The Impact of Production Factor and Costs on Income of Red Onion Farming Business in Sigi District, Central Sulawesi

Armin Muis[1], Muhtar Lutfi[2], Eko Jokolelono[3], Nurnaningsih[4], Ika Rafika[5], Nuryana Dj Haprin[6]*

[1,2,3,4,5,6] Department of Economics and Development, University of Tadulako
[1,2,3,4,5,6] Jl. Soekarno Hatta Km 9, Palu, Sulawesi Tengah, Indonesia
nurnaningsihkebo@gmail.com

ABSTRACT

This study aims to determine and analyze direct correlation of capital, man power, land size, and also production costs to income of red onion farming business; the impact of capital, man power, and also land size towards cost of red onion farming business; and the impact of capital, man power, land area towards income through the cost of red onion farming business in Sigi District. This research used primary data. Population was red onion farmer from three villages and the sample was deliberately determined considering that three villages are red onion producing areas in this district. Analysis for this research are using a structural equation model. From the analysis showed: (1) Production factors of capital, man power and land size had a direct and influential impact towards income; (2) Concerning the impact from production factor on costs, the capital variable had a positive and influential impact towards costs; man power variable had a positive and influential impact towards costs, and land size had a positive and influential impact towards costs; (3) In terms of indirect impact, the variables of capital, man power and land size have a positive and influential impact towards income through mediation of red onion farming costs at Sigi District, Central Sulawesi, Indonesia.

INTRODUCTION

The agricultural field are the main and the most powerful sector for the Indonesian economy (Syukra, 2020). Approximately 100 million individual, almost half the total Indonesian population work within agricultural field (Ministry of Agriculture of the Republic of Indonesia, 2021). Agricultural sector contributed 41.65 percent towards GRDP of Sigi District, Central Sulawesi which was lower than the previous year.

Economic establishment at the agricultural aspect is addressed

towards realization of an independent as well as reliable economy based on economic democracy to improve the welfare of all people in a harmonious, just and equitable way. The development has not succeeded in improving farmers' life and agriculture towardsir proper position. The gap in the farmer's welfare compared to workers in other sectors is widening (Tola, 2016). Productivity and product quality do not show influential improvement.

Horticulture as one of the agricultural sub-sectors is a sector of commodity which had superior economic value and take a vital role to fulfill the needs of farming. Red onion is one of many type of vegetable commodity that has been cultivated for a long time. Red onions (*Allium ascalonicum L.*) is one of country pre-eminence vegetable commodities that has been intensively cultivated by farmers for a long time (Hartoyo, 2020) that accommodate jobs and revenue and also contributes to regional economic development (Karyati et al., 2014). Red onions are classified in the cluster of irreplaceable spices which be used as food seasonings as well as ingredients for traditional remedies. Red onions characteristic, which irreplaceable, cause the development of red onion venture have good potential. Red onion cultivation are spreading to most region in the Republic of Indonesia and there are many technical obstacles in its cultivation process (Permana et al., 2021).

Red onions are one of the important vegetable commodities for the community, in both factor of their high economic value and nutritional value (Rodrigues et al., 2017). Red onion cultivation is carried out on dry land and requires irrigation (Fauziah et al., 2016). Red onion cultivation is a potential business and always gets a good place in the Indonesian market (Fajjriyah, 2017). Red onion production generally comes from the highlands, but in Central Sulawesi, especially in Sigi District, it is widely planted in the lowlands, for example, in Oloboju, Soulove, and Bulu Pountu Jaya villages, Lembah Palu, Tinombo and Tomini sub-districts. While the highlands are in Pagimana Sub-district and North Lore Sub-district. The demand and necessity for red onions growing surely as besides being directly used for flavoring dishes, red onions are also a raw material for fried red onions. Fried red onions originating from the lowlands in Sigi District have become an icon or typical souvenirs of this district. Farmers engaged in this red onion farming business need to consider the management both from the aspect of production and costs. Production theory explains that capital is one of the production factors determining the amount of income. Before entering the harvest period, farmers use working capital to meet the needs of the pre-harvest period in which the capital is obtained from outside of farming or borrowed from relatives and financial institutions without

considering the size of the income that will be obtained from the harvest. Besides capital, the man power factor in red onion farming also affects the farming income. Farmers in Biromaru sub-district, especially Oloboju Village, Soulowe Village, and Bulu Pountu Village are not familiar with appropriate technology, so the working days and working hours of man power require a lot of money and especially in the harvest. Therefore, man power costs will increase and it affects the income. Besides capital and man power, land size also affects income. Since 2004, red onions have been designated as one of the leading vegetable commodities to be developed with the support of the state budget (APBN) or regional budget (APBD) (Azfril et al., 2022). To develop and increase the competitiveness of red onions, it is necessary to increase productivity and efficiency in the utilization of agricultural resources as well as the quality of human resources. Therefore, a comprehensive research is required on "Analysis of the impact of production elements and costs to income of red onion farming as an icon of fried red onion production in Sigi District, Central Sulawesi Province". This research aims to: first, to determine whether capital, man power, land size have a direct impact on red onion farming income in Sigi Sub-district; second, to find out whether production costs affect the red onion farming income in Sigi District; third, to find out whether capital, man power and land size

