt new technologies earlier and are more productive in using these inputs than farmers with relatively low levels of education. Most farmers in disadvantaged areas have never received formal education and cultivate crops with relatively unproductive local residents. Agricultural tools such as hoes, sickles, and other traditional tools. The average land size is very small and the farming system practiced increases land and soil degradation through depletion of soil nutrients. “slashing” and “burning” are still customary and modern agricultural preparation methods and practices are not common.

Cahuc, Caricillo, and Zylbergberg (2014) suggest the importance of human capital in relation to labor productivity. Education is an investment to increase knowledge and skills and lead to increased productivity of the workforce. In a perfectly competitive labor market where firms have perfect information about the characteristics of workers, in fact skilled workers can increase their productivity.

The Relationship Between Health and Labor Productivity

A workforce with good health can increase productivity in various sectors of the economy. People in countries with good health not only increase the overall productivity of the workforce, but also increase their own incomes. According to Mellor (2017) improvements in education and health will increase farmers' responses to increased productivity. Improved health status will increase the ability to manage agricultural land and maximize the use of agricultural inputs. This view is reinforced by Norton et al (2001) who reveal that labor productivity can be increased through investment or improvements in health.

According to Evenson and Pingali (2010) good nutrition will produce healthy physical strength to do a job and have a positive impact on labor productivity. A nutritious and balanced diet will promote a stronger immune system thereby slowing the onset of old diseases such as diabetes, cardiovascular, and cancer.

Health is an important component of human resources that affects the level of worker productivity. Good health is associated with reduced inability of workers to perform work, higher levels of motivation and consequently leads to higher productivity

improvements. In addition, healthy workers are more productive because they are physically and mentally more energetic and strong to challenges and working conditions.

The Relationship Between Technology and Labor Productivity

Junankar (2016) states that in most of the development models in a country, the agricultural sector is a sector with slow-growing productivity, while industry grows faster due to economies of scale and technological improvements. Improvements in agricultural technology have made a big impact on the agricultural sector through the green revolution (the use of high-yielding varieties of seeds).

Evenson and Pingali (2010) suggest that in developing countries the world's population grows by 90 percent, at the same time using only 10 percent of agricultural land, world food production grows by 115 percent and increases food availability per capita by 25 percent. As a result, food prices fell 40 percent in real terms. The driving force behind this success is the application of modern science and technology to increase crop productivity. Technological breakthroughs in rice and wheat became the initial impetus for joint efforts to increase agricultural productivity.

According to Vinilla and Willebald (2018) productivity growth is based on science and technology. Incorporating technology into agriculture requires major adaptation efforts. Technology adoption is a complex process that involves a lot of research and local learning on the part of rural farmers, this is due to agricultural characteristics, varieties, soil composition, and climate differences between countries and regions. The use of technology depends on four main factors, namely, firstly geography such as the quality of land for agricultural production, the role of research institutions that give birth to innovation systems, thirdly rural farmers who have the capacity to interpret new technologies, and fourthly economic efficiency to adopt new technologies.

Relationship Between Land Area and Labor Productivity

According to Junankar (2016) there is a surprising result from a study of agricultural management, where there is an inverse relationship between agricultural land area and productivity. Farms with relatively small land area, on average more workers and as a result have a high output. This is because small farmers maximize yields while large farms are run above the capitalist line and profit is maximized.

It was further explained that labor in agriculture with a small area of land has zero opportunity costs, i.e. there are no alternative employment opportunities and no free time satisfaction, then this farm will employ labor to the point of zero marginal productivity, i.e. maximizing output rather than profit. However, large farms will employ labor to the point where the wage level is equal to the marginal product. Therefore, small farms will use more labor per hectare than large farms.

Agricultural land is an important factor in agricultural productivity. As the theory put forward by Malthus, the land area tends to remain unchanged, while the population continues to grow, resulting in limited land being managed by many populations, which will have an impact on decreasing land productivity.

According to Kragh (2006) labor productivity and land productivity do not have to move in the same direction, an increase in land productivity can be combined with a decrease in labor productivity when the area of land per unit of labor decreases. In addition, labor productivity can be increased without increasing land productivity when the area of land per unit of labor increases, for example if there is migration of workers to other sectors.

According to Gollin (2018), he conducted research on the size of agricultural land and productivity in various countries. The results showed that there was a positive but weak relationship between agricultural land area and agricultural land productivity, and there was a much stronger positive relationship between land area and labor productivity. There are large differences in labor productivity in terms of area of farmland. The remarkable finding here is that large farms produce higher average labor productivity than small farms.

