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RESEARCH ARTICLE

The Importance of Motorcycle Taxi Transport of Agricultural Products and Operator Income in Indonesia

Hakzah Hakzah[1,*], Syarifuddin Yusuf[2] and A. Irmayani Pawelloi[3]

[1]*Department of Civil Engineering, Universitas Muhammadiyah Parepare, Parepare, Indonesia*
[2]*Department of Economics, Universitas Muhammadiyah Parepare, Parepare, Indonesia*
[3]*Department of Electrical Engineering, Universitas Muhammadiyah Parepare, Parepare, Indonesia*

Abstract:

Aims:

The purpose of this research is to analyze the operator profile, operational transportation profile and operational costs, as well as the additional income of the operator.

Background:

South Sulawesi, Indonesia, is known as the city of rice or rice granaries with extensive agricultural areas or rice fields, but road infrastructure is still limited, and there are still many unconnected road networks and the absence of fast, cheap and efficient modes of transportation for agricultural products that can operate. In addition, the level of education and skills of the community is low; limited employment opportunities cause unemployment. Therefore, farming communities create jobs by modifying their two-wheeled motorcycle and becoming operators of motorcycle taxis transporting agricultural products as a livelihood to earn additional income.

Objective:

The object of the study is motorcycle taxis operator as a means of transporting agricultural products operating in the Sidenreng Rappang Regency, with a very large agricultural area.

Methods:

The interview survey is conducted on motorcycle taxi operators. A total of 227 operator respondents were surveyed randomly using a survey form that had been previously designed and tested. Primary data is collected through interview surveys which are analyzed and described.

Results and Discussion:

The results of the study show that the majority of operators have a relatively low education profile, 96% with an education level below high school, 99% working as an operator is a side job, 100% of taxi motorcycles are owned by themselves, the time spent per motorcycle taxi transporting to the destination on average between 100 – 200 minutes per 1,000 – 3,000 kg, operating time used per day is 98% less than 5 hours, operator operating costs per day on average IDR30,600 (equivalent to US$2.1/day), provide additional income per day of IDR173,400 (equivalent to US$12/day) or month between IDR3,500,000 – IDR4,500,000 (equivalent to US$ 241 – US$ 310/month).

Conclusion:

Motorcycle taxis are one of the solutions for transporting agricultural products in this region and created additional jobs become operators to increase income.

Keywords: Transportation, Motorcycle taxi, Agricultural products, Operator, Income, Taxi.

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1. INTRODUCTION

Motorcycle taxi transportation modes have been widely used by people in Indonesia, both in urban and rural areas. Motorcycle taxis have several advantages over other modes. These include higher speed and ability to cope with traffic jams and, in particular, they are fast, flexible and inexpensive mobility services.

Motorcycle taxi services are used primarily for passenger transport, but they can also be used for freight transport operating in rural/urban areas [1], as well as to provide courier

* Address correspondence to this author at Department of Civil Engineering, Universitas Muhammadiyah Parepare, Indonesia; E-mail: hakzahs@gmail.com

and delivery services [2, 3]. Even today, services are developing and partnering with online and offline companies or using technology that requires same-day delivery in shopping. The latest can be used for food delivery [4, 5] so that motorcycle taxis provide a solution to existing problems by offering timely transportation of people and goods without waiting time and brought directly to the required destination at an agreed cost [4, 6]. Two-wheeled motorcycles are widely used in cities and villages as vehicles for transporting people and goods [7] commonly used to distribute parcels in the form of goods and food and are more popularly referred to as online motorcycle taxis because they already use internet applications that operate individually or in an organized manner, such as Go-jek, which is application-based transportation service to improve the welfare of workers in the informal sector [8]. However, this mode of transportation has not changed in physical form.

Capabilities of motorcycle taxis include being used to carry agricultural products to local markets [9] or shelters [10]; motorcycle taxis can often reach remote villages and farms. Farm fields are connected to feeder roads only by footpaths. Taxi motorcycles are created according to the needs and conditions of the operational area [11].

Other phenomena are low levels of education and skills [10] and limited employment opportunities in both urban and rural areas in developing countries, which lead to unemployment and poverty [12]. Becoming a motorcycle taxi operator is an opportunity for the community to create jobs [13] as a livelihood even though it is still an informal transportation sub-sector to earn additional income [14, 15].

