Socio-economic and income characteristics of Pine Sap Tappers (*Pinus merkusii*) in the Covid-19 pandemic situation

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Abstract. Through this research, we tried to examine the social and economic characteristics of harvesting non-timber forest products during the pandemic. On the other hand, this research tries to describe the socio-economic characteristics of *Pinus merkusii* sap tappers and the effects on their income in Cenrana Baru Village, Cenrana District, Maros Regency. Data collection process was carried out directly using interview techniques to 30 respondents who were selected by purposive sampling. Data from the interviews then processed and analyzed using descriptive analysis methods and quantitative analysis. The results of the research that have been conducted show that the socio-economic characteristics of tappers based on the results of the study are the average age of tappers is around 41-48 years which is included in the productive age, the level of education is still low with a percentage of 50% are elementary school graduates, the amount of the average family dependents included in the category of small family with the number of dependents 1-2 people, the main livelihood is as farmers, the tappers have an average 1-2 ha of tapping area, the number of tapped pine trees is at intervals of 20-32 trees with a percentage of 27%, the average age of pine is 40 years, the production of sap produced by tappers are average 176-367 kg per month with a percentage of 53% and the average income of tappers is IDR 2.523.661,27 per month where the income of tappers is still below minimum wage (City or Regency Minimum Wage / UMK) of Maros Regency 2019 that is IDR 3.100.000,00. The socio-economic characteristics are thought to have an effect on tappers' income are age, family dependence, type of work, land ownership, working hours, number of trees, age of pine and sap production. Pine sap production has a significant positive effect at the 99% confidence level and land area has a significant effect on total household income at the 95% confidence level.

1. Introduction

Oftentimes people think that forests have no value, except for producing timber and using land for agriculture. In fact, other than wood, forests produce food, building materials, medicinal plants, animal feed, firewood and all that is needed by the community. Non-Timber Forest Products (NTFPs) is one of the forest products that has many benefits for human welfare [1]. NTFPs have a much more economic value than timber which is still considered the main product. NTFPs are important for forest

sustainability because the harvesting process can usually be done sustainably and without damaging the forest. The utilization of *Pinus merkusii* sap is directed to ensure the sustainability of the forest itself through the NTFPs utilization approach to increase income and welfare. This driven by the availability of the NTFPs processing industry which is labor intensive and doesn't require sophisticated technology, but this capable of producing high economic value and environmentally-friendly products.

One of the many NTFPs utilization is pine sap which is obtained from both natural and plantation forests. *Pinus merkusii* sap is an important NTFP commodity in the forestry sector and provides benefits to the industry [2]. The prospect of the pine sap tapping activity is capable of providing relatively high income. In the past, pine sap tapping was a side job, but now this job has become a major job. This condition shows that there has been a shift in perception in seeing the benefits that can be obtained from pine forests. *Pinus merkusii* sap as one of the NTFPs have been able to provide economic benefits for the community and increase the welfare of farmer families around the pine forest. The increase in household income determines the level of family welfare and the household socio-economic characteristics affect the household income of *Pinus merkusii* sap tappers. Generally, people in villages who live near forests have low levels of education and limited jobs, i.e., only focused in agriculture [1]. Likewise, the people in Cenrana Baru Village, almost all of them only work in the agricultural sector. However, to increase family income, they chose to work as pine sap tappers.

Covid-19 Pandemic that have hit the world has given an impact on various aspects of life. The community around the forest also feels the impact by this condition, especially those who work as pine sap tappers in collaboration with private companies, which in fact, experience economic shocks by stopping every global economic activity. Based on the problems above, the authors are interested in conducting research on the socio-economic characteristics of *Pinus merkusii* sap tappers and identifying the income they earn from sap tapping during the Covid-19 pandemic. One of this sap tapping activity location is in Tanete Sub-village, Cenrana Baru Village, Cenrana District. The sap tapping activity is managed by a Company, i.e., PT APU HOME BESSE ARNESH, with an area of 100 ha of pine forest management, which is located right in Tanete Sbu-village, Cenrana Baru Village, Cenrana District.