Novotna and Volek (2016) who analyzed the impact of agricultural size and labor productivity in the agricultural sector, the results of the analysis prove that land area has a significant influence on labor productivity. There are significant differences between labor productivity in small, medium, and large farms. Labor productivity decreased in small and medium farms, while labor productivity increased in large farms.

III. METHODS

Determination of the sample in this study using the slovin technique, because in sampling, the number must be representative so that the research results can be generalized and the calculation does not require a table of the number of samples. The slovin formula for determining the sample is as follows:

$$n = \frac{N}{1 + N(e)^2}$$

Information:

n = Sample size/number of respondents

N = Population size

e = Fault tolerance limit

The total population in this study was 187 rice farmers, the tolerance limit used was 5% (0.05), so the calculation using the slovin formula is as follows:

$$n = \frac{N}{1 + N(e)^2}$$
$$n = \frac{187}{1 + 187(0{,}05)^2}$$
$$n = \frac{187}{1{,}47}$$
$$n = 127{,}21$$

Based on calculations using the slovin formula, the number of samples was 127.21 rounded up to 127 lowland rice farmers.

The equation of the multiple linear regression analysis model can be written into the following equation:

$$Y = f(X1, D2, X3, D4)$$
$$Y = \beta 0 + \beta 1X1 + D2 + \beta 3X3 + D4 + e \text{.....(4.1)}$$

Information:

Y = Labor productivity

X1 = Education

D2 = Health Status

X3 = Land Area

D4 = Technology

e = Error term

β0 = Constant

β1,β3 = Regression coefficient

Equation 4.1 is then transformed in the form of the natural logarithm (ln) as in the estimation equation 4.2 as follows:

$$lnY = \beta 0 + \beta 1LnX1 + \beta 1D2 + \beta 3LnX3 + \beta 1D4 + e \text{.....(4.2)}$$

Y = Labor productivity

X1 = Education

D1 = Health Status

X3 = Land Area

D2 = Technology

e = Error term

β0 = Constant

β1,β3 = Regression coefficient

ln = Natural logarithm

To make it easier to analyze the data, this research uses analytical tools with the help of statistical software SPSS For Windows Version 26.

IV. ANALYSIS AND DISCUSSION OF RESULT

The collected data is then processed using SPSS software after the data is processed, the output generated in the software is as follows:

Table: 6.1.1: Results of Direct Variable Relationship Analysis

Hubungan Variabel	Koefisien	St.error	Standardized Coefficiennts Beta	t	Sig
X_1 → Y_1	-.106	.070	-.074	-5.515	0.132
X_2 → Y_1	1.977	.616	.175	3.209	0.002
X_3 → Y_1	4.716	.303	.762	15.570	0.000
X_4 → Y_1	2.669	.720	.201	3.708	0.000

Based on the results of the analysis, Table 7.1.1 shows the results of statistical analysis of the direct effect of education on farmer productivity, the effect of health on farmer productivity, and the effect of technology on farmer productivity in Pinrang Regency.

The estimation result of education on farmer productivity is -0.106 with a significance level of 0.132. This shows that education has no significant effect on farmer productivity.

From the magnitude of the coefficient value obtained after performing the regression, it can be said that health has a significant and significant effect on the level of farmer productivity. Where the value of the regression coefficient is 1,977. This amount means that there is a

difference in farmer productivity between healthy farmers and unhealthy farmers, which is 1.977 percent.

The results of the estimation of land area on farmer productivity are 4,716 with a significance level of 0.000. This shows that land area has a significant effect on farmer productivity. This means that land area has a positive and significant effect on farmer productivity, every 1 percent increase in land area will increase productivity by 4,716 percent, and vice versa every 1 percent decrease in land area will decrease productivity by 4,716 percent.

From the magnitude of the coefficient value obtained after performing the regression, it can be said that technology has a significant and significant effect on the level of farmer productivity. Where the value of the regression coefficient is 2.669. This amount means that there is a difference in farmer productivity between farmers who use technology and farmers who do not use technology, which is 2,669 percent.