affect the cost of red onion farming in Sigi District; and fourth, to find out whether capital, man power, land size impact income through farming costs in Sigi District. Red onions (*Allium ascolonicum, L*) is a priority commodity of lowland vegetables in Indonesia, which is quite strategic and economical in terms of profits (Helmayuni et al., 2022). Farming revenue is mostly guided by government policies in regulating the activity of the farming business (Lu et al., 2020). Farming operational income is family income that comes from wages and it is the most basic and important income for most farmers (Tan et al., 2021). Income inequality between large and small farming businesses, both in urban and rural areas should be addressed (Cárdenas-Retamal et al., 2021).

For farming businesses, the costs incurred are varied, one of which is man power costs, if man power costs can be decreased it will increase income and bring profits (Le Phi Khanh et al., 2020). The instability of farming revenue in agricultural nation occurs due to lack of instability prices of agricultural products and it has become a challenge for farmers and the government as policymakers (Abokyi et al., 2020).

Agricultural products have great potential in increasing export performance as other countries highly need them. Indonesia has good horticultural strengths and advantages (Syukra, 2020). One of the main problem in

sustainable agricultural development is having environmentally sustainable production (Ren et al., 2021).

Farming has more influential relationship with prices and income (Khan et al., 2019). The production factor on red onion farmers' income by using the production cost variable, the number of production, the cost of seeds and man power costs with a multiple regression model (Fitriana, 2020)A. However, in this present research, the researcher used input costs as a mediating variable to test the production factor on the income of red onion farmers. A research by Susanti, Budiraharjo, & Handayani, identified the impact of variables of land size, man power, fertilizer, and pesticides towards number of red onion production (Susanti et al., 2018). The main differentiating factor in this research is the production factor has an impact with revenue which is balanced by costs.

Purnamadewi & Firdaus (2021) analyzed the identified factors of household capital/assets related to farming income in Malang District, Indonesia. The independent variables were natural resource capital, physical capital, human capital, financial capital and social capital. Susanawati, Masyhuri, Jamhari, & Darwanto (2018) analyzed income using the UOP Profit Function Model (Susanawati et al., 2018).

The independent variables covered the commodity price variable, the number of production variables, the production cost variable, and the

production input variable using the Cobb Douglas production function approach.

Issues related to man power and agricultural land affect income inequality in farming (Kelley et al., 2020). Land size, man power, and capital greatly affect the sustainability of the entire life cycle of business activities with the conjugate of resources (Bainton et al., 2020) Capital, man power, and land size have a very close relationship and directly affect productivity (Zhang et al., 2020) The concept that underlies the variables selected as production factors in this research refers towards theory of production and costs. Some Micro Economics literature and Agricultural Economics Books describe the direct relationship between production factors and output (commodities). However, production costs greatly determine the level of output which means that when farmers want to increase their production, they will incur higher costs by adding production inputs. Indeed, the production cost affects the income. Some previous studies have not tested the relationship between production factor and income and with the mediation of costs. In general, this research identifies factors affecting income by using direct measurement.

This study aims to determine and analyze direct correlation of capital, man power, land size, and also production costs to income of red onion farming business; the

impact of capital, man power, and also land size towards cost of red onion farming business; and the impact of capital, man power, land area towards income through the cost of red onion farming business in Sigi District.

METHODS

This research used quantitative methods by combining explanation and causality approaches that explain one or more variables as causes that affect other variables, based on facts and events to see the impact of capital, man power, costs, land size, farming experience, and education on red onion farming income in Sigi District.

The population is a generalization area consisting of objects or subjects with certain qualities and characteristics that meet predetermined criteria set by the researcher to be studied and finally counclusion is drawn. The population are an entire subject (Arikunto, 2017). The total population of this research obtained from the village profile (July 2021) was 58 farmers practicing red onion cultivation activities. Sample is partly from population containing of a number of people chosen from the population (Sekaran & Bougie, 2019). Assign of the size of the sample of red onion farmers used the census method by selecting the entire of population as a sample. Therefore, this research involving 58 respondents as samples. Data set were gathered from observation, questionary, and literature. Data collection was adjusted towards conditions during the COVID-19 pandemic. Observation, the researcher directly dealt with the object of research to obtain a clear picture of the phenomena it enabling social integration between the researcher and the community being studied. Questionnaires, distributing questionnaires could be done by mail and email.Unstructured and detailed interviews were conducted to get detailed data to answer formulated problems. Document, data were collected from relevant written documents in accordance with the research objectives. The analysis of this research used the structural equation model (SEM). Before using the SEM, the assumptions were tested first as a prerequisite for SEM analysis.