1.1. The Emergence of Motorcycle Taxis

This two-wheeled taxi motorcycle is only intended to transport agricultural products, which the local community calls "Pattassi," and is generally a low-powered 2-stroke engine that could carry a limited load weight, a maximum of about 150 kg additional from the operator, as shown in Fig. (**1**), which has an additional frame or frame on the front for the storage of goods. The emergence of two-wheeled freight transportation modes to transport agricultural products is a phenomenon in South Sulawesi, especially in Sidenreng Rappang Regency, which has become part of the agricultural product transportation sector.

Several factors that give rise to the efficiency of this means of transport include the absence of a fast, inexpensive and able to operate freight transport mode in rural areas that have agricultural areas with poor road infrastructure, such as a road network that is not yet connected to others [13], winding road conditions, uphill, muddy, steep and so on. Several years ago, the transportation of agricultural goods was still dominated by human labor (carried or with assistive devices such as bicycles) and animal power such as cows and horses. Examples of research resulted in the development of bicycles and motorcycles that have been innovated by adding components to the back of the carriage (trailer) to transport and mobilize goods and even people in rural Nigeria [16]. The results of other research are using cargo bicycles, both two-wheeled and three-wheeled, designed by adding cargo boxes on the front and operator stripes, this research is for the future by exploiting the potential of using cargo cycles for transportation required by public authorities, private companies to jointly together support sustainable urban logistics [17]. This means that the need for transportation of goods in the city/village is very large and does not require transportation to transport agricultural products. The results of the study [18] concluded that improvements would encourage to work harder in rural areas to increase production, reduce spoilage and waste, and have a positive impact on farmer productivity, the rate of employment and poverty reduction in rural areas.

1.2. Design of Motorcycle Taxi

Changes in the shape of two-wheeled taxi motorcycles that are used specifically for transporting agricultural products include experiencing changes in the shape of parts such as wheels, replacing tires with trail tires such as in motor crosses and also making the steering wheel longer. The important part is the addition of a special body frame made of stainless steel pipes located at the front, which is right above the motorcycle engine because it is intended to load one or two sacks of agricultural produce, and the saddle is made shorter than a motorcycle in general to provide additional cargo space. This two-wheeled taxi motorcycle transportation mode has good capability or reliability for winding, muddy road conditions that can operate in agricultural areas with tough terrain characteristics and is a solution for transporting existing agricultural products (Fig. **1**).

The transportation equipment for agricultural products and motorcycle taxis are very well used, and the community feels very helped by the presence of this tool, especially during the harvest season. Agricultural produce in the harvest season is very abundant, which lasts two to three harvests a year with a harvest time of about two to three months per season. This is what makes most of the rural communities in this region modify or innovate their two-wheeled transportation mode to transport agricultural products and become operators as an additional livelihood apart from being a farmer. Usually, they work in groups and are paid depending on the number and distance they travel.

2. METHODOLOGY AND SURVEY

2.1. Object Study and Location

The object of the study is motorcycle taxis as a means of transporting agricultural products operating in the area of Sidenreng Rappang Regency. Coordinates: 3°43' – 4°09' South Latitude, 119°41' – 120°10 East Longitude (Fig. **2**). The area is 1.883.25 km2. The total population is 264.955 people, while the agricultural area is around 44,958 m2, with the harvested agricultural land area of 80.331.78 ha and rice production reaching 524,214 tons, according to data [19].

Fig. (1). Taxi motorcycle at agricultural sites transporting crops.