The results of estimates or multiple linear regression calculations regarding the factors that affect Farmer Productivity in Pinrang Regency can be seen in the regression equation (1) and then simplified into the regression equation (1), as follows:

LnY = -2.756 + -0.106 X1 + 1.977 D2 + 4.716 LnX3 + 2.669 D4

R^2 = 0.714, adjusted R^2 = 0.705, $F_{statistic}$ = 76.221, n = 127

Testing on the effect of all independent variables in the model can be done by conducting a simultaneous test (F test). The F statistical test basically shows whether all the independent variables included in the model have a joint effect on the dependent variable.

Testing on the effect of all independent variables in the model can be done with a simultaneous test (F test). The F statistical test basically shows whether all the independent variables included in the model have a joint effect on the dependent variable. For this test, the following hypothesis is used: H0 is accepted (F-count < F-table) meaning that the independent variables together have no significant effect on the dependent variable. H1 is accepted ($F\text{-}_{count}$ > $F\text{-}_{table}$) meaning that the independent variables together have a significant effect on the dependent variable.

From the results of the regression of the effect of the variables Education, health, land area and technology on farmer productivity (Y), using a 95% confidence level (α = 0.05) degree of freedom (df1 = k -1 = 4 -1 = 3) and (df2 = n - k = 127 - 4 = 123) obtained F-table of (2,680). The results obtained are F-count (76,221) > F-table (2,680). So it can be concluded that at the 95 percent confidence level, H0 is rejected and H1 is accepted, namely the independent variables simultaneously or jointly affect the variables described significantly.

The results of statistical tests showed that the education level variable was not significant in influencing the productivity of rice farmers in Duampanua District, Pinrang Regency. The estimation result of education on farmer productivity is -0.106 with a significance level of 0.132. This is known by looking at the level of significance of the effect of education can be seen from the probability level (α = 5%) is 0.132 and tstatistic is -1.515. Furthermore, the educational regression coefficient value is -0.106. This means that education has no effect on farmer productivity.

The results of statistical tests show that the health variable has a positive and significant effect on the productivity of rice farmers in Duampanua District, Pinrang Regency. This is known by looking at the level of significance of the health effect seen from the probability value (α=5%) of 0.002 and ttstatistic of 3.209. Furthermore, the value of the health regression coefficient is 1,977. This amount means that there is a difference in farmer productivity between healthy farmers and unhealthy farmers, which is 1.977 percent.

The results of statistical tests show that the variable land area has a positive and significant effect on the productivity level of rice farmers in Duampanua District, Pinrang Regency. This is known by looking at the significance level of the influence of land area seen from the probability value (α = 5%) of 0.000 and ttstatistic of 15.570. Furthermore, the value of the regression coefficient of land area is 4.716. This means that each additional 1% of land area, it will increase the productivity of rice farmers by 4.71% with the assumption that other variables are constant.

The results of statistical tests show that the variable of technology use has a positive and significant effect on the productivity level of rice farmers in Duampanua District, Pinrang Regency. This is known by looking at the level of significance of the influence of the use of technology seen from the probability value (α = 5%) of 0.000 and ttstatistic of 3,708. Furthermore, the regression coefficient value of the use of technology is 2,669. This amount means that there is a difference in farmer productivity between farmers who use technology and farmers who do not use technology, which is 2,669 percent.

Based on the results of the regression calculation between education, health, land area and technology use, the value of R2 = 0.714 indicates that the variation of changes in the value of rice farmer productivity (Y)

can be explained simultaneously by education, health, land area and technology use by 71.4 percent. while the remaining 28.6 percent is explained by other factors not included in the model. The next analysis is that all variables placed in the model, namely rice farmer productivity (Y), education (X1), health (X2), land area (X3), and technology (X4) need to be tested for significance as follows:

The Effect of Education on the Productivity of Rice Farmers in Pinrang

From the magnitude of the coefficient value obtained after performing the regression, it can be said that education has no effect on the productivity level of farmers where the regression coefficient value is -0.106 with a significant level of -0.132. Awareness of the importance of productivity plays an important role in encouraging efforts to increase agricultural production (Mahendra, 2014). Likewise, previous research shows that the higher the level of education, the higher the level of productivity of farmers. This study is not in line with previous findings conducted by Malik (2015) The quality of higher education human resources is significantly positive in increasing labor productivity in Malaysia.

The Effect of Health on the Productivity of Rice Farmers in Pinrang

From the magnitude of the coefficient value obtained after performing the regression, it can be said that health affects the productivity level of farmers where the regression coefficient value is 1.977 with a significant level of 0.002. This research is in line with research conducted by Mellor (2017), improvements in health will increase farmers' responses to increased productivity. Improved health status will increase the ability to manage agricultural land and maximize the use of agricultural inputs. Health is an important component of human resources that affects the level of worker productivity.

