THE IMPACT OF FORESTRY SECTOR PERFORMANCE ON ECONOMIC INCOME GROWTH: A SOCIAL ACCOUNTING APPROACH[1]

Nur Arifatul Ulya

Forestry Research Institute Palembang, Forestry Research and Development Agency,
Ministry of Forestry Republic of Indonesia
(nur_arifa@yahoo.com)

Syafrul Yunardy

Regional Development Planning Agency of South Sumatera Province, Indonesia
(s_yunardy@yahoo.com)

Abstract

Framework for Socio-economic Accounting System or the Social Accounting Matrix (SAM) states that the distribution of income received by each production factor specified in terms of economic sector concerned and called the factorial income distribution. Value added generated from the sum of total wages and salary plus capital income. Total of value added showed gross domestic product (GDP). Impact of Indonesia's forestry sector performance can be measured by knowing its contribution to economic income growth.

This paper discusses the impact of output growth in the forestry sector to factor income growth using Socio-economic Accounting System or the Social Accounting Matrix (SAM) approach. The impact of forestry sector production growth can be used to measure economic growth. Accounting multiplier is used to calculate the impact of output growth in the forestry sector to factor income growth in the year 2000 until the year 2005.

Forestry sector for 5 years (2000-2005) gave a positive contribution to income growth. There are 16 economic sectors contributes positively to the factor income. Decrease in income growth occurred only on one factor of production, which are; Laborship, Leadership, Administration, Military, Professionals Recipients of Wages & Salaries in the Village. Forestry sector as a whole increases income growth of 104.64 percent during the years 2000-2005.

Keywords: accounting multiplier, production factor, SAM, value added

INTRODUCTION

Forest resources have become a major capital of Indonesia economic development in three last decades. It's provided a positive impact on increasing government revenue, labor absorption and boosts regional develop-ment and economic growth. The contribution of forestry sector in foreign exchange earnings during the year 1992 - 1997 was recorded at US\$ 16.0 billion, or about 3.5 percent of Indonesia GDP (Indonesian Central Agency of Statistics or Badan Pusat Statistik-BPS, 2000). Although the contribution of forestry sector to total national value added (GDP) decreased from 4.3 percent in 1993 become 2.3 percent

---

in 2002, but the value added was increased from Rp. 141 trillion to Rp. 36.2 trillion (BPS, 2003).

Labor absorption of forestry sector in 1980 accommodated approximately 113 thousand people, and to about 179 thousand people 1985. In 1990 the amount labor of forestry sector was 285 thousand people and reached its peak in 1997 (388 thousand people). In 2000, labor absorption of forestry sector recorded approximately 3.092.470 people, with an average income of worker in concessionaire company amounted Rp. 7.3 million/person/year and for industry amounted to Rp. 3.3 million/person/year (Simangunsong, 2004).

About 100 million people depend on forest products, both as goods and services to fill daily needs and also as source of income. At least one-third of rural population depends on the availability of firewood, drug crop, food, organic manure from forest floor to fill daily needs and as source of income (Vitalaya, 2004).

Forestry development also has a far greater contribution to regional development. This is shown by opening access of remote areas through availability of logging road for public roads in and around forest, increasing employment opportunities, and increase revenue of local government and society.

Data and information mentioned above can illustrate the contribution of forestry sector in Indonesia economic and development. However, those data and information cannot give information about the impact of forestry sector performance on economic income growth. This research was conducted to identify the impact of the increased output of forestry sector production on economic income growth. The amount of impact of the increased output of forestry sector production on production factor income can be used to measure the growth of economic income which represented by income of production factor. The result of this research is expected to be utilized as a basis for determining the direction of forestry policy to boosts economic growth.

RESEARCH METHODOLOGY

The research used The Social Accounting Matrix (SAM) Model as approach. Accounting multiplier used to calculate the impact of the increased output of forestry sector production on production factor income growth in the year of 2000 and 2005.