2. Research methods

The population in this study were *Pinus merkusii* sap tappers in Tanete Sub-village, Cenrana Baru Village, Cenrana District, Maros Regency which could provide as much information as possible about the data needed in the study. The sampling method used was purposive sampling, i.e., sampling based on certain criteria with the consideration that the respondents were *Pinus merkusii* sap tappers in Tanete Sub-village, Cenrana Baru Village, which made tapping as a source of income both as primary and secondary income. The number of samples taken was 30 respondents from the total number of sap tappers in Tanete Sub-village, Cenrana Baru Village which were determined using the sampling intensity formula [3]. The criteria used in determining the sample included: Working as a *Pinus merkusii* sap tapper farmer consisting of local sap tappers from Cenrana Baru Village, and migrant sap tappers who live around the forest. The data that has been collected by observation and interviews in this study are processed, classified, and analyzed using qualitative analysis. Data from interviews and observations were collected by field notes which were grouped or recapitulated according to the objectives to be achieved. The first objective was answered by describing the socio-economic characteristics of *Pinus merkusii* sap tappers using descriptive analysis methods. The second objective

is answered by calculating the income obtained by tapping activities during the pandemic using quantitative analysis methods with the formula [4]:

$$\pi = TR - TC$$

Remarks:
π = Income (Rp)
TR = Total Revenue (Rp)
TC = Total Cost (Rp)

$$TR = P \times Q$$

Remarks:
TR = Total Revenue (Rp)
P = Sap production (kg)
Q = Price (Rp)

$$TC = BT + BV$$

Remarks:
TC = Total Cost (Rp)
BT = Fixed cost (Rp)
BV = Variable Cost (Rp)

3. Results

3.1. Socio-economic characteristic of sap tappers

The socio-economic characteristics of the sap tappers are the inherent characteristics of their individuals. These characteristics will influence socio-economic conditions and decision making in the household. The number of *Pinus merkusii* sap tappers in Cenrana Baru Village, Cenrana District, Maros Regency are 30 people living around the forest, i.e., in the Tanete Sub-village. Most of the *Pinus merkusii* sap tappers farmers are local residents of Cenrana Baru Village and non-local residents from Java Island. Specifically, the characteristics of the *Pinus merkusii* sap tappers in the research location can be seen by the identity of the tappers such as age, level of education, number of dependents, type of work, land ownership, number of trees, age of pine and sap production.

3.1.1. Age. The age of tappers varies greatly from young to old. This age variation will certainly affect the productivity of tappers in conducting their farming. Generally, tappers who are relatively young are more productive than older ones [5].

Table 1. Age of *Pinus merkusii* sap tappers.

No	Interval	Number of respondents	Percentage (%)
1	17-28	6	20.00
2	29-40	7	23.33
3	41-52	15	50.00
4	53-64	2	6.67
Total		**30**	**100.00**

Table 1 show that the average age of tappers is at the productive age. The most age interval for *Pinus merkusii* sap tappers are 41-52 years which is 50%, with 15 respondents and only 2 unproductive sap tappers with age intervals of 53-64 years. The age of the tappers is grouped

according to Indri (2017) which divides adulthood into three groups, i.e., early adulthood (18-40 years), middle adulthood (41-60 years), and advanced adulthood (> 60 years) [6]. Age is one of the characteristics of an individual that plays a major role in determining a person's work ability and mindset. Sap tappers age is a measure of time in years indicating the age of the respondents. Age is a benchmark for someone whether or not they are fit to work, because the older a person is at their productive age they are required to work, because at that age sap tappers have the responsibility to earn a living both for themselves and their families.