RESULT AND DISCUSSION
Red Onion Farming Business in Sigi District
District especially in Oloboju, Bulu Pountu Jaya and Soulove Villages was relatively uniform in terms of planting time, fertilization time, kinds of seed used, the intensity of spraying and duration of planting. The red onion farming process covered seed preparation, land preparation planting, maintenance and harvesting.

Outcome of Validity Testing
The validity test used Pearson Correlation with the help of SPSS version 16.0. An instrument is declared valid if it has a Pearson Product Moment

correlation coefficient of > r table (0.3) (Sugiyono, 2016). Outcome from validity test are presented as shown below:

Table 1. Outcome of validity testing

Variable	Corrected item-Total Correlation	Standard	Status
Y	0.956		Valid
Z	0.978		Valid
X1	0.927	0.3	Valid
X2	0.716		Valid
X3	0.988		Valid

Source: Results of Data Analysis using the Structural Equation Modeling (2021)

According to Table 1, all questions have a value of r count > r table (0.3). Therefore, it can be stated that all questions in the questionary were declared valid.

Inner   Model
Path coefficient evaluation was used to enumerate how intense the impact or influential of the independent variable on the dependent variable. Where as, the determination coefficient (R-Square) was used to quantify how much the endogenous variable is affected by other variables. The outcome from the analysis of the R-square level for entire equations are presented as shown   below.
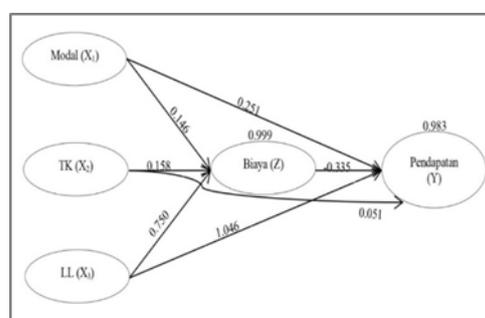
Figure 1. Outcome of SEM Analysis
According to figure above, overall R-Square results can be described as follows:

Table 2. Outcome of R-Square

Variable	Variable Z	Variable Y		Total Indirect Impact
		Direct (L)	Indirect (TL)	L + TL
Capital (X_1)	0.146	0.251	-0.048	0.203
Man power (X_2)	0.158	0.051	-0.052	-0.001
Land Size (X_3)	0.750	1.046	-0.251	0.795
Cost (Z)		-0.335		
R-Square	0.999		0.983	

Source: Results of Data Analysis using the Structural Equation Modeling (2021)

According towards table above, outcome will be describe as follows:
a.) The Impact of Capital, Man power as well as Land Size towards costs.

According towards outcome of the analysis, the coefficient value (R-Square) of the capital variable (X1) on the cost variable (Z) is 0.146. Therefore, the cost variable (Z) can be desribed by the capital variable by 14.6% and the remaining 85.4% is affected by other variables outside the research. The coefficient (R-Square) obtained from the man power variable (X2) on the cost variable (Z) is 0.158. It means that the cost variable (Z) can be describe by the man power variable (X2) of 15.8% and the remaining 84, 2% is affected by other variables outside of the research. The coefficient (R-Square) obtained from the land size variable (X3) on the cost variable (Z) is 0.750. Therefore, the cost variable (Z) can be described by the land size variable (X3) of 75.0% and the remaining 25% is affected by other variables beyond of the research. Relatively, it can be describe that the R-square value is 0.999 imply that the capital, man power and land size affect 99.9% on the cost of red onion farming as an icon of fried red onion in Sigi District, while the remaining 0.1% is affected by other variables beyond of the research. As for the results for each variable, the variable with the most dominant influence on costs is the land size (75.0%) and then followed by man power (15.8%) and capital (14.6%).
b.) The Impact of Capital, Man power and Land Size towards Income.

According towards outcome of the analysis, coefficient value (R-Square) of capital variable (X1) on the income variable (Y) reaches 0.251. It imply that the income variable (Y) can be describe by the capital variable of 25.1% and the remaining 74.9% is affected by other variables beyond of the research. The coefficient (R-Square) obtained from the man power variable (X2) on the income variable (Y) is 0.051. It indicates that the income variable (Y) can be describe by the man power variable (X2) of 5.1% and the remaining 94.9% is affected by other variables outside of the research. The coefficient (R-Square) obtained from the land size variable (X3) on the income variable (Y) is 1.046. It means that the income variable (Y) can be describe by the land size variable (X3). The coefficient (R-Square) obtained from the cost variable (Z) on the income variable (Y) is -0.335. It indicates that the income variable (Y) can be describe by the cost variable (Z) of 33.5% and the remaining 66.5% is affected by other variables outside of the research.