The Indonesian SAM data that published by BPS used as the main data. These research analyzed the Indonesian SAM data that published in year 2000 and 2005. BPS publishes the Indonesian SAM every 5 years and has done this since 1975. The fact that many researchers—for example Lewis (1991), Thorbecke (1992), Azis (2000), Azis & Mansury (2003), Bourguignon *et al.* (2003) and Clements *et al.* (2007)—have used these SAMs in their publications indicates the validity and reliability of the SAMs published by BPS (Hartono & Resosudarmo, 1998).

A. Framework of SAM

SAM is a traditional double accounting economic matrix in the form of a partition matrix that records all economic transactions between agents, especially between sectors in production blocks, sectors within institution blocks (including households) and sectors within production factors, in the economy (Pyatt & Round, 1979; Sadoulet & de Janvry, 1995; Hartono & Resosudarmo, 1998). It is a solid database system, since it summarizes all transaction activities in an economy within a certain period of time, thus giving a general picture of the socio-economic structure in an economy and illustrating the income distribution situation.

SAM is also an important analyzing tool, because: (1) its multiplier coefficients are able to properly describe economic policy impacts

on a household's income, hence illustrating the economic policy impact on income distribution; and (2) the application is relatively simple; thus, it can easily be applied to various countries (Hartono & Resosudarmo, 2008). As a data framework, the SAM is a snapshot which incorporates explicitly various crucial transformations among variables, such as the mapping of factorial income distribution from the structure of production and the mapping of the household income distribution from the factorial income distribution (Thorbecke, 1985).

If the SAM is to be used as a modular analytical framework complementary to its role as a data framework, the forms of the relationships underlying these transformations and mappings among variables have to be specified in a causal way through an appropriate set of behavioral and technical relations in at least a comparative-static if not dynamic setting. Furthermore, this conceptual framework, in order to be useful for policy purposes, should include potential policy means which can be controlled to move the system in the direction of growth and equity consistent with the preferences of the policymakers. Hence, in what follows, an attempt is made to identify the major causal relationships which a comprehensive and consistent conceptual planning framework should contain and to show how these relationships are implicitly-if not explicitly-incorporated into the SAM data system (Thorbecke, 1985).

The Social Accounting Matrix (SAM) has become used increasingly in the last years as a general equilibrium data system linking, among other accounts, production activities, factors of production and institutions (companies and households). As such, it captures the circular interdependence characteristic of any economic system among (a) production, (b) the factorial income distribution (i.e. the distribution of value added generated by each production activity to the various factors), and

(c) the income distribution among institutions and, particularly, among different socio-economic household groups.

Under certain assumptions, such as excess capacity (i.e. availability of unused resources) and fixed prices, the SAM can be used as the basis for simple modeling. More specifically, the effects of exogenous injections on the whole economic system can be explored by multiplier analysis which requires partitioning the SAM into endogenous and exogenous accounts. Typically the former include (i) factors; (ii) institutions (companies and households); and, (iii) production activities; while the exogenous accounts consist of (iv) government; (v) capital; and (vi) rest of the world. Figure 1. Illustrates the major interrelationship among principal SAM accounts

Simplified SAM shown in Table 1. The structure of production can be defined in terms of a set of production activities classified according to criteria such as type of commodity, level of technology, and prevailing form of organization. These production activities generate a flow of value added which accrues to the various factors of production which, in turn, can be broken down according to labor skills, type of capital, and land classification according to agroecological criteria. The resulting factorial income distribution provides the major source of income for the institutions including different types of households which might be classified according to socioeconomic criteria. Then transfers (including taxes and subsidies) are added, the income distribution among institutions, and particularly among household categories, is determined. Finally, the various institutions, which include corporate and unincorporated firms as well as government, in addition to the different classes of households, spend their incomes on a variety of commodities and services which are supplied by the production activities, thus completing the feedback system (loop) shown in Figure 1 (Thorbecke, 1985).
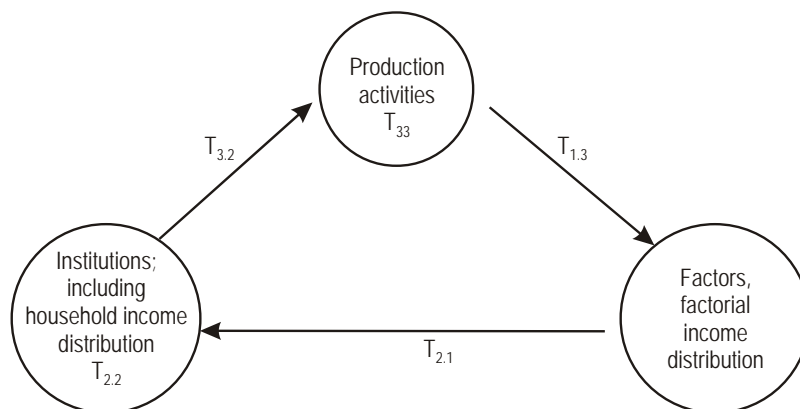
Note: T stands for the corresponding matrix in the simplified SAM that appears in table 10.1.
Thus, for example, T1.3 refers to the matrix at the intersection of row 1 (account 1),
that is, "factors" and column 3 (account 3), that is,"production activities".

