



PRODUCTIVITY ANALYSIS OF LABOR FOR USE ON POTATOES

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ABSTRACT

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Potato production in Indonesia is not yet optimal, other factors are related, knowledge level, job outpouring rate, working capital, production facilities and management. The purpose of research to determine the level of productivity and factors of production that is the number of labor, age, education and length of working of labor use. The study was conducted in Pangalengan District, South Bandung in November 2017 until January 2018. The samples were 30 potato farmers. Work productivity is based on the ratio between the amount of revenue and the amount of income employees. Analysis of data with multiple linear regression. The optimization of labor usage based on production elasticity is the ratio of marginal product price to labor cost. Simultaneously the amount of labor income, age, education and length of real employment for employees who work with the magnitude of the division of 75.5%. In general, the amount of labor has a negative effect on the use of labor, while age, education and duration of employment cannot be used for labor usage. The optimization level of $-9.589 < 1$, indicates that the use of labor in the study site is too much, not optimal. The proposed suggestion is that the use of labor needs to be recalculated in the maximum amount of the farmers' maximum wage energy. Suggestions of analysis in accordance with the stages and networks in farmer groups or between groups of farmers.

1. INTRODUCTION

The agricultural sector in Indonesia, in addition to its role in the provision of food, industrial raw materials and sources of foreign exchange, also became the foundation of 70% of the population, especially those living in rural areas. The growth rate of agriculture is only 67%. The growth rate of agriculture is only 67% [1]. The closeness of the agricultural sector to the rural economy causes the development of the agricultural sector will always be positively correlated with the growth of the rural economy [2]. Because the farmers is a rural community, the growth of the rural economy will be in line with improving the welfare of rural communities.

In a narrow sense agriculture is defined as agricultural farming of the people, i.e. family farming (subsistence or half subsistence) where main foodstuffs are produced such as rice, crops and horticultural crops, most of which are to meet the needs of family consumption. Potato productivity is strongly influenced by many factors such as plantation area, farmer's knowledge level, job outreach rate, capital and management. The application of information technology increases potatoes productivity significantly [3]; [4]. In general, farming is done with two purposes, namely: farming as a way of life and farming as a farm business. As a way of life farming is only done to meet the needs of the family (subsistence), while as farm business farming is done to gain profit.

From the results of previous research conducted by Noor, et al. [5] it is known that the dominant factor in potato farming is the area of land followed by the price of fertilizer, but the two factors cannot be controlled by

farmers. Labor cost factors have negative and long-term impacts on farm income. In this case it can be explained that if labor costs rise then income will decrease, and if farming skills increase then income will increase. Both factors are factors that can be controlled by farmers. For that we need to examine more deeply the factors of employment that can be controlled by farmers which has a significant effect on increasing production.

Generally, the potential of family labor is the number of potential labor available to one farming family. In farming all labor used during the production process must be taken into account, whether by manpower, women, children, livestock or mechanical power. The existence of sex difference caused the amount of work outpouring in farmer's family different. Factors such as: age, experience of farming, the amount of labor, income to be achieved, the wage rate to be gained is the parameters that determine the amount of the outpouring of the work.

The agricultural sector has internal weaknesses: bulky and perishable nature of agricultural commodities, small and scattered business scale, limited access to capital, low human resource capacity, marketing constraints, global climate factors and inconsistent post-harvest handling. Such matters result in inefficient outpouring of labor employed, so that the continuity, availability and quality of products are less competitive than similar products produced by neighboring countries. Farmers can only accept prices on the market and do not have sufficient bargaining power to determine market prices. Another factor that is influential and can be controlled by farmers is the employment factor. But the question is whether the potatoes are still profitable and what is the level of productivity and optimization of labor usage?

Based on the description on the background then the problems in this study are as follows: (1). How does the simultaneous and partial influence of labor variables on productivity of potato growers? (2). How magnitude is the optimization of labor supply in potato farming.

2. LITERATURE REVIEW

Labor is an important production factor in addition to land, capital and management. [Hernanto \[6\]](#) divides the labor into human labor, livestock and mechanics. Human labor is divided into male, female and child labor. Manpower can work on all types of work based on their level of capability. In addition, human labor in farming can be influenced by the age, education, skills, experience, nutritional adequacy, and level of health owned by farmers. Natural factors such as climate and agricultural land conditions also contribute to job outpouring. Agricultural land is the dominant factor on agricultural production [\[7\]](#).