The Effect of Land Area on the Productivity of Rice Farmers in Pinrang Regency

From the magnitude of the coefficient value obtained after performing the regression, it can be said that the land area affects the productivity level of farmers where the regression coefficient value is 2.669 with a significant level of 0.000. Then it is supported by research conducted by Widanta (2017) Land area, technology, and training have a positive and significant influence on the productivity of rice farmers in Mengwi District. Then added by Volek (2016) who analyzes the impact of agricultural size and labor productivity in the agricultural sector. The results of the analysis prove that land area has a significant influence on labor productivity.

The Influence of Technology on the Productivity of Rice Farmers in Pinrang

From the magnitude of the coefficient value obtained after performing the regression, it can be said that technology affects the productivity level of farmers where the regression coefficient value is 2.669 with a significant level of 0.000. This research is in line with the findings by Pingali (2010) which states that in developing countries the world population grows by 90 percent, at the same time using only 10 percent of agricultural land, world food production grows by 115 percent and increases food availability per capita by 25 percent. As a result, food prices fell 40 percent in real terms.

V. CONCLUSION AND RECOMMENDATION

Based on the data that has been processed and analyzed, it can be concluded:

1. Education has no significant effect on the productivity of rice farmers in Pinrang Regency 2. Health has a positive effect on the productivity of rice farmers in Pinrang Regency. 3. Land area has a positive effect on farmer productivity in Pinrang Regency. 4. Technology has a positive effect on farmer productivity in Pinrang Regency.

RECOMMENDATION

1. It is recommended that agricultural extension officers be more intensive in providing counseling, guidance, and knowledge. Especially for rice farmers to be more motivated to increase farmer productivity in Pinrang Regency
2. The local government of Pinrang Regency, especially the Department of Agriculture and Food Crops, to further increase and streamline its expenditure budget, especially expenditures in the agricultural sector. So that it can prosper the farmers, especially rice farmers equally in each sub-district in Pinrang Regency.
3. Lowland rice farmers need to improve their ability, productivity and competitiveness. Absorption of agricultural technology is needed in an effort to diversify agricultural products. Actually, the economic prospects for lowland rice farmers are very large, considering that rice is a basic need of the community (both regional and national). Moreover, if supported by government policies that favor farmers, it can encourage the suitability of rice commodity prices. Therefore, if farmers can increase their production, it will be able to increase income and welfare for the family.

4. The realization of education and health in Pinrang Regency is further improved every year. In addition, an increase in education and health spending needs to be accompanied by an efficient and effective allocation pattern so that the budget actually works to improve education and health indicators and in turn is able to contribute positively to improving education and health outcomes and in turn will have an impact on improving education and health outcomes. productivity of the workforce.

REFERENCES

[1] Cahuc, Pierre., Carcillo, Stephane dan Zylbergberg, Andre. 2014. *Labor Economics*. London: The MIT Press.

[2] Evenson, Robert dan Pingali, Prabhu. 2010. Handbook of Agricultural Economics Volume 3 Agricultural Development: Farmers, Farm Production And Farm Markets. North Holland: Elsevier BV.

[3] Gollin, Douglas. 2018. *Farm Size And Productivity: Lessons From Recent Literature*. Investing in Rural People: Oxford University.

[4] International Labor Organization. 2019. *Labour Productivity*.(online), (https://www.ilo.org/ilostat-files/Documents/description_PRODY_EN, diakses 30 September 2020).

[5] Junankar, Raja. 2016. Development Economics: The Role of Agriculture in Development. London: Palgrave Macmillan.

[6] Mellor, John. 2017. Agricultural Development And Economic Transformation. London: Palgrave Macmillan.

[7] Muller, Christophe dan Croppenstedt, Andre. 2010. The Impact of Farmer's Health And Nutritional Status on Their Productivity And Efficiency: Evidence From Ethiopia. *Article in Economic Development And Cultural Change*.

[8] Novotna, Martina dan Volek, Tomas. 2016. The Significance of Farm Size in The Evaluation of Labour Productivity in Agriculture. *Article in Acta Universitatis Agriculturae Et Silviculturae Mendelianae Brunensis*, 64

[9] Vinilla, Vicente dan Willebald, Henry. 2018. *Agricultural Development in The World Periphery*. London: Palgrave Macmillan.