THE IMPACTS OF INVESTMENT IN THE FORESTRY SECTOR ON THE INDONESIAN ECONOMY

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THE IMPACTS OF INVESTMENT IN THE FORESTRY SECTOR ON THE INDONESIAN ECONOMY. Indonesia has abundant forest resources, reaching 120 million hectares of forest area. However, the forestry sector's contribution to the national economy continues to decline. The low performance of the forestry sector cannot be separated from the limited availability of round-wood materials for its processing industries and insufficient development of the multi-businesses activities among the forestry companies. Therefore, increasing the forestry sector's productivity is necessary through raising investment. This study investigates the impacts of investment in the forestry sector on Indonesian economic performance, including output, income, employment, and import, using the Input-Output (I-O) Model. The results show that investment in the forestry sector will increase output, income, and labour in the forestry sector and its related sectors. However, with the increase in its output, the demand for inputs, including round-wood materials, will also increase, encouraging a rise in imports. Thus, an increase in investment in the forestry sector needs to be balanced with the availability of roundwood materials and other associated inputs in Indonesia. For the follow-up research, it is important to separate the investment into upstream and downstream activities along the forestry value chain and include a regional aspect in the analysis.

Keywords: Backward and forward linkages, input-output, multiplier

DAMPAK INVESTASI DI SEKTOR KEHUTANAN TERHADAP KINERJA PEREKONOMIAN INDONESIA. Indonesia merupakan negara yang kaya akan sumberdaya hutan dimana luas areal kawasan hutan mencapai 120 juta hektar. Namun demikian kontribusi sektor kehutanan terhadap perekonomian nasional terus menurun. Kinerja sektor kehutanan tidak lepas dari semakin terbatasnya ketersediaan bahan baku kayu bulat dan masih belum berkembangnya kegiatan multiusaha oleh perusahaan-perusahaan yang bergerak di sektor kehutanan. Oleh karena itu, perlu dilakukan peningkatan produktivitas di sektor kehutanan melalui peningkatan investasi. Penelitian ini bertujuan untuk menganalisis dampak investasi di sektor kehutanan terhadap kinerja perekonomian Indonesia yang meliputi kinerja output, pendapatan, tenaga kerja, dan impor dengan menggunakan Model Input-Output (I-O). Hasil analisis menunjukkan bahwa investasi di sektor kehutanan akan meningkatkan output, pendapatan, dan tenaga kerja di sektor kehutanan dan sektor-sektor perekonomian lainnya. Namun seiring dengan peningkatan output, permintaan input termasuk kayu bulat juga meningkat sehingga mendorong peningkatan impor sektor kehutanan itu sendiri dan sektor-sektor lainnya. Dengan demikian, peningkatan investasi di sektor kehutanan perlu diimbangi dengan ketersediaan material kayu bulat dan input terkait lainnya di dalam negeri. Untuk penelitian selanjutnya, penting untuk memisahkan investasi ke dalam kegiatan hulu dan hilir di sepanjang rantai nilai sektor kehutanan dan memasukkan aspek regional dalam model.

Kata kunci: Keterkaitan ke belakang dan ke depan, input-output, multiplier

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I. INTRODUCTION

Globally Indonesia is endowed with diverse tropical forests, covering 120 million hectares (KLHK, 2019) or 64.1% of its total land area (Asosiasi Pengusaha Hutan Indonesia, 2019). Forests provide wood, non-timber goods, biodiversity conservation, and environmental services, including protection of water systems, ecotourism, and carbon sequestration and storage (Dayneko et al., 2021; Nur et al., 2018; Rossita et al., 2021; v. P. Hmyria et al., 2019). The tremendous economic potential of forest resources can be used as capital in developing the forestry sector (Nurfatriani et al., 2015; Sheriffdeen et al., 2020). However, the performance of the forestry sector in the economy tends to decline (Asosiasi Pengusaha Hutan Indonesia, 2019; Mäkelä, 2017; Zendrato et al., 2020). The contribution of the forestry sector to Indonesia's GDP was 0.83% in 2010. However, it has consistently decreased until 2020 to 0.54% of Indonesia's total GDP (BPS, 2021).