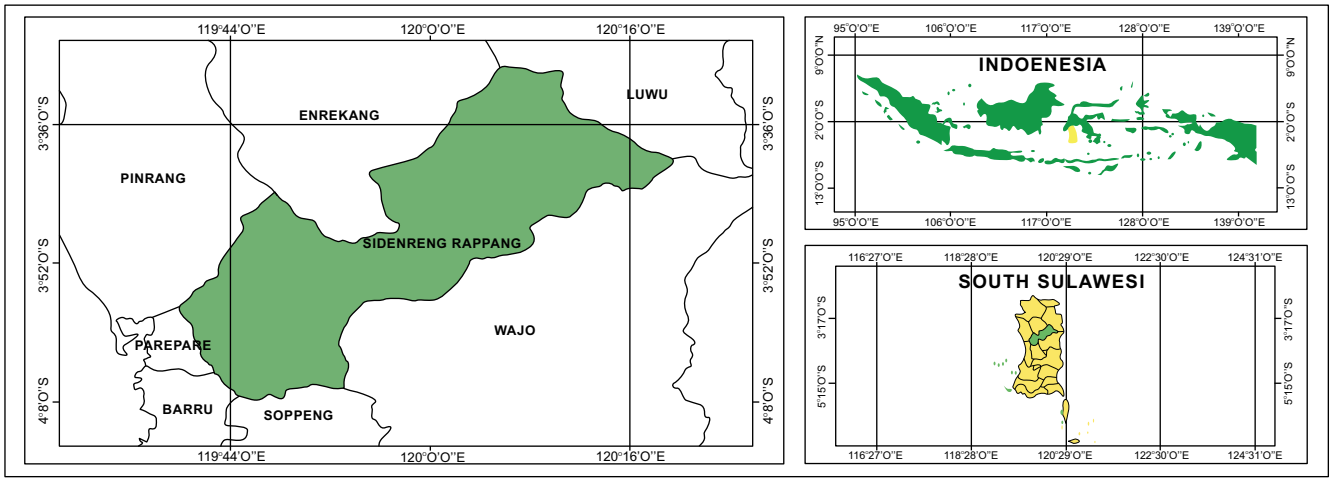

Fig. (2). Map of the research location.

2.2. Scope and Object Study

The interview survey is conducted on motorcycle taxi operators scattered and operating in Sidenreng Rappang Regency, with a very large agricultural area. A total of 227 operator respondents were surveyed randomly using a survey form that had been previously designed and tested. This is done by visiting their residences, operational locations or gathering places with their community and then interviewing them according to the question items in the questionnaire from May to July 2021. The research uses the questionnaire because the instrument helps obtain direct information and reach out to various respondents [20]. On the other hand, qualitative data collection techniques such as interviews and observations are used to collect qualitative data and detailed descriptions of phenomena, thoughts, feelings, beliefs and experiences [21].

The survey includes details related to operator profiles such as gender, age, education, marital status, daily income and satisfaction as an operator, operational transport profiles such as quantity transported daily, weight transported, distribution location, the time required for one trip, one-way mileage and

daily operating time, as well as operator operating costs needed on average every day such as fuel oil costs, lubricating oil, motorcycle tires, vehicle taxes and other unexpected costs. Then it is analyzed in a qualitative descriptive form according to the conditions in the field. The results of the data analysis draw several conclusions about the existence of motorcycle taxis as a mode of transportation for agricultural products, additional employment and aspects of operator income (Fig. **3**). This analytical approach is used to analyze qualitative data based on research objectives and driven by original records and community observations [22, 23].

3. QUESTIONNAIRE ANALYSIS

The questionnaire has been analyzed according to the operator profile, operational transport profile and operating costs.

3.1. Operator's Personal Profile

The results of the personal profile analysis of motorcycle taxi operators are shown in Table **1**.

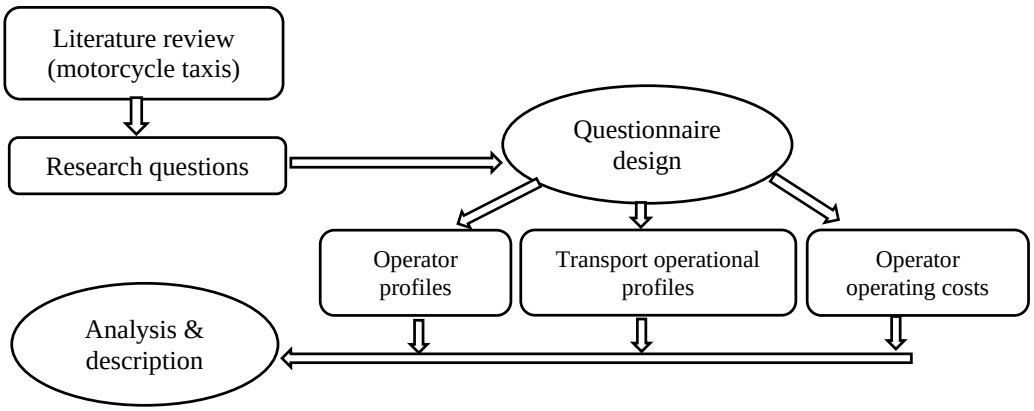

Fig. (3). Study framework.