In conducting farming, generally farmers in Indonesia use labor taken from within the family. According to [Mubyarto \[8\]](#) the utilization of family labor is influenced by several factors, namely level wages, income levels to be gained, the range of available employment opportunities, local employment institutions and owned land assets. As stated by [Mulyadi \[9\]](#) that the success of business branch can be seen from the amount of output (output) and labor is one important factor of production in farming because it can affect the amount of expense in the effort.

Rukasah in [Hernanto \[6\]](#) states that to know the potential of family labor, all types of labor available in the family, calculated based on the number of working hours used in a year. A male worker will work 300 working days (HOK) within a year. Women workforce for 226 working days and children 140 working days in one year. Yang in [Hernanto \[6\]](#) makes the conversion of labor, by comparing male labor as a standard measure and other labor types converted or synchronized with men, namely: 1 male = 1 working day man; 1 woman = 0.7 man days; 1 cattle = 2 working days man; and 1 child = 0.5 working days man. One working day is calculated for 7 hours. Working units (working days) are needed to measure the efficiency of labor usage. Efficiency is an attempt to achieve goals by using the resources to a minimum. One way to measure efficiency is to look at labor productivity. Labor productivity is the ratio between the income received and the amount of labor disbursed by farmers. High labor productivity will demonstrate efficient use of production factors for farming.

The level of input usage optimization is derived from the ratio of the marginal product value (MPV) to the cost or price of each input [9]. The optimum value indicates the adequacy of input use to the value of the product produced.

Farming is the set of natural resources for agricultural production [10]. For subsistence farming, some workers come from their own farming families consisting of fathers, wives and children of farmers, so there is no need for wages in the form of cash to be paid in cash so as to reduce labor costs. In the economic sense, capital is a good or money which together factors of land production, labor and management produce new goods, that is agricultural products. A key element that also plays a role in farming is management. This element must be owned by farmers to be able to determine, organize and coordinate the factors of production are mastered, so as to provide optimal results [11].

Madarwati [12] states that the income of potato farming can be measured by looking at the amount of cash receipts and expenditures during the run of their farms. Revenue is the amount of production multiplied by the average price received by farmers, while expenditure is the amount of costs incurred in the process of farming.

Manpower is one of the important production factors for conducting business activities that can be affected by age, education, skills, experience, nutritional adequacy, and the level of health owned by farmers. Natural factors such as climate and agricultural land conditions also contribute to job outpouring

In implementing potato farming, in addition to using wage labor, most farmers in Indonesia use labor taken from within the family such as mothers, children and relatives. The utilization of family labor is influenced by the wage rate, the level of income to be gained, the range of available employment opportunities, local employment institutions and the assets of the land they own. The success of business branches can be seen from the amount of output and labor is one of the important production factors in farming because it can affect the amount of costs incurred in the business [13].

3. RESEARCH METHODS

The research was conducted in Pangalengan district, South Bandung, purposively chosen as the largest agricultural area and largest potato producer in West Java Province [4]; [14]. Respondents are potato farmers in the research location determined purposively based on land ownership of 30 farmers. Quantitative and qualitative data were collected through interviews.

In this study the dependent variable (Y) is the productivity of farming and the independent variable (X) is the use of labor consisting of the number of labor (X1), age (X2), education (X3) and length of farming (X4). The operational definition of variables is as follows:

1. Labor productivity is the amount of income from the farm branch in one growing season, calculated in rupiah per man work day (IDR/DoW).
2. The number of farm laborers is the number of farm laborers used during the production process, measured in terms of the soul.
3. Farmer's age is the age of farmers measured in years.
4. Farmers' education is the length of time for farmers to run formal education, in this case SD (Elementary School) score 6, SMP (Secondary School) score 9 and SMU (High School) score 12.
5. The length of farming is the length of the farmers in carrying out the farm, measured in units of years
6. Labor productivity analysis is measured by comparison between gross income value of rice farming with the amount of labor outpouring [15]. Labor Productivity (IDR/DoW) = Revenue / (Labor Curve)

To determine the effect of the number of labor, age, education and experience of producing potatoes on the productivity of labor usage formulated in one model:

$$Y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + e$$

Y = Productivity of labor usage

x1 = Total labor of farmers (soul)

x2 = Farmer's age (year)

x3 = Farmer education

x4 = Length of farming (year)

x1. x4 = Independent or explanatory variable

b1. b4 = Estimated parameters

Single-regression test parameters use t-test while simultaneously using F-Test.