Overall, it can be interpreted that the R-square value of 0.983 means the capital, man power, land area and costs contributes 98.3% on red onion farming as an icon of fried red onions in Sigi District, while the remaining 1.7% is affected by other variables outside of the research.

As for the results for each variable, the variable that

has the most dominant influence towards income is the land size (104.6%), costs (33.5%), capital (25.1%), and man power (5.01%).

c). The Impact of Capital, Man power, Land Size towards Income through Costs

The total impact onto relationship of the independent variable (Xi) on the dependent variable (Y) is same as direct impact of the independent variable (Xi) on the dependent variable (Y) plus the indirect impact of the coefficient path from the independent variable (Xi) towards mediating variable (Z) multiplied by the coefficient path variable (Z) towards dependent variable (Y). The results of the analysis using the R-Square coefficient of the capital variable (X1) on the income variable (Y) through the cost variable (Z) reaches 20.3%. The results of the R-Square coefficient analysis of the man power variable (X2) on the income variable (Y) through the cost variable (Z) is 0.1%. The results of the R-Square coefficient analysis of the land size variable (X3) on the income variable (Y) through the cost variable (Z) is 79.5%.

According from explanation above, conclusions can be drawn that the effect of the cost variable in mediating the capital, man power, and land size variables towards income is better than the direct impact of the capital, man power and land size variables towards income.

Structural Equation Model (SEM) Analysis

The quantitative analysis model used path analysis and SEM. SEM (Structural Equation Model) analysis is a set of statistical techniques that allows the simultaneous testing of a relatively complex series of connection. SEM were used to define the impact gradually, namely to analyze the impact of capital, man power and land size towards income and costs. This analysis also used to prove the proposed hypothesis described in the previous section.

1. Hypothesis testing for the direct impacts

Evaluation of Parameter Estimation or Factor Loading Measurement model analysis is to test the unidimensionality of indicators that explain a factor or a latent variable. For this purpose, each indicator in this research was tested whether simultaneously strong enough to reflect a dimension of a factor. The evaluation was based on the t-count value of the parameter and its significance value. At $\alpha=0.05$, the parameter with a t-value of 2.00 indicates that the parameter is influential or valid. Besides, a significance value below 0.05 indicates that the parameter is influential, which is the unidimensionality of a factor being tested. Outcome of the t-test on all indicators explaining for each variable there is 1 item that does not count the calculated t-value and probability as the item is a preference for that variable, namely, the item that has the largest loading factor.

Outcome of hypothesis testing for direct impacts are be presented as follow :

Table 3. Outcome of hypothesis testing for direct impacts

Exogenous	Endogenous	Sig.
Capital	Income	0.039
Man power	Income	0.654
Land Size	Income	0.044
Costs	Income	0.619
Capital	Costs	0.000
Man power	Costs	0.000
Land Size	Costs	0.000

Source: Results of Data Analysis using the Structural Equation Modeling (2021)

According towards table shown, the outcome of the analysis can be describe as follows: (a) The Impact of Capital towards income. The t-statistic value of the impact of capital towards income reaches 2.115 with a probability value (P-Value) of 0.039. The P-value is lower than probability value of 0.05 (0.0389 < 0.05). It proves the capital variable had a positive and influential impact towards income. Therefore, it empirically rejects the hypothesis (H0) and accepts the hypothesis (H1). In other words, the more capital owned by red onion farmers, more profits for red onion farmers. (b) Impact from Man power towards income. The t-statistic value of the impact of man power towards income reaches 0.450 with a probability value (P-Value) of 0.654. The P-value is lower than probability value of 0.05 (0.654>0.05). It define the power variable has a positive and influential impact towards income. Therefore, it empirically rejects the hypothesis (H2) and accepts the hypothesis (H0) indicating more man power used by red onion farmers, more profits for red onion farmers. (c) Impact from Land Size towards income. The t-statistic value of the impact of land size towards income is 2.060 with a probability value (P-Value) of 0.044. The P-value is lower than the probability value of 0.05 (0.044 < 0.05). It define that the land size variable has a positive and influential impact towards income. Therefore, it epirically rejects the hypothesis (H0) and accepts the hypothesis (H3). It means the larger the land size used by red onion farmers, more profits for red onion farmers. (d) Impact from Costs towards income. The t-statistic value of the impact of costs towards income is -0.501 with a probability value (P-Value) of 0.619. The P-value is lower than the probability value of 0.05 (0.619 > 0.05). It proves that the cost variable has a negative and less influential impact towards income. Therefore, it empirically rejects the hypothesis (H0) and accepts the hypothesis (H4). In other words, greater the costs issued by red onion farmers, less income of the red onion farmer. (e) Impact from Capital on