This will affect the productivity of Pinus merkusii sap tapping and the income it will receive. According to the Central Sulawesi Provincial Statistics Agency / BPS Central Sulawesi (2012), the classification of working productive age ranges from 15 to 64 years of age. The age of the population is based on the level of productivity, i.e.: <15 years (not yet productive), 15-50 years (productive) and> 55 years (not productive). Communities belonging to productive age are one of the potentials in increasing the productivity of community cultivated land in order to meet their daily needs. This is in line with the opinion of [7] which states that people who are in the productive age are easier to accept new things and are able to provide the latest innovations for new things. Age has a relationship to a person's responsibility for the supply of labor. The increasing age of a person, the greater the supply of labor. As long as they are still in their productive age, the higher the age of a person, the greater their responsibilities, although at some point the supply will decrease with increasing age.

However, people belonging to the unproductive age category have a positive side, i.e., such as maturity in thinking and acting, even though physically decreased (speed, dexterity and strength). Sap tappers who are young and healthy have a physical ability to accept things that are recommended. The harder the work is physically, the older the performance will decrease. However, in terms of responsibilities, the older the workforce will not have an effect because it is more experienced.

3.1.2. Level of education. The educational level of *Pinus merkusii* sap tappers in Tanete Sub-village, Cenrana Baru Village, of the 30 tappers has an educational level as can be seen in figure 1.

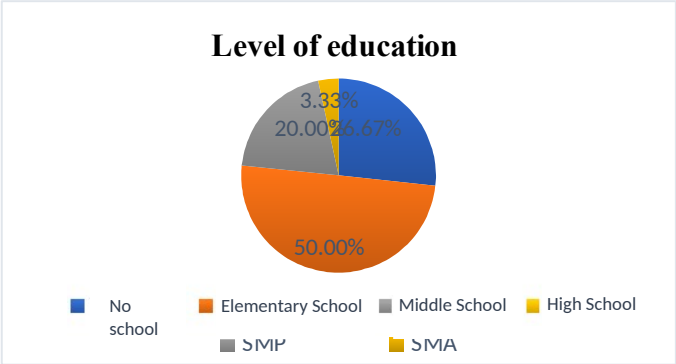

Figure 1. Educational level of *pinus merkusii* sap tappers.

Education is one of most important needs for one's life. The higher educational level achieved by a person, the higher position and job can be obtained so that it can increase their income. The level of education is an indicator of community welfare. The level of someone's education can build a mindset to living life. This is in line with the opinion of [5] that the level of education has a relation to the power of sap tapping adoption of new technology. The higher educational level, the higher intelligence of the sap tappers and this will affect the adoption of new technology. The results showed

that the education level of the Cenrana Baru community respondents was still low. Figure 1 shows that the average level of education of *Pinus merkusii* sap tappers in Tanete Sub-village is mostly only in Elementary School (SD) by 50%, with 15 respondents, while people whose education level only reaches the Senior High School (SMA) amounted to 1 person, while the Junior High School (SMP) amounted to 6 persons. According to [8], forest communities generally have a low level of education and do not have adequate skills so that they usually work only based on small experiences and traditionally. In addition, education is still relatively low because education is not yet a top priority for sap tappers. The sap tappers also think that the higher the level of education, the relatively large costs incurred so that the sap tappers give priority to the adequacy of their daily needs rather than education.

The level of education of the sap tappers referred to this study are measured based on the level of formal education that has been attended. The people in Tanete Sub-village have never received non-formal education from any agency or institution because the Sub-village location is very far from the City Center and the people in that village are not yet fluent in using good Indonesian (Bahasa). The higher educational level, the greater probability of sap tappers working. The higher educational level, that make their time become more expensive and their desire to work become higher. Conversely, the lower the level of education, the very limited access to work. This limited access to education means that tappers are only able to work in agricultural activities. This is in line with the opinion of Anggraini (2013), education, especially formal education, is a very valuable asset to get a decent economic life, education is also very influential on the life pattern of each individual, both ways of thinking and behaving [9].

3.1.3. Number of dependents. Suwija et. Al (2017) states that sap tapping family members are a potential source of labor for their farming business [4]. Family members who are dependent of the family are all family members who are the responsibility of a household (KK), which consists of the wife, children and other families who live in one household and part of what is financed by the household. The number of dependents of the *Pinus merkusii* sap tappers based on the results of interviews in the field can be seen in table 2 below:

Table 2. Number of sap tappers dependents.