Table 1. The results of the operator's personal profile analysis.

Parameter		Frequency (%)
Gender	Male	100
	Female	0
Education	Primary school	39
	Junior high school	31
	Senior high school	26
	Diploma	4
Ages	<20 years	12
	20 – 35 years	43
	35 – 50 years	30
	>50 years	15
Martial Status	Married	90,6
	Unmarried	9,4
Motor Taxi Owner	Owner	100
	Rent	0
Daily Income	<IDR200,000	12,6
	IDR200.000 – IDR250.000	42
	IDR250.000 – IDR300.000	33
	>IDR300.000	12,4
Job	The main job Side job	1 99
Satisfaction Job	Satisfied	70
	Unsatisfied	30
The Tariff Per Trip (IDR)	IDR10.000 – IDR12.000 >IDR12.000.	95 5

The analysis of this section aims to determine the personal profile of motorcycle taxi operators, such as gender, level of education, age, marital status, ownership of motorcycle taxis, daily income, employment status and job satisfaction. Knowing this allowed us to understand the benefits of having motorcycle taxis for operators, as shown in Table **1**.

Motorcycle taxi operators for transporting agricultural products operating in this area are 100% male, and there are no women who use their time to earn or increase their income as an operator as found in commercial motorcycle taxis for transporting people and delivering goods. Education levels show that 39% are only completed at the elementary school level, 31% at junior high school, 26% in high school and only 4% have completed at the diploma level. The low level of education makes the operation of motorcycle taxis a choice for them. This indicates that formal employment has been still lacking for people with relatively low education. Therefore, operating a motorcycle taxi should be considered a temporary solution for the unemployed among elementary, junior high and high school graduates. At the same time, they are answering the need for transportation modes of agricultural products for farming communities. Many motorcycle taxi operators consider this a side job because they generally have their main job as farmers and have their own fields.

The age profile shows that around 43% of motorcycle taxi operators are aged between 20 – 35 years, 30% are between 35 – 50 years, 15% are over 50 years old, and 12% are under 20 years old. This indicates that the age is dominated by relatively young and still productive age drivers. This job requires a strong workforce for heavy transportation and heavy agricultural conditions as well. The marital status for motorcycle taxi operators is 90.6% married and 9.4% unmarried. Therefore, they view this job as an additional job to increase their income apart from being a farmer for their family needs, so many farming communities who own two-wheeled vehicles are innovated into motorcycle taxis to transport agricultural products and show ownership of motorcycle taxis is 100% their own and nothing to rent. The tariff per trip for transporting agricultural products obtained by the operator based on the agreement is 95% between IDR10.000 – IDR12.000 (equivalent to US$ 0.7 – US$ 0.8/trip), 5% above IDR12.000 (equivalent to above US$ 0.8/trip).

The gross income of motorcycles taxi operators as a means of transporting agricultural products is quite large each harvest season, with around 42% of income per day between IDR200.000 – IDR250.000 (equivalent to US$ 14 – US$ 17/day), 33% between IDR250.000 – IDR300.000 (equivalent to US$ 17 – US$ 21/day), 12.4% above IDR300.000 (equivalent to above US$ 21/day) and only 12.6% below IDR200,000 (equivalent to under US$ 14/day). This shows that the gross income per day earned by motorcycles taxi operators is greater than conventional ojek drivers who report a daily income of IDR50.000 – IDR100.000 (equivalent to US$ 3.4 – US$ 6.9/day), go-jek drivers around IDR150.000 per day (equivalent to US$ 10.4/day) [8]. As many as 99% of people in rural areas make this as an additional or side job because the income earned is quite large. Most of this work, which is 70%, could satisfy motorcycle taxi operators, and only about 30% provide a statement that being an operator does not satisfy them. This statement is conveyed by operators who have an average level of education completed at the diploma level and want or expect to be able to work as formal employees in government or companies.

3.2. Transport Operational Profile

The analysis results of the operational transportation profile of motorcycle taxis are shown in Table **2**.

Table 2. Summary of the operational transportation profiles.