Costs. The t-statistic value of the impact of capital on costs is 10.544 with a probability value (P-Value) of 0.000. The P-value is lower than the probability value of 0.05 (0.000 < 0.05). It define that the capital variable has a positive and influential effect towards costs. Therefore, it empirically rejects the hypothesis (H0) and accepts the hypothesis (H5). It means more capital owned by red onion farmers, the higher the costs. (f) Impact from Man power on Costs. The t-statistic value of the impact of man power on costs is 20.909 with a probability value (P-Value) of 0.000. The P-value is lower than the probability value of 0.05 (0.000 < 0.05). It define that the man power variable has a positive and influential effect towards costs. Therefore, it empirically rejects the hypothesis (H0) and accepts the hypothesis (H6) meaning that more man power used by red onion farmers, the higher the cost of red onion farmers. (g) Impact from LandSize on Costs. The t-statistic value of the impact of

land size on costs is 46.564 with a probability value (P-Value) of 0.000. The P-value is lower than the probability value of 0.05 (0.000 < 0.05). It proves that the land size variable has a positive and influential impact on costs. Therefore, it empirically rejects the hypothesis (H0) and accepts the hypothesis (H7). In other words, the larger the land size used by red onion farmers, the higher the costs.
2. Hypothesis testing for indirect im-pacts   (Mediation)
        Outcome from the hypothesis testing for indirect impacts (mediation) of capital, man power and land size towards income through costs are presented in table 5. The hypothesis testing for indirect impacts aims to detect the position of the mediating variable in the model. Mediation testing aimed to specify the nature of connection amongst the variables, namely complete mediation, partial mediation, and non-mediation variable. Outcome of hypothesis testing for indirect impacts are presented as follow:

Table 4. Hypothesis testing for indirect impacts

Exogenous	Mediation	Endogenous	Path Coefficient	Sig.
Capital	Cost	Income	-0.048	0.000
Man power	Cost	Income	-0.052	0.000
Land size	Cost	Income	-0.251	0.000

Source: Results of Data Analysis using the Structural Equation Modeling (2021)

Based on the outcome of the hypothesis testing for indirect impacts, the outcome of the analysis described as follows: (a) The Impact of Capital towards income through

costs is -0.048. The t-statistic value of the indirect impact of the capital variable is 21.799 with a probability value (P-Value) of 0.000. The P-value is lower than the probability

value of 0.05 (0.000 < 0.05). It verify the capital variable had a positive and influential impact towards income through the mediation of costs. Therefore, H8 is accepted meaning that the more capital used, the more income of the red onion farmers through costs. (b) The Impact of Man power towards income Through Costs. The outcome of the analysis showed indirect impact of the man power variable towards income through costs is -0.52. The t-statistic value of the indirect impact from man power variable is 8.908 with a probability value (P-Value) of 0.000. The P-value is lower than the probability value of 0.05 (0.039 < 0.05). It define the man power variable had a positive and influential impact into income through the mediation of costs. Therefore, H9 is accepted. It means that the more man power used, the higher the income through costs. (c) The Impact of Land Size towards income through Costs. The outcome of the analysis showed indirect impact of land size variable towards income through costs is -0.251. The t-statistic value of the indirect impact of the man power variable is 95.421 with a probability value (P-Value) of 0.000. The P-value is lower than the probability value of 0.05 (0.000<0.05). It showed land size variable had a positive and influential impact into income through the mediation of costs. mediation of costs. Therefore, H9 is accepted meaning that greater land size used, more greater the income of red onion farmer through cost.

Discussion

As a production factor, capital determines the high or low productivity of farming. Agricultural capital at the macro level is in the form of available capital to be managed and controlled in economic activities. Result of this research are align with the previous research which sufficient capital allows farmers to sufficiently meet farming production facilities as well as to meet other technological inputs to improve farming, such as fertilizers, man power costs, and the provision of other supporting facilities and infrastructure. Sufficient capital available for farming helps farmers increase yields and income.

Most of the capital is from own capital without loans from third parties such as banks, cooperatives, and others. Capital had influential impact into income of red onion farmers because use of capital that is in accordance with the needs will increase production and finally increase income. Besides capital, man power is important in production as man power is a defining factor for another production inputs and without man power, other production factors shall be useless. Increasing man power productivity will encourage increased production and finally increasing income. If many products are sold, the producer will increase the number of production. Increasing the number of production will increase the required man power so that income will also increase. Field observations revealed that the

need for man power in the red onion farming business is for land preparation, planting, harvesting, and post-harvesting period. Overall, the production process on an average cultivated land size of 1-4 hectares is 11-49 people with a unit of wages calculating the Days of Work (HOK) with special man power costs before land preparation of Rp. 80,000/day per individual. Then, the average wage for planting is Rp. 80,000/day per individual. Meanwhile, for harvesting period or known as *protol* (separating the fruit from the leaves) is Rp. 80,000/day per individual. The post- harvesting period also needs man power with wages of Rp. 80,000/day per individual. The harvesting period requires the highest man power costs.