`	**Dependents (Person)**	**Number of respondents (Person)**	**Percentage (%)**
1.	0	6	20
2.	1	5	17
3.	2	11	37
4.	3	6	20
5.	4	2	6
	Total	**30**	**100**

Table 2 shows that the number of sap tappers' dependents is different, the average tappers have two (2) dependents with a percentage of 37%. The more dependents of the family, the greater burden that the head of household receives to subsistence. On the other hand, the large number of dependents of productive age families is a potential workforce to increase income. In addition, the size of the family dependents will affect the allocation of household expenses. The family dependents referred to here are all people who live in the same house or who are outside and become the responsibility of the

head of the family, which includes his wife, children and other family members who join him. A household regulates who goes to school, works and manages the household, which depends on the number of family members.

This shows that the average family size owned by tappers is small. According to Central Bureau of Statistics / BPS (1997) in Indri (2017), family based on size categories are grouped into small (≤ 4 people), medium (5-7 people) and large (> 7 people) families. Every family certainly has family dependents that must be supported [6]. It can be assumed that the number of family dependents, if the greater the number of family dependents in a family, the higher the amount of working hours spent in order to get a bigger income, so that the needs of family dependents are met. This is in accordance with [10] research which states that the influence of a large number of family dependents encourages a worker to add additional sources of income. This is due to meeting the needs of a family. Productivity growth allows an increase in output per person and thus supports a higher standard of living.

3.1.4. Land ownership. Income issues cannot be separated from the area of tapped land owned by tappers. Land is one of the capitals in agriculture besides labor. The people of Tanete Sub-village, Cenrana Baru Village have different working areas. This can be seen in table 3 below:

Table 3. Sap tappers land ownership.

No	Land ownership (ha)	Number of respondents	Percentage (%)
1.	1-2	23	77
2.	3-4	5	17
3.	5-6	1	3
4.	7-8	1	3
	Total	**30**	**100**

Average land ownership is 1-2 ha with a percentage of 77%. Only one (1) tapper has a tapping area of 7 ha with a percentage of 3%. Each tapper obtains the tapping area depending on the tapping's ability. The more the number of trees in the tapping area, the more sap will be obtained because each tree is made '*quarre*'. However, the sap production of *Pinus merkusii* is not solely determined by the number of trees but there are also other factors that also influence it, such as tree external factors, tree internal factors, and human treatment. Land area greatly affects income, the more tapping land is, the greater the level of income it gets [8].

Land area is a measure of the level of household welfare. The wider the tapping area tapped by the tappers, the higher the time spent working. This caused by tappers will tend to increase their working time if the area of land being cultivated becomes wider. This is in accordance with the theory of [11], which states that production time is influenced by the size of the land used. However, the wider the agricultural land, the more inefficient the land is due to weak control over the use of production factors, limited labor supply, and limited capital stock. The narrower the land, the better the effort to control the use of production factors, the use of labor is sufficient, and the capital required is not too large.

3.1.5. Amount of Sap Productions. The people of Tanete Sub-village, Cenrana Baru Village who live around pine forests have different amounts of tapped sap production, this can be seen in Table 4 below:

Table 4. Sap productions

No	Sap productions (kg per month)	Number of respondents	Percentage (%)
1	176-461	20	67
2	462-747	5	17
3	748-1033	3	10
4	1034-1319	1	3
5	1319-1604	1	3
	Total	**30**	**100.00**