Parameter		Frequency (%)
Transported (sacks/day)	<10 sacks	4
	10 – 15 sacks	46
	15 – 20 sacks	33
	>20 sacks	17
Load weight (kg/trip)	<50 kg	4
	50 – 100 kg	9
	100 – 150 kg	82
	>150 kg	5
Distribution	Farmhouse	21
	Factory	5
	Side of the road	72
	Consument	2
Travel time per round trip (min/trip)	<5 minutes	2
	5 – 10 minutes	53
	10 – 15 minutes	28
	>15 minutes	17
Operational time (h/day)	<2 hours	5
	2 – 4 hours	21
	4 – 6 hours	72
	>6 hours	2
Travel distance (km/trip)	<1 km	10
	1 – 2 km	50
	2 – 3 km	31
	>3 km	9

This section aims to determine the operational profile of motorcycle taxis, the number of vehicles transported in one trip, the weight of transportation, distribution location, time taken to the destination, operating time each day and operational distance shown in Table **2**. This is useful for understanding the wider operational profile. The data showed that agricultural produce transported by motorcycle taxis during operation shows that 46% are transported between 10 – 15 sacks, 33% between 15 – 20 sacks and 17% over 20 sacks, and only 4% under 10 sacks. The weight carried per sack is 82% between 100 – 150 kg, 9% between 50 – 100 kg, 5% over 150 kg, and only 4% under 50 kg. The weight of the transport shows the ability of motorcycle taxis and the ability of operators operating in agricultural areas. The locations for distributing agricultural products are 72% on the roadside, 21% in farmers' houses, 5% in factories, and 2% to consumers indicating that the majority of agricultural products temporarily stored on the roadside would be transported by modes of transportation that have a larger capacity then it would be

distributed to factories with large capacity and good production quality. The time used to transport agricultural products to their destination per one way is 53% between five – 10 minutes, 28% between 10 – 15 minutes, 17% over 15 minutes and 2% under five minutes. This shows that the time taken for each motorcycles taxi to transport agricultural products to their destination is, on average, between 100 – 200 minutes per 10 – 20 sacks (1.000 – 3.000 kg) which is quite fast when compared to using animal power or other means of transportation and transported faster when done in groups or working together so that agricultural products have better quality and better selling prices. The findings of motorcycle taxis as a means of transporting agricultural products could answer and anticipate the results of research that have been carried out by [24, 25] that with road infrastructure that is still limited and there are still many road networks that is not yet connected, poor, means of transportation modes to transport agricultural products are also limited and not available during harvest so that it could result in post-harvest losses.

The operating time used daily is 72% between 4 – 6 hours, 21% between two – 4 hours, 5% under 2 hours and 2% above 6 hours. The average operating time is under 5 hours per day or 30 hours per week and is still under the provisions of the International Labor Organization, which is 40 hours per week [26], that the efficiency of working time of operators is currently very high. The distance for transporting agricultural products to their destination is 50% between one – 2 km, 31% between two – 3 km, 10% under 1 km and 9% above 3 km. This means that with an average mileage of just under 3 km, the condition of access to the main road as a temporary shelter for agricultural products is not good at the research location.

3.3. Operator Operating Costs

3.3.1. The Results of the Analysis of the Operating Costs of the Motorcycles Taxi Operators are shown in Table 3.

The analysis of this section aims to find out the average operational costs of motorcycle taxi operators and operator income, and the amount of additional operator income, as shown in Table **3**. The results of the survey data analysis show that the rate per trip for the majority of agricultural products is based on the agreement obtained by the operator are IDR10.000 – IDR12.000 (equivalent to US$ 0.7 – US$ 0.8/trip). Motorcycle taxi operators charge almost the same fees to users because this work is done in cooperation or in groups. The operator's average daily income is IDR204.000 (equivalent to US$ 14/day), and the operator's operating cost per day is an average of IDR30.600 (equivalent to US$ 2.1/day), which consists of 86% fuel usage costs, 2% oil or lubricant costs, 2% motorcycle tax fees, 3% motorcycle tire fees and 9% contingency fees, thus providing an additional net income per day of IDR173.400 (equivalent to US$ 12/day) or average income per month between IDR3.500.000 – IDR4.500.000 (equivalent to US$ 241 – US$ 310/month). This shows that the income earned by motorcycle taxi operators is greater than conventional ojek drivers, who report a daily income of IDR50.000 – IDR100.000 (equivalent to US$ 3.4 – US$ 6.9/day), go-jek drivers approx. IDR150.000 per day (equivalent to US$ 10.4/day) [8], and when compared to the income of farm laborers per day of IDR56.470 (equivalent to US$ 4/day), construction workers per day IDR90.971 (equivalent to US$ 6.3/day) [27], while the minimum wage for South Sulawesi Province Indonesia per month is set at IDR3.165.000 (equivalent to US$ 218.3/month). So that the income of motorcycle taxi operators is still above the wages of a conventional motorcycle taxi and drivers go-jek, farm laborers and construction workers, even above the provincial minimum daily average wage. This indicates that a motorcycle taxi operator could provide additional income, which is quite large apart from being a farmer. This work is carried out about three to four months of the year, namely in the harvest season, while in other months, it is used for farming or farming.