Man power is a physical and brainpower tool that cannot be separated from humans and is aimed at production. The impact of man power towards income is not the same in each production stage. Ability of man power is greatly determined by the skills and mastery of science and technology which in practice greatly determines the amount of production and profits. Land is one of the production factors that determine a number of production. That land is one of the production factors, where agricultural products are produced which have a large contribution to farming as the number of production is strongly affected by the size of the land used (Pradnyawati & Cipta, 2021).

Therefore, a special policy is needed for land size as cultivating a large area will increase farmers' income and vice versa. The larger the land size land can increase the number of red onions planted and as well as the number of red onion production.

Outcome showed that cost of red onion farming in Oloboju, Bulu Pountu Jaya, and Solouve villages, Sigi District had a negative also influential impact towards income. It can be interpreted that when costs incurred increase, it will reduce the income of red onion farming. Outcome of this other research, that cost is one of the important production factors in a farming activity, both fixed costs and variable costs due towardsir nature to support activities in farming. Farming spending mostly determined by land size. The costs referred to in this research are the costs incurred during one harvest cycle.

In this research, capital has a negative and influential impact on costs. It can be interpreted to subsidiary capital used will reduce use of costs. This is because the capital used is from gain earned in the previous production activities so that the cost of capital in the form of interest does not burden red onion farmers in this area. This aspect highly determines the income received by red onion farmers in Oloboju, Bulu Pountu Jaya, and Solouve villages in Sigi district, Central Sulawesi.

Man power is a production

input of the input variable where the use of man power can be adjusted towards needs of farming. In this research, man power greatly affects the costs used because the more man power used, the more costs will be incurred for wages. In terms of costs, it is important to consider the availability of man power wages. However, most of the workforce comes from the farmer's family members consisting of husband, wife, and children. Family workers are the family's contribution to overall agricultural production and are never valued in cash. Therefore, additional costs will be followed by additional income for red onion farming in Oloboju, Bulu Pountu Jaya, and Solouve villages.

The land size factor had a positive and influential impact on the cost of red onion farming in the Sigi District. Land size is the total area of land used by farmers to plant red onions expressed in hectares. Calculation from outcome showed land size had a positive and influential impact towards cost of red onion farming in Sigi District at a 95% confidence level and a regression coefficient value of 0.750. It can be interpreted if there is an subsidiary in the land size, it will increase the cost of production. That land as one of the production factors has a influential contribution to farming (Pradnyawati & Cipta, 2021).

The decrease in land size results in a decrease in red onion production. Therefore, it is necessary to increase the land size to increase the red onion production as well as income of red onion farmers.

The capital variable has a positive and influential impact into income through costs on red onion farming in Sigi District. Capital is all the capital used by farmers in red onion farming activities in one planting season which is expressed in rupiah. The calculation results revealed capital variable has a positive and influential effect into income through costs. Limited capital obtained by red onion farmers in this district can hinder business growth. The amount of capital is relatively low and it is hard to get. As a result, the income grade of farmers decreases due towards low level of capital used in the business. Capital is a determining factor in production activities and the size of capital affects the number of output produced. Therefore, the more capital used, the higher the income received by red onion farmers. The man power variable has a positive and influential impact into income through costs on red onion farming in Sigi District. Man power is all man power used by farmers in red onion farming activities in one planting season which is expressed in HOK units. The calculation results revealed the man power variable has a positive and influential impact into income through costs on red onion farming in this district. It means that if there is an increase in the red onion farming man power, it will reduce the income. The man power variable does not directly increase income, but through the cost variable, man power can

have a negative impact towards income. It is because if there is additional man power, it will increase production costs and finally reduce red onion farming income. After all, income is derived from revenues minus costs. If the revenue is higher than the cost, the farmer will make a profit. Otherwise, if the revenue is lower than the cost, the farmer will experience a loss.

The man power used in one period starting from land processing to harvesting covered the farmer's family members and outside workers with wages of Rp. 80,000/day per individual. The wages are not the same in every production business. Man power is an important factor in farming, especially family workers. If the work can still be done by the farmer's family members, there is no need to hire outside workers, so that the level of cost-efficiency incurred can provide a very influential income for the farmer. However, the absorption of the number of man power is not high because it will reduce the farming income. The land size variable has a positive and influential impact into income through costs on red onion farming in Sigi District. Land size is the total area of land used by farmers to plant red onions expressed in hectares.