Rate of Optimization = MPV / LC [15]

$MPV / LC = 1$ then the use of labor is optimal

$MPV / LC > 1$ then the use of labor has not been optimal, can be added

$MPV / LC < 1$ then the use of labor is not optimal (too much), so it can be reduced.

MPV = marginal product value

LC = labor cost

4. RESULTS AND DISCUSSION

4.1. Characteristics of Respondents

In general, respondents have self-owned land with an average of 1.23 ha / planting season and some increase by rent (7%) from other parties. It is known that the number of male respondents more (93%) than women who only 7% with the average age of respondents is 45 years. The formal education of most respondents graduated from elementary school (37%), junior high (33%) and senior high school (30%), with a good experience of 14.1 years. This shows that potato farming has become a way of life for potato farmers in Pangalengan, South of Bandung.

The results of the data show the range of dependents of the farming families between 1 - 6 people, with an average of 3 people (43.5%) and 23.9% having 2 family dependents. Literally the greater the number of dependents of the family, the greater the potential labor available to the farming families.

The ability to run the farm is also influenced by the age factor. The average age of farmers is 45 years (range 22 - 71 years), some 76% belong to the productive age. This situation shows that in most of the respondents have the potential of the maximum workforce.

In general, the formal education of the respondents is quite good, coupled with the informal knowledge obtained from generations of parents and the amount of information from the local agricultural extension officers, from farmers' contacts and internet media. This is reinforced by the fact that the average respondent has been working on potatoes long enough with a range of 1 - 30 years. The longer the respondents are experienced in farming, the higher their ability to grow crops [6].

Farms 44% owned by farmers own 44%, 33% rent from other owners and some 23% in addition to working on their own also rent from other farmers. The respondents' area ranged from 0.3 to 2.2 hectares / planting season with an average production of 6 - 8 tons of harvest. In the struggle of respondents who are status as tenant farmers get capital assistance in the form of production facilities (fertilizer, seeds and medicines) from land owners. While respondents with status as the owner and the cultivators use their own capital, only some of them borrow from relatives or collectors / wholesalers, where the capital is used by farmers to finance the purchase of production facilities, tools (hoes, sickles etc.), wage labor and marketing of production.

4.2. Analysis of Labor Intensive

In the struggle of potatoes, respondents do activities ranging from planting to harvest. In addition to family members, respondents also use wage labor to undertake land-cultivation, planting, spraying, weeding and harvesting activities. Average labor wage in Pangalengan District is Rp.70 000, - / day, with 7 hours working time. The outpouring of potato farming in Pangalengan is presented in Table 5.1.

Table-5.1. Outpouring Potato Farming Work In Pangalengan District

No.	Type of Activities	DoW / Ha / Season	Percentage
1	Land processing	144,5	27
2	Planting	41,6	8
3	Maintenance	203	38
4	Harvesting	74,9	14
5	Transportation	69	13
	Total	533	100,00

Source: Primary data processed, 2017

In land-processing activities, farmers generally do not do their own, but be encouraged with a cost of 10,000,000 IDR/Ha This activity is carried out for 4 - 5 days/Ha. Planting activities are generally carried out by the respondents themselves (40%) or wage man (60%) who are generally male for 3-5 days, while spraying pests are done by man power, weeding more done by women.

Outputs on maintenance activities occupy the highest percentage (38%), because maintenance includes embroidery activities, weeding weeds that have to be done over and over done by women's workforce. Spraying activities of pests and diseases involve more male labor. The second most outpouring work is in the field of land processing done in bulk and generally men and the cost of harvesting activities is paid by the profit-sharing system that is with a ratio of 5: 1 for men or women, while the outpouring of work the least is on planting activities (8%) simultaneously performed by men and women labor about 3-4 hours/day.

4.3. Analysis of Revenue of Potato Farming

The high low income of farming is very dependent on the production obtained and the amount of costs incurred in the production process. From the research results there are respondents who managed to harvest quite well, but there are also respondents who are less fortunate because the potato plant is exposed to pest attacks. Production of potato respondents ranged from 8-10 tons of harvest, sold to collecting merchants coming to the location or to the sub district market at an average price of 7,000 - 8,000 IDR/kg. For the tiller farmers the crops will be divided by the land owner, whose amount is adjusted according to the agreement.

The costs incurred by the respondents for the farming activities may vary depending on the status of the cultivated land. At the farmer the owner and the cultivator usually they will finance their own expenses, whereas the farmers there are assisted by the owner of land (expenditure of fertilizer, seeds and medicines), but there is also self-financing all expenditures. The average cost of potato farming in Pangalengan is presented in Table 5.2.