3.3.2. The Results of the Analysis of the Modification Costs and the Effective Age of the Taxi Motorcycle

The analysis in Fig. (**4**) shows that the cost of modifying a two-wheeled motorcycle varies for each operator as a vehicle owner. As many as 71% spent above IDR7.000.000 (equivalent to US$ 483), 18% between IDR5.000.000 - IDR7.000.000 (equivalent to US$ 345 – US$ 483) and 11% under IDR5.000.000 (equivalent to US$ 345). This indicates that each operator has different financial capabilities for each modified vehicle. The effective age of motorcycle taxi modification according to the operator as a vehicle owner is that 58% are effectively used between 3 – 5 years, 33% are between 5 – 7 years, 6% are used under 3 years, and only 3% are over 7 years. This indicates that the effective age of motorcycle taxis is only 5 years.

Table 3. An average operator operating costs and revenue.

Operating costs and average earnings (per operator)	
One-way net-fare per trip	IDR10.000 – IDR12.000
Total earnings per day	IDR204.000
Total operating costs per day	IDR30.600
Gasoline cost	86%
Oil or lubricant costs	2%
Motorcycle tax fee	2%
Motorcycle tire cost	3%
Unexpected costs	9%
Net income (*i.e.*, total income – total operating expenses) per day	IDR204.000 – IDR30.600
Net income per day	IDR173.400
Net income per month	IDR3.500.000 – IDR4.500.000

Note: US$ 1= IDR14.500 (Indonesian exchange rate 2021). Harvest: every 3 – 4 months (average two times a year).

The decrease in depreciation value from motorcycle taxi modifications based on the data in Fig. (**4**). Is the maximum modification cost of IDR7.000.000 (equivalent to US$ 483) and divided by the maximum utilization of the motorcycle taxi for 5 years, the decrease in value is IDR1.400.000 per year (equivalent to US$ 97/year) or IDR117.000 per month (equivalent to US$ 8/month). This shows a low depreciation value compared to the monthly income earned by motorcycle taxi operators.