A decrease in forest resources caused a decline in the performance of the forestry sector (Darusman & Nurrochmat, 2001; Yovi & Nurrochmat, 2018). The rapid population growth, the use of timber and non-timber forest products, and illegal logging lead to increasing deforestation (Ahmad et al., 2016; Defries et al., 2010; Djaenudin et al., 2016; Nurrochmat et al., 2017). Deforestation causes increasingly limited timber production from natural forests (Asosiasi Pengusaha Hutan Indonesia, 2019). To combat this, the government encourages timber production with sustainable forest management and social forestry programs, one of which is the development of Community Plantation Forests (Hutan Tanaman Rakyat-HTR). HTR is an option to revitalize the forestry industry to increase the availability of round-wood materials for the forestry industry (Alviya et al., 2020). However, the Social Forestry Program and HTR development performances are still relatively slow (Wiyono et al., 2018; Wulandari et al., 2017).

The increasingly limited timber materials led to a decline in Indonesia's processed wood production (M. Nur et al., 2018; Marbun, 2017). The shortage of timber materials forced the forestry sector to import more materials to support the production process. Based on the 2016 Indonesian Input-Output Table, the most significant imports of raw materials were in the paper and pulp industries, about 22.78% and 11.72%, respectively of the total inputs were used in the sector (BPS, 2021).

The decline in productivity and performance of the forestry sector needs to be improved through investment (Masru'ah & Soejoto, 2013). The presence of investment can have implications for increasing the production and productivity of forestry-related sectors (Arshaf et al., 2020). However, investment in the forestry sector is still relatively low; investment in the forestry sector in 2016 was only 1.10% of Indonesia's total investment and consistently decreased until 2020 to only 0.21%. (BKPM, 2021).

The value of the investment in the forestry sector, which has consistently decreased from year to year, impacts the decline in the forestry sector's contribution to the Indonesian economy (Nurrochmat et al., 2017). Also, the productivity of the forestry sector depends on the availability of raw materials. The availability of raw materials can certainly be increased through increased investment. However, an increase in investment, if not balanced with an increase in the availability of raw materials in the country, will increase imports of raw materials.

Previous literature has examined the relationship between investment and economic growth in developing countries using the partial model, particularly the econometrics model (Felix N, 2021). Banday et al. (2021) studied BRICS countries from 1990 to 2018 using an autoregressive distributed lag model. The results reveal that Foreign Direct Investment (FDI) positively impacts long-term economic growth in BRICS countries. Kobilov & Kurbonov

(2020) applied a vector error-correction model (VECM) to the quarterly data of FDI and GDP from 2010 to2019 in Uzbekistan and found that investment has a significant impact on growth in the country.

Similarly, Sohail and Mirza (2020) investigated the impact of FDI on economic growth in Pakistan by using the data from 1996 to 2015. The results confirmed the significant relationship between FDI and Gross Domestic Product in Pakistan by applying a correlation matrix and regression analysis. Felix (2021) utilized Ordinary Least Square by using the data of FDI, Real Gross Domestic Product (RGDP), and Exchange Rate (EXR) over the period 1989-2019 in examining the impact of FDI on economic growth in Nigeria and concluded that FDI has a positive and significant influence on economic growth in the country. The government needs to stabilize the exchange rate to attract more investors to Nigeria. By employing a stochastic frontier model on the data from 45 countries, Wijeweera et al. (2010) found similar results related to the positive and significant impact of FDI and economic growth. Important to note from the study that the positive relationship between the two variables only occurred when the investment was accompanied by high-skill labor.