Table-5.2. Average Cost of Potato Farming in Pangalengan (Ha/Season)

No	Fixed Cost	Amount (IDR)	%	Variable Cost	Amount (IDR)	%
1	Land rent	1.006.793	80,78	Purchase of seeds	15.615.000	27,45
2	Depreciation tools	38.559	3,09	Purchasing of fertilizer	3.105.000	5,46
3	Sacks	100.597	8,07	Purchase of Pesticide	502.000	0,88
4	Rent sprayer	100.543	8,06	Labor	37.659.000	66,21
	Total	1.246.494	100	Total	56.881.000	100
	Total Cost of Farming Potato = 58.127.494 (IDR/Ha/ season)					

Source: Processed data (2017)

The total cost of potato farming in Pangalengan is 58,127,494 IDR/Ha/ season. The largest cost incurred by farmers is to finance the workforce. This is due to the inefficient use of labor in each activity. Often farmers use labor based on a sense of solidarity among peasants, namely that occurs in planting and harvesting activities that can involve an average of 20 people labor. In the use of production facilities, respondents spend a considerable cost of 33.79% of the total cost. The largest expenditure on fertilizer purchases, the average cost of fertilizer is 3,105,000 IDR/ha/ planting season. In addition there is a tendency of farmers to use excessive pesticides, with an average cost of 502,000 IDR/ha/planting season

Potato seeds are purchased at 12,345 IDR/kg and the cost of purchasing seeds is 27% of the total variable cost with an average of 649,985 kg/ha or 12,368 IDR/ha/planting season. Fixed costs in potato farming include: Land cost calculated from rental value of an average of 1,006,793 IDR/season. The farmers' harvest yields vary between 14,700 kg - 16,300 kg/ha/season with an average yield of 15,615 kg / ha / planting season. In marketing the crops, respondents directly sell to the collectors or to the market with prices varying between 7,500 - 8,500 IDR with an average price of 8,000 IDR/kg. The full details of farming costs, revenues, and income are outlined (Table 5.3.):

Table-5.3. Cost, Revenue and Revenue of Potato Farming in Pangalengan

No	Description	Per Hectare
1	Fixed Cost	1,285,733
2	Variable Cost	56,881,000
3	Total Cost	58,166,733
4	Total Production (IDR/kg)	15,615
5	Production Price (IDR/ kg)	8,000
6	Revenues	1,010,084,743
7	Revenue / Profit	33,669,491
8	R/C	1.61
9	B/C	0.61

Source: Processed data (2017)

The level of profit earned by farmers in trying potato farming is to see the ratio between the amount of revenue (Revenue) with expenditure (Cost). From the calculation results obtained value R/C ratio of 1.61 which means every 100 IDR issued in an activity will be obtained revenue of 161 IDR. In addition the results of comparison analysis of profits with the cost indicates that the value of B/C of 0.61 which means potato farming in research location is still profitable and feasible to cultivate. The greater the R/C ratio, the greater the profits the farmer will receive. This can be achieved if farmers can allocate production factors more efficiently, for example by more efficient use of labor.

4.4. Influence of Total Labor, Farmer Age, Education and Length of Striving on Productivity of Labor Usage

Productivity is the number of outputs generated per input unit.

Labor productivity is the amount of income from the farm branch in one growing season, calculated in rupiah per man work day (IDR/DoW). The labor productivity analysis was measured by comparison between the gross income value of potato farming and the amount of labor outpouring [15].

The progress of a farm can be measured through the level of labor productivity, and all farming is directed to efficiency in order to increase labor productivity. The productivity of labor in farming can be seen from the comparison between the value of production and the labor that is shed. From the data analysis of the amount of labor productivity (IDR/ DoW) for potato farming for one year is 1,895,093 IDR/DoW. According to Mubyarto [8] the increase of manpower can be done through various ways such as by providing education and training to improve the quality and quantity of work. Respondents, especially potato farmers in Pangalengan need to be continuously given counseling and demonstration in order to develop the insight and knowledge in integrated effort.

The correlation analysis of the relationship between the number of labor, age, education and duration of labor with labor usage productivity is a strong negative labor force (-0,878), the more the labor force decreases the productivity of its workforce, energy used compared to the amount of work so that it is not effective. The age relationship with the negative labor productivity is weak, the older the farmer's age the more unproductive. The relationship of formal education is weak (0.037), the more educated the more productive the workforce. Long-term

farming relationship with moderate positive labor productivity (0.254), the more experienced a farmer in potato production, the more productivity increases.