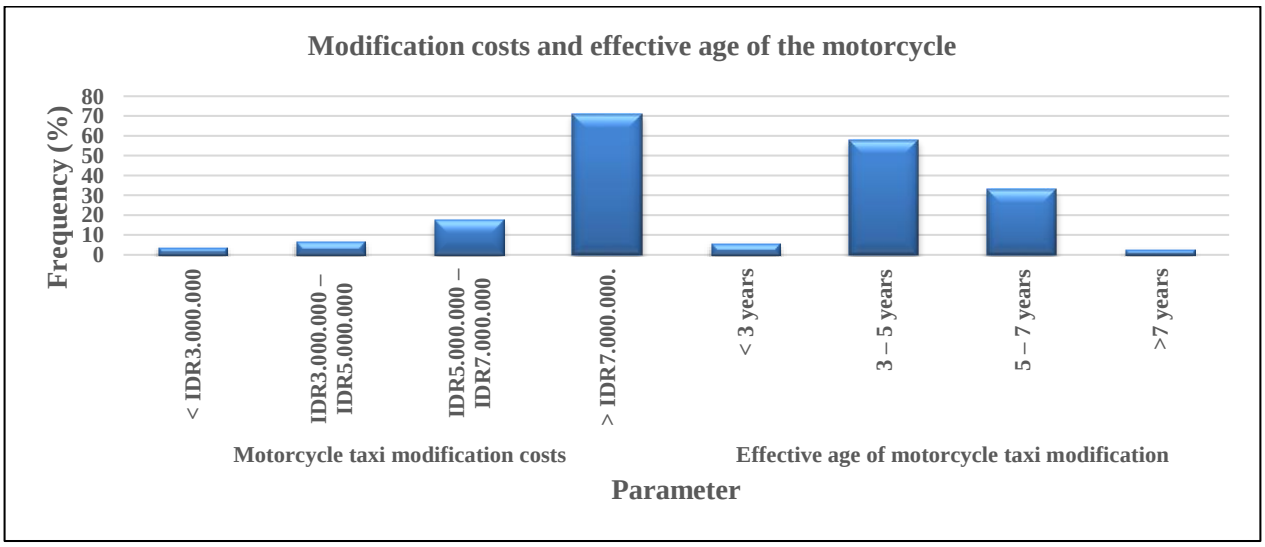

Fig. (4). Modification costs and effective age of the motorcycle.

4. RESULTS AND DISCUSSION

Table **1** data has been analyzed based on operator profiles; most operators have a relatively low educational profile, namely 96% with an education level below high school. Low education levels result in very limited opportunities to get decent jobs with good incomes. Cultivators with low incomes try hard to increase their income by creating jobs as motorcycle taxi operators, which is 99% even though it is a side job other than sharecroppers. The magnitude of the phenomenon of becoming an operator is because people who own two-wheeled motorcycles modify them to become taxi motorcycles, which are 100% their own. The gross income earned by the operator is quite large and varies around 87.4% of the operator's income, which is between IDR200.000 (equivalent to US$14) and above IDR300.000 (equivalent to US$21/day).

The operational profile of transportation in Table **2** shows that the time used each time the motorcycle taxi operates to the destination is very fast, with an average of between 100 – 200 minutes per 1,000 – 3,000 kg of cargo weight of agricultural products. The average operational time used per day is 98% less than 5 hours indicating that the working time is less than the existing informal work and is still under the operating hours stipulated by The International Labor Organization.

Table **3** shows the operator operating costs per day on average IDR30.600 (equivalent to US$2.1/day) with a net rate per trip of IDR10.000 – IDR12.000 (equivalent to US$ 0.7 – US$ 0.8/trip), thus providing additional net income per day of IDR173.400 (equivalent to US$12/day), or per month between IDR3.500,000 – IDR4.500,000 (equivalent to US$241 – US$310/month). The net income earned is greater than the income of farm laborers and construction workers in the study area, above the provincial minimum daily average wage based on Statistics Indonesia 2021. It is greater than the wages of conventional motorcycle taxi drivers and go-jek drivers per day.

CONCLUSION AND RECOMMENDATIONS

Motorcycle taxi operators transporting agricultural products are 100% male, 99% make this work an additional job with an education level of 96% below high school, and 85% under 50 years old. Motorcycle taxis 79% transported between 10 – 20 sacks, 17% over 20 sacks. The transported weight of 87% is between 100 – above 150 kg, the location of distributing the majority of agricultural products is 72% by the roadside, 21% to farmers' houses and 7% to factories and consumers. Most of the time used to transport to the destination per one way is 81% between 5 – 15 minutes, with daily operating time is 93% between two – 6 hours; most of the distance traveled to transport agricultural products to the destination is 81% between one – 3 km, with additional net income per month between IDR3.500.000 – IDR4.500.000 (equivalent to US$ 241 – US$ 310/month)

The mode of transportation of agricultural products arises because of the absence of transportation of agricultural products, where every year the harvest is very abundant with a large enough agricultural area, so motorcycle taxis are one of the solutions for transporting agricultural products for the people in this region, as well as opportunities for the community to create additional jobs and become an operator to increase income. Based on the research results and the findings obtained, the recommendations that can be given are as follows:

1. For researchers: Further research is needed and other innovations on motorcycle taxis so that the transportation of agricultural products is more environmentally friendly by using renewable energy and technology. This research is needed to explore other factors that can improve the performance of motorcycle taxis so that they are more efficient, especially in the use of fuel, reducing exhaust emissions that can cause air and noise pollution.

2. For the Government: The results of this study can be used as input for the use of motorcycle taxis as a mode of

transportation for agricultural products, encouraging the creation and improvement of transportation modes that can be used in areas that have poor road infrastructure and road characteristics muddy, steep, winding or uphill such as in mountainous or hilly areas and can be used as input for improving regulations related to their implementation policies.

CONSENT FOR PUBLICATION

Not applicable.

FUNDING

None.

CONFLICT OF INTEREST

The authors declare that they have no competing interests.

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