The econometrics model is clearly shown as a partial analysis focusing on the causal relationship between investment, economic growth, and GDP. Only a few studies examined the impact of economic performance investment using the I-O model, one type of computable general equilibrium model. Using the I-O model, the impact of investment in a particular sector on economic growth, labour absorption, household income, and the trade balance (import or export performance) can be calculated. Anas et al. (2015) investigated the impact of a transportation project on the regional economic growth in West Java Province, Indonesia. They found increasing RGDP of the province when investment in the transportation sector was increased. Using a similar model, Vukić et al. (2021) found that investment in the transportation sector increased economic growth in Croatia. Kim et al. (2019) reported that increasing public investment in the service sector in Turkey created more jobs and promoted gender-inclusive growth. In Indonesia, the I-O model has been widely used in various studies (e.g., Junari et al., 2020; Widyawati, 2017; Yunitasari & Priyono, 2021; Zendrato et al., 2020). In general, the research examines the relations between various economic sectors and the extent to which the economic sectors promote economic growth, income distribution, and job creation.

Most previous studies focus on the entire investment in the country and pay less attention to the impact of investment in particular sectors, including the forestry sector. Additionally, the previous literature using the I-O model has not captured the impact of investment on imports. This research contributes to the literature by examining the impacts of investment in the forestry sector on economic growth, labour absorption, household income, and import.

This research aims to investigate the impact of investment in the forestry sector on the performance of the Indonesian economy, including output, income, employment, and import. The forestry sector covered in this study includes the upstream and downstream forestry activities, including the timber sub-sector, other forest products sub-sector, sawn and processed wood sub-sector, plywood, and similar sub-sectors, wooden building materials sub-sector, other wood goods, cork, bamboo, and rattan, the pulp sub-sector, and the paper sub-sector. These sectors are listed in the latest Indonesian I-O Table published by the Indonesian Central Statistics Agency (BPS).

II. MATERIALS AND METHOD

A. Study Site

The scope of this research is at the national level (Indonesia) using secondary data from the Indonesian Input-Output (I-O) Table for the classification of 185 sectors published by the

Indonesian Central Statistics Agency (BPS) in 2021. In addition to I-O Table, the data in this study were obtained from various sources and agencies such as BPS, KLHK, and APHI.

B. Methods

The I-O model was conducted to measure the impact of investment in the forestry sector on the performance of output, income, employment, and imports in Indonesia. The I-O table is a statistical description made in a matrix containing information about transactions of goods and services and the interrelations among economic activities (sectors) in a region at a given period (Sahara, 2017). In the case of the I-O table it consists of an "n x n" matrix which is described in Table 1.

Based on Table 1, the equations in Table (I-O), when viewed in rows, can be written in the form of algebraic equations as follows:

$$\begin{array}{ccccccccccc} x_{11} & + & x_{12} & + & \dots & + & x_{n1} & + & F_1 & = & X_1 \\ x_{12} & + & x_{22} & + & \dots & + & x_{n2} & + & F_2 & = & X_2 \\ \vdots & & \vdots & & \vdots & & \vdots & & \vdots & & \vdots \\ x_{1n} & + & x_{2n} & + & \dots & + & x_{nn} & + & F_n & = & X_n \end{array} \quad \dots(1)$$

In general, the above equation can be reformulated into the following:

$$\sum_{j=1}^{n} x_{ij} + F_i = X_i; \text{for n} = 1,2,3, \text{and so forth}$$

Where x_{ij} is the value of outputs of the sector used as input by sector j, F_i is the final demand for sector i, and X_i is the number of outputs of sector i. the technical coefficient matrix (technological coefficient) can be expressed in the mathematical form as stated in equation 2:

$$a_{ij} = \frac{x_{ij}}{x_j} \quad \dots(2)$$

If equation (2) is substituted into equation (1), the following equation will be obtained:

Table 1. Input-Output Table Framework

Economic Activities		Products (Industries) 1	2	…	n	Total Intermediate Demands	Final Demands: Household consumption, Government expenditure, Investment, Export	Total Final Demand	Total Output
Product (Industries)	1	x_{11}	x_{12}	…	x_{1n}		F_1		X_1
	2	x_{21}	x_{22}	…	x_{2n}		F_2		X_2
	⋮	Quadrant I			⋮		Quadrant II		
	n	x_{n1}	x_{n2}	…	x_{nn}		F_n		X_n
Taxes – Subsidies		Taxes – Subsidies on Products					–		
Import for Intermediate input		Intermediate Consumption for Imported Products							
Primary Input (Added Value)		V_1	V_2	…	V_n				
		Quadrant III							
Total Input		X_1	X_2	…	X_n				
Number of Employment		E_1	E_2	…	E_n				

Source: BPS 2021 (modified)

$$\begin{array}{ccccccccccccc} a_{11}X_1 & + & a_{12}X_2 & + & \dots & + & a_{1n}X_n & + & F_1 & = & X_1 \\ a_{21}X_1 & + & a_{22}X_2 & + & \dots & + & a_{2n}X_n & + & F_2 & = & X_2 \\ \vdots & & \vdots & & \vdots & & \vdots & & \vdots & & \vdots \\ a_{n1}X_1 & + & a_{n2}X_2 & + & \dots & + & a_{nn}x_n & + & F_n & = & X_n \end{array} \quad \dots(3)$$

If equation (3) is written in the matrix equation:

$$\begin{vmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \vdots & \vdots & \vdots & \vdots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{vmatrix} \begin{vmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{vmatrix} + \begin{vmatrix} F_1 \\ F_2 \\ \vdots \\ F_n \end{vmatrix} = \begin{vmatrix} X_1 \\ X_2 \\ \vdots \\ X_n \end{vmatrix} \quad \dots(4)$$

$$A \qquad X + F = X$$

If equation (4) is written in the form of a mathematical equation, the following equation will be obtained :

$$AX + F = X \text{ or } (I-A)X = F \text{ or } X = (I-A)^{-1} F \quad (5)$$

Where:

I = matrix identity
F = final demand
X = total output
(I-A) = Leontief Matrix
$(I-A)^{-1}$ = Leontief's inverse matrix

The simulation used in the I-O model was increasing investment in the forestry sector by IDR 3.28 trillion or USD234.3 million (USD1=IDR14,000). This investment amount was obtained from the KLHK budget allocation for the sustainable forest management program in the 2021 work plan, which was allocated for the forestry sector from upstream to downstream sectors. Details of investment allocation in the forestry sector are presented in Table 2.

C. Sector Aggregation

Product coverage in the forestry sector includes wood and other forest products (natural honey, natural sap, lacquer, resin, natural cork,

Table 2. Budget allocation for the KLHK sustainable forest management program in 2021

No.	Program/Activities	Budget (IDR Billion)
1.	Improved Production Forest Management Planning	109.8
2.	Production Forest Business Improvement	24.8
3.	Improvement of Orderly Administration of Forest Products and forest fees	12.1
4.	Enhancing Environmental Services Business for Production Forests and Non-Timber Forest Products (NTFPs)	14.8
5.	Forestry Industry Business Improvement	26.2
6.	Forest Rehabilitation and Reclamation, Land Rehabilitation, and Soil and Water Conservation	1 599.2
7.	Protection Forest Management Unit	37.3
8.	Watershed Management	23.1
9.	Forest Plant Seed Development	164.6
10.	Patterning and Nature Conservation Information	79.1
11.	Conservation Area Management	368.3
12.	Species Conservation and Genetics	238.5
13.	Utilization of Protected Area Environmental Services	87.4
14.	Establishment and Administration of Forest Areas	130.3
15.	Forest Resource Inventory and Monitoring	11.9
16.	Forest Area Planning	8.9
17.	Extension Improvement	8.5
18.	Granting Access to Manage Forest Areas	50.4
19.	Capacity Building for Social Forestry Groups and Environmental Partnerships	221.3
20.	Forest Prevention and Protection	70.9
	Total	3,288.2