The tapping activity is continuous, which is carried out every day. Activities carried out include quarre renewal on pine stands, collecting sap and carrying sap from the forest to the sap collection point (TPG). The average production of *Pinus merkusii* sap obtained by each tapper varies. Table 4 shows that 67% of tappers were able to produce sap per month 176-467 kg and only two (2) tappers produced sap >1000 kg per month. The more trees in the tapping area, the more sap is likely to be obtained. This relatively large income can be relied on to meet family needs. Based on direct field monitoring, the potential for *Pinus merkusii* sap is affected by the weather. During the rainy season, the productivity of *Pinus merkusii* sap decreases. The difficult terrain can also affect the sap production of *Pinus merkusii*, including the distance to the tapping location. The more time the tappers spend in the forest, the more trees are tapped and the higher the sap yields and conversely the less time they spend in the forest, the less sap will be obtained. The more the number of trees that are tapped, the more sap of *Pinus merkusii* will be obtained. The productivity of *Pinus merkusii* sap that can be produced from the tapping of *Pinus merkusii* sap in Tanete Sub-village depends on the number of trees tapped by the tappers at each charge. The production of *Pinus merkusii* sap is influenced by internal and external factors. External factors in the form of places to grow and management actions that affect the production of sap directly or indirectly through internal factors.

One of the internal factors that affect the sap production is the age of the tree. According to Sulhaji (2020), young pine tree stands produce more sap per hectare than older ones [12]. The productivity of the pines decreases as the stands get older. This can be seen from the reduced number of trees per hectare as a result of thin cutting in the context of forest maintenance. One of the external factors that influence the sap production is the tapping technique. Tapping the sap using the quarre method, produces dirty sap mixed with various impurities such as leaves, insects, wood chips and soil so that it will affect the quality of sap production. The potential for latex production from a pine stand tends to vary, which is due to differences in age, height of the growing site, diameter, basal area, and other factors.

3.1.6. Pine tree ages. All of the pine trees tapped by tappers are 40 years old. This caused by pines are planted simultaneously with the aim of accelerating reforestation and rehabilitation of empty land in forest areas. When first tapped at the age of 21-22 years, diameter class IV (61 cm - 70 cm). However, some trees were tapped by tappers when the pine trees were 11 years old diameter class III (51-60 cm). The difference in the production of the sap produced is due to the influence of the stem diameter

class on the production of the sap itself. According to [2] states that the large amount of sap production produced by large-diameter trees is due to the large volume of sapwood and has many sap channels so that the sap produced is also a lot.

Ikhsan S (2019) stated that generally, productive pine trees can be tapped for their sap after they are 11 years old to 80 years old [8]. When a tree is tapped at the age of ± 35 years, it will affect tree production and the resulting sap. Therefore, there is a long enough range for the community to be able to earn income from pine trees without having to cut the trees.

3.2. Sap tappers income during the pandemic

*3.2.1. Revenue.*Revenue is the result of multiplying the amount of production produced and the selling price of the product. The price received by tapping farmers is IDR 5.000 per kg, so the average tapping revenue obtained from the tapping of *Pinus merkusii* sap in Tanete Sub-village varies. The minimum amount of community revenue from tapping *Pinus merkusii* sap for one month is IDR 968.000, - and the highest is IDR 7.260.000, - with an average of IDR 2.618.000, -. According to [13], revenue is the amount of total value received from business results or the amount of production generated in a business activity multiplied by the selling price prevailing in the market. The high and low income of tappers is very much influenced by the price and the amount of sap produced by *Pinus merkusii*. Revenue is the sum of the sap per month at the price that has been determined by the company concerned or the tapping wages that the tappers receive from tapping the sap of *Pinus merkusii* sap which is then added up with the received wages the level of acceptance of the sap tappers is influenced by the wages for tapping and the wages for the tapping that the sap tappers receive.

3.2.2. Wages. The prevailing wage system is that wages are given based on the number of tappers of *Pinus merkusii* sap earned by tappers in kilograms. Incentives or bonuses will be given to tappers if they have exceeded the production target. Wages are also given based on the distance of the bear from the tapping site to the sap collection point (TPG). The wage rates for the sap of the sap that are in effect in Cenrana Baru Village are the distance of the 1 km the prevailing wage rate by IDR 100 per kg, 2 km distance prevailing wage rate by IDR 200 per kg, and the distance of 3 km the prevailing wage rate is IDR 500 per kg.

Table 5. Tappers bearing wages.