Calculation from the outcome revealed land size variable has a positive and influential impact into income through costs. It can be interpreted as if there is an increase in land size, it will reduce the red onion farming income. The land size variable does not directly increase income, but through costs, the land area can have a negative impact towards income. It is because if there is an increase in land size, it will increase production costs so which then reduce the red onion farming income as the income is derived from revenues minus costs. If the revenue is higher than the cost, the farmer will get profits. Otherwise, if the revenue is lower than the cost, the farmer will experience a loss.

CONCLUSION AND SUGGESTION

Based on the results of testing the hypothesis of the direct effect, the production factors of capital, labor and land area have an effect and have a direct effect on income. Partially, the results of the analysis show that the capital variable has a positive effect on income; labor has a positive impact and affects income; and land area has a positive effect on income. The cost variable has a negative and small effect on income. Regarding the cost of production factors, variable capital has a positive effect on costs; labor variable has a positive effect on costs; and the variable land size has a positive effect on costs. The results of testing the indirect effect hypothesis show that the variable capital, labor and land area have a positive effect and influence income through the mediation of shallot farming costs. Based on this research, the authors suggest that shallot farmers try to increase the area of land so that farmers' income increases. In addition, the government also needs to implement a price policy so that prices at harvest do not

fluctuate and continue to improve the economic welfare of farmers in Sigi Regency. For future researchers who wish to study the same subject, it is hoped that they can conduct research in different places to obtain information about factors of production and costs on the income of shallot farming in other places in Indonesia besides Sigi district.

ACKNOWLEDGE

REFERENCES

Abokyi, E., Strijker, D., Asiedu, K. F., & Daams, M. N. (2020). The impact of output price support on smallholder farmers' income: evidence from maize farmers in Ghana. *Heliyon*, *6*(9), e05013. https://doi.org/10.1016/j.heliyon.2020.e05013

Arikunto, S. (2017). *Metodologi Penelitian*. PT. Rineka Cipta.

Azfril, Daga, R., Samad, A., & Murdin. (2022). Analisis Manajemen Risiko Petani Bawang dan Dampak Pertumbuhan Ekonomi Masyarakat Desa Tobalu Kecamatan Enrekang Kabupaten Enrekang. *Jurnal Sains Manajemen Nitro*, *1*(5).

Bainton, N., Owen, J. R., Kenema, S., & Burton, J. (2020). Land, labour and capital: Small and large-scale miners in Papua New Guinea. *Resources Policy*, *68*, 101805. https://doi.org/10.1016/j.resourpol.2020.101805

Budiastuti, D., & Bandur, A. (2018). *Validitas dan Reliabilitas Penelitian dengan NVIVO, SPSS, dan AMOS*. Mitra Wacana Media.

Cárdenas-Retamal, R., Dresdner-Cid, J., & Ceballos-Concha, A. (2021). Impact assessment of salmon farming on income distribution in remote coastal areas: The Chilean case. *Food Policy*, *101*, 102078. https://doi.org/10.1016/j.foodpol.2021.102078

Fajjriyah, N. (2017). *Kiat Sukses Budidaya Bawang Merah*. Bio Genesis.

Fauziah, R., Susila, A. D., & Sulistyono, E. (2016). Budidaya Bawang Merah (Allium ascalonicum L.) pada Lahan Kering Menggunakan Irigasi Sprinkler pada berbagai Volume dan Frekuensi. *Jurnal Hortikultura Indonesia*, *7*(1), 1. https://doi.org/10.29244/jhi.7.1.1-8

Fitriana, L. (2020). Pengaruh Beberapa Faktor Terhadap Pendapatan Petani Bawang Merah (Allium Ascolanicum) Di Kecamatan Junjung Sirih Kabupaten Solok Sumatera Barat. *Jurnal Sungkai*, *8*(1), 51–60.

Hartoyo, H. (2020). Potensi Bawang Merah Sebagai Tanaman Herbal Untuk Kesehatan Masyarakat Desa Jemasih Kec. Ketanggungan Kab. Brebes. *Syntax Literate: Jurnal Ilmiah Indonesia*, *5*(54).

Helmayuni, Mardianto, & Agustin, F. (2022). Analisis Risiko Produksi dan Perilaku Petani Menghadapi Risiko Usaha Tani Bawang Merah di Nagari Paninggahan Tani Bawang Merah di Nagari Paninggahan Kecamatan Junjung Sirih Kabupaten Solok. *Ekasakti Jurnal Penelitian &*

*Pengabdian,*2(2).

Karyati, K., Ipor, I. B., & Sapawi, N. M. (2014). Laju Infiltrasi Beberapa Jenis Tumbuhan Herba Di Matang Wildlife Centre, Sarawak. *Jurnal Magrobis*, *14*(5).