Source: KLHK 2021

or wild plants that can be consumed as food and used for webbing and natural dyes). These products include upstream activities in the forestry value chain. The downstream activities at the forestry value chain include services and processing activities of forestry sectors. In many cases, the forestry sector's contribution is only calculated based on wood products and other forest products (upstream activities). As such, to find out the actual contribution of the forestry sector to the Indonesian economy, the expansion of the scope of the forestry sector is needed to include timber, non-timber forest products, timber-based processing industries, and forestry services. This process is similar to the Forestry Satelite Account (FSA), which is a framework for analyzing policies related to forestry and measuring the contribution of forestry to the economy. Therefore, the forestry activities in the I-O table used in the study are classified into one sector, including upstream and downstream activities along the forestry sector value chain. The study team aggregated 185 sectors of the I-O table produced by BPS into 18 sectors, and the forestry sector is coded as sector 18 (Table 3).

D. Impact Analysis

After the 18 aggregation sectors were obtained, the study team measured the impact of investments in the forestry sector by utilizing these formulas (Firmansyah, 2006):

a. Impact on output

$$\Delta X = (I-A)^{-1} \Delta Y \quad \text{.....(6)}$$

b. Impact on household income

$$\Delta H^* = h_i(I-A)^{-1} \Delta Y \quad \text{.....(7)}$$

c. Impact on labour absorption

$$\Delta E^* = e_i(I-A)^{-1} \Delta Y \quad \text{.....(8)}$$

d. Impact on import

$$\Delta M^* = m_i(I-A)^{-1} \Delta Y \quad \text{.....(9)}$$

e. Income coefficient

$$h_i = \frac{h_j}{X_j} \quad \text{.....(10)}$$

f. Labour coefficient

$$e_i = \frac{E_j}{X_j} \quad \text{.....(11)}$$

g. Import coefficient

$$m_i = \frac{m_j}{X_j} \quad \text{.....(12)}$$

Table 3. Sector aggregation

Codes of Sectors	Sectors
1.	Agriculture and Fisheries
2.	Mining and Quarrying
3.	Processing Industries
4.	Provision of electricity and gas
5.	Water supply, waste management, Waste, and Recycling
6.	Construction
7.	Wholesale and Retail Trade, Car and Motorcycle Repair
8.	Transportation and Warehousing
9.	Provision of Accommodation and Food and Drink
10.	Information and Communication
11.	Financial Services and Insurance
12.	Real Estate
13.	Company Services
14.	Government Administration, Défense and Mandatory Social Security
15.	Education Services
16.	Health Services and Social Activities
17.	Other Services
18.	Forestry Sector

Where:

ΔX = impact on output
ΔH^* = impact on household income
ΔE^* = impacts on labour absorption
ΔM^* = impacts on import
ΔY = changes in final demand in the form of investment in the forestry sector
$(I-A)^{-1}$ = Leontief's inverse matrix
h_i = income coefficient
e_i = labour coefficient
m_i = import coefficient
h_j = wage/salary of sector j
E_j = number of labour of sector j
m_j = the value of import of sector j

III. RESULT AND DISCUSSION

A. Results

1) Forward and Backward Linkages

Table 4 presents backward and forward linkages of the 18 sectors focused in the study. The Leontief inverse matrix shows the values of backward and forward linkages. The backward linkage shows the relationships of the forestry sector to its upstream sectors. The forward linkage refers to the relationships of the forestry sector to its downstream sectors. The value of the forward linkage is 1.3481