Bearing distance (km)	**Sap productions (kg)**	**Number of respondents**	**Bearing wages (IDR per months)**
1	330 – 439	2	66,000, -
	440 – 549	3	132,000, -
	550 – 669	1	55,000, -
	670 – 779	1	77,000, -
	Amount	7	330,000, -
2	220 – 467	9	506,000, -
	468 – 715	0	0, -
	716 – 963	3	506,000, -
	964 – 1211	2	440,000, -
	Amount	14	1,452,000, -
3	176 – 461	6	858,000, -
	462 – 747	2	660,000, -

748 – 1033	0	0, -
1034 – 1319	0	0, -
1320 – 1605	1	660,000, -
Amount	9	2,178,000, -
Averages		132,000, -

Based on the table 5 above, it is known that the sap tappers have different bearing distances. Tappers are mostly paid for bearing at a distance of 3 km. This is due to the large amount of sap production that is capable of tapping bearing. The different distance of the bearing can affect the bearer wages that the *Pinus merkusii* sap tappers earn. The average wage for the sap of the sap tappers is IDR 132.000, - per month. The bearing wage rate is determined by the company concerned. The size of the bearing wages earned can affect the income of *Pinus merkusii* sap tappers. This is in accordance with [2] research which states that the higher the wage of the tappers, the higher the income to be obtained.

3.2.3. Net income earned by tappers during the Pandemic Covid-19. Income is the difference between revenue and total costs incurred in implementing tapping. The total cost is the amount of money spent during the tapping activity. The calculation of costs in tapping activities is intended to determine the amount of costs incurred by the *Pinus merkusii* sap tappers in Cenrana Baru Village. At the research location, the tools and materials needed for the sap tappers in the tapping process are borne by the company. However, there are some tools and materials that are tapping on their own responsibility. The following shows the tools and materials covered by the sap tappers, which can be seen in Table 6.

Table 6. Tools and materials covered by the sap tappers in Cenrana Baru Village.

No	Tools and materials	Price	Lifespan / Economic age
1	Scraper	IDR 55.000, - per unit	1 year
2	Whetstone	IDR 20.000, - per unit	1 year
3	Fertilizer	IDR 125.000, - per sack	

Household income is the income of the head of the household and the members of household in accordance with the main livelihood plus additional livelihoods that the tappers earn per unit time. Income is usually calculated monthly or annually. Monthly income is obtained from work for one month while income per year is obtained from work for one year. Each of them can come from basic livelihoods or additional jobs [13].

Household income for Pinus merkusii sap tappers was calculated in the last month which was sourced from the tapping of Pinus merkusii sap and non-tapping of Pinus merkusii sap. Income from tapping Pinus merkusii sap is earned based on the weight of Pinus merkusii sap earned in kilograms per certain period of time multiplied by the wage rate for *Pinus merkusii* sap per kilogram. The activities carried out by sap tappers are aimed at earning income that is used to meet family needs. The income of *Pinus merkusii* sap tappers in Tanete Sub-village are earned from the difference between revenue and total production costs. The average income earned was IDR 2.523.661,27 per month during the pandemic. When compared with the Regency Minimum Wage (UMK) in Maros Regency 2019 before the pandemic by IDR 3.100.000, -. So, the tapping business from the sap of *Pinus merkusii* sap is still classified as low with a difference of 18.59%.

4. Conclusion

Based on the results of the research and discussion, it can be concluded that the socio-economic characteristics of tappers based on the results of the study consist of the age of the tappers where the average age ranges from 41-52 years which is included in the productive age, the level of education is still relatively low with a percentage of 50% being elementary school graduates, the number of average family dependents are included in the category of small families with a number of dependents of 1-2 people, the average type of livelihood of tappers makes tapping a side job, the average land ownership of tappers has an area of 1-2 ha tapping as many as 23 tappers, the number of *Pinus merkusii* trees tapped are at intervals of 38-55 trees, the average age of the pine is 40 years old, the sap production produced by tappers is 176-461 kg per month on average with a percentage of 66.67% and the average income of tappers is 2,523,661.27 per month where the income of tappers is still below the 2019 Maros Regency Minimum Wage before the pandemic amounting to IDR 3.100.000,- with the difference in income earned during the pandemic of 18.59%.