Source: Thorbecke (1985).

Figure 1. The major interrelationship among principal SAM accounts

Table 1. A Simplified Social Accounting Matrix

				Expenditures				
				Endogenous Accounts			Exogenous Accounts	Total
				Production Factors	*Institutions*	*Productions Activities*		
				1	2	3	4	5
Receipt	Endogenous Accounts	*Production Factors*	1	T_{11} 0	T_{12} 0	T_{13} *Factorial Income Distribution*	X_1 *Receipt of Factors from The Rest of The World*	Y_1 *Income of Factors*
		Institution	2	T_{21} *Income Distribution to Households and other institutions*	T_{22} *Transfer, Taxes and Subsidies*	T_{23} 0	X_2 *Receipt of Institution from Rest of The World*	Y_2 *Income of Institutions*
		Kegiatan Produksi *Production Activities*	3	T_{31} 0	T_{32} *Institutional Demand for Goods and Services*	T_{33} *Interindustry Demand*	X_3 *Export*	Y_3 *Gross Demand= gross Ouput*
	Exogenous Accounts		4	L_1 *Expenditure of Institution from The Rest of The World*	L_2 *Domestic Saving*	L_3 *Import and Indirect Taxes*	R *Balance of Payments Current Account Deficit*	*Total Foreign Exchange Outflow*
	Jumlah		5	Y_1' *Outlay (Income of Factors)*	Y_2' *Expenditure of Institution*	Y_3' *Gross Output*	*Total Foreign Exchange Inflow*	

Source: Thorbeck (1985)

The major causal relationships which are shown in the interdependent diagram in Figure 1 find their counterpart in the simplified SAM data system presented in Table.1. Thus, the factorial income distribution is derived from the value added generated by various production activities - a transformation that is represented by matrix T_{13} (the intersection of row 1, "factors," and column 3,"production activities") in Table 1. Likewise, the mapping of the distribution of income among institutions (including households) from the factorial income distribution is given by matrix $T_{2.1}$. In addition, the former distribution is affected by transfers, taxes, and subsidies which appear in T_{22}. The final loop in Figure 1, showing the expenditures of institutions on the various commodities supplied by the production activities, appears on Table 1 as T_{32}.

It is important to recall that in a SAM table the various causal relations (such as those shown in Figure 1) reveal the situation prevailing at one point in time. The causal process which generates any given SAM may be very complex and nonlinear and would have to be explicitly specified in equation form in a conceptual model. The generating mechanism is, of course, not reflected in the resulting static matrices in Table 1. Only in a special (linear) case does the SAM as a data system become identical with the SAM as a conceptual framework or model.