Kelley, L. C., Peluso, N. L., Carlson, K. M., & Afiff, S. (2020). Circular labor migration and land-livelihood dynamics in Southeast Asia's concession landscapes. *Journal of Rural Studies*, *73*, 21–33. https://doi.org/10.1016/j.jrurstud.2019.11.019

Khan, M. F., Nakano, Y., & Kurosaki, T. (2019). Impact of contract farming on land productivity and income of maize and potato growers in Pakistan. *Food Policy*, *85*, 28–39. https://doi.org/10.1016/j.foodpol.2019.04.004

Le Phi Khanh, H., Corfield, J., Lane, P., Ba, N. X., Van, N. H., & Parsons, D. (2020). Intensive forage cultivation reduces labour input and increases cattle production income in smallholder mixed farming communities of South Central Coastal Vietnam. *Journal of Agriculture and Food Research*, *2*, 100067. https://doi.org/10.1016/j.jafr.2020.100067

Lu, S., Sun, H., Zhou, Y., Qin, F., & Guan, X. (2020). Examining the impact of forestry policy on poor and non-poor farmers' income and production input in collective forest areas in China. *Journal of Cleaner Production*, *276*, 123784. https://doi.org/10.1016/j.jclepro.2020.123784

Permana, D. F. W., Mustofa, A. H., Nuryani, L., Kristiaputra, P. S.,

& Alamudin, Y. (2021). Budidaya Bawang Merah di Kabupaten Brebes. *Jurnal Bina Desa*, *3*(6).

Pradnyawati, I. G. A. B., & Cipta, W. (2021). Pengaruh Luas Lahan, Modal dan Jumlah Produksi Terhadap Pendapatan Petani Sayur di Kecamatan Baturiti. *Ekuitas: Jurnal Pendidikan Ekonomi*, *9*(1), 93. https://doi.org/10.23887/ekuitas.v9i1.27562

Purnamadewi, Y., & Firdaus, M. (2021). Analysis of Income Determinants Among Farm Households in the Upland Shallot Production Center in Malang District, Indonesia. In *Proceedings: 2nd International Conference on Food and Agricultural Economics*.

Ren, Y., Peng, Y., Castro Campos, B., & Li, H. (2021). The effect of contract farming on the environmentally sustainable production of rice in China. *Sustainable Production and Consumption*, *28*, 1381–1395. https://doi.org/10.1016/j.spc.2021.08.011

Retnawati, H. (2016). *Validitas Reliabilitas dan Karakteristik Butir (Panduan untuk Peneliti, Mahasiswa, dan Psikometrian).* Parama Publishing.

Rodrigues, A. S., Almeida, D. P. F., Simal-Gándara, J., & Pérez-Gregorio, M. R. (2017). Onions: A Source of Flavonoids. In *Flavonoids - From Biosynthesis to Human Health*. InTech. https://doi.org/10.5772/intechopen.69896

Sekaran, U., & Bougie, R. (2019). *Research methods for business: A skill building approach*. John Wiley & Sons

Sugiyono. (2016). *Metode Penelitian Pendidikan Pendekatan Kuantitatif, kualitatif, dan R&D*. Alfabeta.

Susanawati, S., Masyhuri, M., Jamhari, J., & Hadi Darwanto, D. (2018). Factors Influencing Income of Shallot Farming in Java Indonesia Using UOP Profit Function Model. *Proceedings of the International Conference on Food, Agriculture and Natural Resources (FANRes 2018)*. https://doi.org/10.2991/fanres-18.2018.14

Susanti, H., Budiraharjo, K., & Handayani, M. (2018). Analisis Pengaruh Faktor-Faktor Produksi Terhadap Produksi Usahatani Bawang Merah di Kecamatan Wanasari Kabupaten Brebes. *Agrisocionomics: Jurnal Sosial Ekonomi Pertanian*, *2*(1), 23. https://doi.org/10.14710/agrisocionomics.v2i1.2673

Syukra, R. (2020). *Kadin: Sektor Pertanian Basis Perekonomian Indonesia*. Investor.Id.

Tan, S., Zhong, Y., Yang, F., & Gong, X. (2021). The impact of Nanshan National Park concession policy on farmers' income in China. *Global Ecology and Conservation*, *31*, e01804. https://doi.org/10.1016/j.gecco.2021.e01804

Tola, D. (2016). Pembangunan Sektor Pertanian Sebagai Basis Pertumbuhan Ekonomi Pedesaan (Kajian Kepustakaan). *Jurnal Pendidikan Ekonomi* , *1*(6).

Zhang, J., Mishra, A. K., Zhu, P., & Li, X. (2020). Land rental market and agricultural labor productivity in rural China: A mediation analysis. *World Development*, *135*, 105089. https://doi.org/10.1016/j.worlddev.2020.105089