Table 4. Forward and Backward Linkage of the 18 Sectors

Codes of Sectors	Sectors	Forward Linkage		Backward Linkage	
		Value	Ranking	Value	Ranking
1.	Agriculture and fisheries	1.8097	5	1.3133	18
2.	Mining and quarrying	1.9532	3	1.4527	13
3.	Manufacturing industry	3.8969	1	1.7528	5
4.	Provision of electricity and gas	1.4062	9	1.9263	1
5.	Water supply, waste, and Recycling	1.0530	16	1.4103	15
6.	Construction	1.3363	11	1.8206	2
7.	Wholesale and retail trade, car and motorcycle repair	2.0335	2	1.4220	14
8.	Transportation and warehousing	1.8286	4	1.7566	4
9.	Provision of accommodation, food, and drink	1.2348	13	1.7838	3
10.	Information and communication	1.6963	7	1.5520	11
11.	Financial services and insurance	1.6768	8	1.3792	16
12.	Real estate	1.2806	12	1.3531	17
13.	Company services	1.7643	6	1.5785	10
14.	Government administration, defense, and mandatory social security	1.1131	15	1.6970	7
15.	Education services	1.0503	17	1.4812	12
16.	Health services and social activities	1.0327	18	1.7079	6
17.	Other services	1.1131	14	1.6269	9
18.	Forestry	1.3841	10	1.6494	8

shows that an increase in final demand in the forestry sector by IDR. 1 million will stimulate the development of its downstream industry by IDR. 1.3481 million. The value of the backward linkage shows that an increase in final demand in the forestry sector by IDR. 1 million will attract the development of its upstream industry by about IDR. 1.6494 million. The values of the forestry sector's forward and backward linkages are more than one (1) and are included in the top 10 among other economic sectors showing the important roles of the forestry sector in the Indonesian economy.

2) Impact on Output

Table 5 shows that the impact of investment in the forestry sector will increase the output in all sectors by about IDR 5.4 trillion. The forestry sector received the most significant effect, with an increase of IDR 3.9 trillion or 73.14% of total output. The rise in output is because the investment will contribute to the capital accumulation in the forestry sector, and thus increasing productivity (Satibi, 2020). Increasing productivity will thereby boost production in the sector. The importance of investment in production enhancement is also appointed in the Solow growth model, emphasizing investment's vital role in the physical capital accumulation process. According to this model, an increase in investment promotes capital stock and thus increases output (Mankiw, 2006).

The manufacturing industry follows, with an increase in output of IDR411 billion or 7.61%. An economic stimulus in the form of investment in the forestry sector directly or indirectly impacts other sectors. The forestry sector is one of the upstream sectors of the manufacturing industry; therefore, an increase in production due to the specific injection (in this

Table 5. Impacts of investment in the forestry sector on the performance of output, income, labour absorption, and import in Indonesia

Codes of Sectors	Output (IDR Million)		Income (IDR Million)		Labour (Person)		Imports (IDR Million)	
	Values	Percentage	Values	Percentage	Values	Percentage	Values	Percentage
1	67,447	1.25	22,006	1.91	1,339	3.78	1,821	0.47
2	85,290	1.58	14,191	1.23	107	0.30	3,506	0.90
3	411,461	7.61	56,526	4.90	787	2.22	51,641	13.26
4	56,358	1.04	4,271	0.37	37	0.11	2,005	0.51
5	2,966	0.05	334	0.03	13	0.04	139	0.04
6	41,123	0.76	7,721	0.67	113	0.32	3,834	0.98
7	300,966	5.56	93,038	8.07	2,690	7.60	8,929	2.29
8	192,058	3.55	28,186	2.44	643	1.82	15,795	4.05
9	15,753	0.29	3,518	0.31	109	0.31	510	0.13
10	63,521	1.17	11,398	0.99	59	0.17	2,018	0.52
11	95,763	1.77	32,117	2.79	233	0.66	1,882	0.48
12	20,285	0.37	1,365	0.12	9	0.03	290	0.07
13	74,656	1.38	20,760	1.80	171	0.48	4,044	1.04
14	9,747	0.18	3,701	0.32	64	0.18	254	0.07
15	4,186	0.08	2,058	0.18	41	0.12	132	0.03
16	3,574	0.07	966	0.08	22	0.06	223	0.06
17	8,043	0.15	3,082	0.27	101	0.28	203	0.05
18	3,956,901	73.14	847,793	73.53	28,864	81.53	292,348	75.04
Total	5,410,097	100.00	1,153,032	100.00	35,401	100.00	389,574	100.00