References

[1] Cahyono S A 2010 Faktor-faktor yang mempengaruhi petani menyadap pinus di Kawasan Hutan dengan Tujuan Khusus (KHDTK) Gombong *Balai Penelit. Kehutan. Solo*

[2] Tarigan E 2012 *Penggunaan Stimulansia ETRAT pada Penyadapan Getah Pinus merkusii, Pinus oocarpa dan Pinus insularis di Hutan Pendidikan Gunung Walat* (Institut Pertanian Bogor)

[3] Martono D S 2009 Konstribusi pendapatan dari peryadapan getah pinus merkusii terhadap pendapatan totalnya (Studi kasus di RPH Guyangan BKPH Ponorogo Barat KPH Lawu DS Perum Perhutani Unit II Jawa Timur) *J. Agritek* **10**

[4] Suwaji S, Lamusa A and Howara D 2017 Analisis pendapatan petani penyadap getah pinus di desa tangkulowi Kecamatan Kulawi Kabupaten Sigi Sulawesi Tengah *AGROTEKBIS E-JURNAL ILMU Pertan.* **5** 127–33

[5] Mufti M and Zargustin D 2017 Penguasaan lahan USAhatani padi sawah dan hubungannya dengan tingkat pemiskinan di desa padang mutung kecamatan Kampar Kabupaten Kampar *J. Agribisnis* **19** 26–32

[6] E. Indri Dewi 2017 *Penentuan Upah Minimum Penyadap Getah Pinus di BKPH Lengkong, KPH Sukabumi* (Institut Pertanian Bogor)

[7] Maulana T and ATMANTI H D 2014 Pengaruh Umur, Pendidikan, Pendapatan Dan Jumlah Tanggungan Keluarga Terhadap Tingkat Kejahatan Pencurian Dengan Pendekatan Ekonomi (Studi Kasus: Narapidana Di Lp Klas 1 Kedungpane Kota Semarang)

[8] Ikhsan S 2019 Kontribusi Penyadapan Getah Pinus (Pinus merkusii) Terhadap Tingkat Pendapatan Penyadap di Desa Linge, Kecamatan Linge, Kabupaten Aceh Tengah

[9] Anggraini A 2013 *Pengaruh Perlakuan Inovasi Penyadapan Getah Pinus terhadap Produktivitas Penyadap (Kasus _ Hutan Pendidikan Gunung Walat, Kabupaten Sukabumi, Provinsi Jawa Barat)* (Institut Pertanian Bogor)

[10] UTAMI R T 2019 *Faktor-Faktor Yang Mempengaruhi Pendapatan Penyadap Getah Karet di PTPN XII (Persero) Kebun Kalisanen Kec. Tempurejo Kab. Jember (Studi Kasus di Afdeling Utara dan Afdeling Curahberkong)* (Universitas Jember)

[11] Widyawati R F and Pujiyono A 2013 Pengaruh umur, jumlah tanggungan keluarga, luas lahan, pendidikan, jarak tempat tinggal pekerja ke tempat kerja, dan keuntungan terhadap curahan

waktu kerja wanita tani sektor pertanian di Desa Tajuk, Kec. Getasan, Kab. Semarang *Diponegoro J. Econ.* 111–24

[12] Sulhaji 2020 *Produksi Getah Pinus merkusii Pada Hutan Rakyat Pola Agroforestry Di Kecamatan Tinggimoncong Kabupaten Gowa* (Universitas Muhammadiyah Makassar)

[13] SAHRIL R 2018 *Analisis Pendapatan Petani Penyadap Getah Pinus merkusii Pada Hutan Produksi di Kecamatan Buntu Batu Kabupaten Enrekang* (Makassar: Fakultas Pertanian. Universitas Muhammadiyah Makassar)