The simultaneous influence (Test F) amount of labor (labor deprivation), age, education and experience of producing potatoes on labor usage productivity are presented in Table 5.4.

Table-5.4. The Simultaneous Effect of Labor Amount, Age, Education and Length of Working on Productivity of Labor Usage ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	13856711592,737	4	3464177898,184	23,321	,000 ^b
	Residual	3713558353,131	25	148542334,125		
	Total	17570269945,868	29			

a. Dependent Variable: Labor productivity

b. Predictors: (Constant), length of working, outpouring of work, age, formal education

Based on F test (Table 5.4), P value (Sig.) = 0.000 < 0.005, thus it can be stated that simultaneously the amount of labor (labor outpour), age, education and experience of potatoes have a significant effect on labor usage productivity. The amount of contribution (coefficient of determination, R² adjusted) amount of labor (labor deprivation), age, education and experience of producing potatoes to labor usage productivity is 0.755 (75.5%), thus it can be stated that 75.5% labor is affected by the amount of labor (labor outpour), age, education and farming experience, while the rest (24.5%) by other factors not examined (Table 5.5).

Table-5.5. Coefficient of Determination

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	,888 ^a	,789	,755	12187,79447338

a. Predictors: (Constant), age, outpouring work, age, formal education

b. Dependent Variable: Labor productivity

Table-5.6. Partial Effect of Labor, Age, and Education Duration of Productive Labor Usage

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	259356,029	18341,792		14,140	,000
Outpouring work	-161,296	17,828	-,862	-9,047	,000
age	-35,787	193,376	-,018	-,185	,855
Formal education	-279,088	995,821	-,028	-,280	,782
Length of working	436,140	371,155	,126	1,175	,251

Source: data processed with SPSS, 2017

Based on Table 5.6, the regression equation is expressed as follows:

$$\text{Labor Usage Productivity} = 259356,029 - 161,296 X_1 - 35,787 X_2 - 279,088 X_3 + 436,140 X_4$$

Based on the t test (Table 5.6), it is stated that the number of labor (labor outpour) has a positive effect on the productivity of labor usage, while age, formal education and duration of farming do not affect the productivity of labor usage. Based on the Beta coefficient, the total labor value of Beta is 0.862 > 0.05, it means that the labor force is the dominant factor to the productivity of labor usage in potato farming. The negative sign on the number of workers suggests that an increasing number of workers will further decrease the productivity of labor usage, or say to be inefficient.

The level of optimization is the ratio between the value of the marginal product and the labor cost. From the results of the data obtained that the level of optimization of labor usage in potato farming in Pangalengan region obtained value -9.589 which means less than 1. This indicates that the use of labor in the study site too much, so it becomes not optimal. This is because farmers still use labor based on kinship system, too much labor is used compared to the amount of work that should be ineffective.

In macro, labor is a group that occupies working age. In micro, labor is employees who are able to provide services in the production process, quantity. While the micro, understanding of labor is quality, i.e. as services provided or poured in the production process. In practice, especially in Indonesia, the term labor includes workers, employees, and employees [16].

Work productivity can be interpreted as a process and also as a result. As a process, the definition of work productivity implies "the will" (desire) and "effort" human to always improve the quality of life and livelihood in all fields. Therefore, the main meaning of the notion of work productivity is the mental attitude that always sees that life today must be better than yesterday, and tomorrow must be better than today. As a result, productivity has been interpreted as a performance that includes effectiveness and efficiency. Effectiveness relates to how far the goal can be achieved, whereas efficiency relates to the extent of its resources can be used appropriately and correctly.

Labor management defined as labor management is an effort to increase productive contribution of labor to company which is done by holding on principle and carry out administrative function and operational function.

The effective use of labor in agriculture requires job analysis through the analysis of each stage of plant cultivation work. Manpower management is done by increasing the cultivation skills of the plants, providing a conducive working climate, providing sufficient incentives and creating networks within farmer groups.

The results of research by Niken, et al. [17] show other eccentric factors such as interest rates, infrastructure expenditures, and last year's invasion (17)

5. CONCLUSION

The results of this study are summarized as follows:

1. Simultaneously the number of labor (labor outpour), age, education and experience of potato farming have real effect on labor usage productivity with contribution amount 75,5%. Partially, the amount of labor has a significant negative effect on the productivity of labor usage, whereas age, education and duration of farming have no significant effect on the productivity of labor usage.
2. The level of optimization obtained -9.589 less than 1. This indicates that the use of labor in the study site is too much, so not optimal

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