case, the investment) will enhance production in the manufacturing industry through their linkages in the input markets. In other words, as production in the forestry sector increase, the availability of raw materials needed by the manufacturing industry in input markets will increase. The third sector experiencing the most significant increase in output is the wholesale/ retail trade, car, and motorcycle repair, with IDR301 billion or 5.56%.

3) Impact on Household Income

Investment in the forestry sector will provide an additional income in all sectors of IDR 1.1 trillion (Table 5). The forestry sector received the most significant impact amounting to IDR 847 billion or 73.53% of the total income increase. As outlined previously, the forestry sector experienced the highest additional output when investment in the sector was boosted. The forestry sector needs extra inputs to produce additional output, including labour. In the economic context, the household provides labour, meaning that an increase in labour absorption offers other income for the family (Safina & Rahayu, 2011).

4) The wholesale/retail trade, car, and motorcycle repair sector receive the second-largest impact of household income with an additional household income of about Rp 93 billion or 8.07%. The manufacturing industry also experienced extra household income of approximately IDR 57 billion or 4.90%. The increase in revenue in these two sectors shows that the two sectors have strong relationships with the forestry sector.

5) Impact on Labour

Table 5 shows that the impact of investment in the forestry sector will provide additional employment for 35,401 people in all sectors of the economy. The forestry sector receives the most considerable other effects on employment, amounting to 28,864 people or 81.53% of the total increase in the workforce as a result of the investment. The additional workforce is due to new investments that allow the creation of new jobs (Mankiw, 2006).

The wholesale/retail trade, car, and motorcycle repair sector receive the second-largest impact, experiencing an additional labour force of 2,690 people or 7.60%. The agriculture and fisheries sector obtains the third most significant impact, with an additional workforce of 1,339 people or 3.78%. The forestry sector has strong forward and backward linkages to these two sectors. Therefore, increasing investment in the forestry sector will increase production capacity, providing new jobs in the forestry sector and other sectors having strong linkages with the forestry sector.

Impact on Import

Investments in the forestry sector will provide additional output to other economic sectors (Table 5). An increase in output in the forestry sector will consequently increase the need for raw materials in the production process leading to an increase in the value of imports. The additional investment in the forestry sector will increase total imports by about IDR 389 billion. The forestry sector receives the most significant impact amounting to IDR 292 billion or 75.04% of the total increase in imports.

Mankiw (2006) stated that an increase in imports would impact a decline in a country's economic level. The increase in imports also occurs in other sectors having strong linkages with the forestry sector. The manufacturing industry receives the second-largest impact, increasing about IDR 51 billion or 13.26% of imports. The wholesale/retail trade, car, and motorcycle repair sector experience the third most significant impact, with an additional import of about IDR 8.9 billion or 2.29%. The results show that investment in the forestry sector needs to be carried out carefully because acquisition enhances its demand for intermediate and primary inputs. If the domestic market fails to increase the demand for the production factors, imports for such inputs, particularly intermediary inputs, will increase.

B. Discussion

Investment in the forestry sector will increase production in the forestry sector. It means that timber availability is crucial in supporting the increase in production. It is important to note that timber production for holders of Business Permits for Utilization of Natural Forest Timber Products (IUPHHK-HA) tends to decline. Timber production in 1992 IUPHHK-HA reached 26.05 million m3, but in 2018, the production only reached 7 million m3 (Kementrian Lingkungan Hidup dan Kehutanan, 2019). With the decreasing availability of timber, increased productivity due to increased investment will encourage import in the forestry sector, as stated in Table 5.

The presence of plantation forests also supports the production of timber. However, compared to several other countries globally, the addition of plantation forests in Indonesia is still low. Based on Table 6, the growth of plantation forests in Indonesia durng 15 years was only 1.72 million hectares or 0.11 million hectares annually. This condition is far below that of China, whose plantation forests increased by 1.64 million hectares yearly or increased by 24.59 million hectares in 15 years (FAO, 2016).

This issue became a dilemma because, in 1986, the government imposed a ban on the export of logs to encourage the development of domestic forestry, which stimulated the growth of the forest industry at that time (Asosiasi Pengusaha Hutan Indonesia, 2019). Theoretically, with the log ban export policy, the availability of round-wood materials in the country became abundant, but this did not pull through in practice. The inefficiency in the production and supply of timber from natural forests combined with the low number of additions or realization of plantation forests have provided challenges for the forestry industry to obtain timber, resulting in many wood processing companies closing their businesses. To deal with the challenges, some companies have imported timber from other countries (APHI, 2019).

According to Hersaputri & Santoso (2017), excessive extraction of natural resources requires a relatively long recovery time. An increase in static land can lead to a decline in production (Putra & Nasir, 2015). If this condition persists, the forestry sector will face some challenges in obtaining timber supplies. The existence of land conversion and forest fires causes forests to be increasingly degraded. Therefore, investment in the forestry sector aiming at increasing productivity, if not balanced with the availability of timber, will increase imports in the forestry sector.

The Government of Indonesia (GoI) is continually pushing forest productivity to boost the production of logs through intensive silviculture or SILIN. The GoI also provides wider business opportunities in forest production through a multi-business policy. This policy is an incentive for businesses to optimize their

Table 6. The development of plantation forests in various countries

Countries	Plantation Forest Area (million hectares)				Increase in the area (million hectares)	
	2000	2005	2010	2015	2000-2015	Average/Year
China	54.39	67.22	73.07	78.98	24.59	1.64
United States Of America	22.56	24.43	25.56	26.36	3.80	0.25
Russia	15.36	16.96	19.61	19.84	4.48	0.30
Canada	9.35	11.71	13.98	15.78	6.44	0.43
Indonesia	3.22	4.66	4.80	4.95	1.72	0.11

Source: FAO (2016)

forest resources. Apart from wood, companies can also invest in other forest products, such as non-timber and environmental services, increasing the forestry sector's contribution to the Indonesian economy.

IV. CONCLUSION AND IMPLICATION

The forestry sector has an essential role in the economic development in Indonesia, as shown by its forward and backward linkages that is higher than one (1). Investment in the forestry sector positively impacts output, income, and employment, both in the forestry sector itself and in other economic sectors in Indonesia. Thus, efforts to encourage investment in the forestry sector must continue to be pursued.

There is an important note from this study that investment in the forestry sector will inevitably encourage imports. The increase in imports is feared to harm Indonesia's trade balance. Therefore, efforts to increase investment in the forestry sector need to be focused not only on the downstream forestry sector but also on the upstream forestry sector as a provider of raw materials for the forestry industry. Moreover, investment in forest utilization needs to be expanded to timber production and non timber forest products and environmental services. Potentially, it will increase the role of the forest industry sector in the Indonesian economy.

The availability of domestic raw materials, especially wood, is essential to reduce the import of raw materials. Reducing imports will support the trade balance of Indonesia. The multi-business activities (wood, non-timber products, and environmental services) are also important to be promoted among forestry companies to optimize the utilization of their forest resources and to secure their inputs.

For the follow-up research, it is important to separate the investment into the upstream and downstream activities to capture which activities along the forestry value chain need to be prioritized by the GoI. Including regional aspects (provincial level) in the analysis can also be considered to determine in which province the increasing investment should be conducted..

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