The basic framework of a SAM is a 4x4 partition matrix as shown in Table 1. The accounts in a SAM are grouped into endogenous and exogenous accounts. The main endogenous accounts are divided into three blocks: production factor, institutional and production activity blocks. The row shows income, while the column shows expenditure. Sub-matrix T_{ij} shows the income of the account in row i from the account of column j. Vector Y_i shows the total incomes of all accounts, and vector Y_j' shows the total expenditure account of all accounts. In addition, SAM requires that the vector Y_i is the same as vector Y_j', or in other words Y_j' is a transpose of Y_i, for every i = j. The relations in Table 1 can be written as (Defourny and Thorbecke, 1984).

$$Y = AY + X$$

where Y is total income (receipts) vectors of the first three accounts ; X represent the vector of exogenous injection of the other accounts (namely, capital and rest of the world); and A the matrix whose members are $A_{ij} = T_{ij}/\hat{Y}_j$.

B. Multiplier Analysis

Multiplier analysis in SAM model can be divided into two main group, that is: accounting multiplier and fixed price multiplier. Accounting multiplier basically the same with multiplier from Leontief Inverse Matrix in Input-Output model. It means that all multiplier analysis in Input-Output model can be used in SAM analysis (Thorbecke, 1985).

An accounting multiplier matrix in a SAM framework is very important since it captures overall impacts of changes in a particular sector on other sectors within the economy, and is thus also used to explain the impacts of changes in exogenous accounts on endogenous accounts. The accounting multiplier matrix, which is a standard inversion of the (I-A) matrix, can be derived from the basic SAM framework and written as (Defourny and Thorbecke, 1984).

Thorbecke (1985) explained that ach of the elements of the T_{ij} matrices can be expressed as a proportion of the corresponding column sum total which yields a new set of matrices A_{ij}. Thus, A_{ij} is obtained from T_{ij} by dividing elements of the latter by the sum of the column in which they appear,

$$A_{ij} = T_{ij}\hat{Y}_j^{-1} \tag{1}$$

where $\hat{Y}_j^{-1}$ is a diagonal matrix of column sums.

Since the fourth row and column represent the sum of all other accounts which are assumed to be exogenously given, it follows that the vectors of injections X_i and of leakages L_j, respectively, are determined outside the SAM framework. Conversely the endogenous part of the SAM consists of the income and expenditure determination of the first three accounts (factors, institutions, and production activities). Hence, the five nonzero A, matrices representing the interacting endogenous part of the SAM can be grouped into a corresponding partitioned matrix A such that

$$A = \begin{bmatrix} 0 & 0 & A_{13} \\ A_{21} & A_{22} & 0 \\ 0 & A_{32} & A_{33} \end{bmatrix} \qquad (2)$$

It follows that

$$Y = AY + X \qquad (3)$$

where Y stands for the total income (receipts) vectors of the first three accounts and where X represents the vector of exogenous injections of the other accounts (namely, capital and rest of the world), which accrue as receipts or income to accounts 1 to 3.

It follows (3) that

$$Y = (I-A)^{-1} X \qquad (4)$$

The meaning of this equation is that the income levels of factors (Y_1), institutions (Y_2), and production activities (Y_3) are endogenously determined as functions of the exogenous demand on the other accounts. All the behavioral and technical coefficients of the underlying interdependent system are explicitly incorporated in the partitioned (fixed coefficient) matrix A. Thus, by way of illustration, A_{l3} allocates the value added generated by the various production activities to the various factors such as labor skills as a proportion of the value of gross output of each activity (sector). Likewise, A_{33} represents the intermediate (input-output) demand. As such, the elements of A_{13} and A33 must be based on an empirical knowledge of the sectoral production functions. Each column of the production activities account represents, in fact, a linear Leontief-type sectoral production function.

If $Ma = (I - A)^{-1}$ so:

$$Y = Ma\ X \qquad (5)$$

The $Ma = (I - A)^{-1}$ is known as accounting multiplier matrix, which shows global impacts of changes in a particular economic sector on other sectors. Where A is direct coefficients that show change of a sector to other sectors.

Ma which known as accounting multiplier matrix explained that change 1 unit output of a sector will change output of whole economic sector will equal to Ma. Assumed that fixed price variable and income (expenditure) elasticity is 1.

To analyze the impact of the increased output of forestry sector production on total economic sectors, the accounting multiplier (Ma) used as basic analysis. Every 1 unit shock (injection) on forestry sector will give impact on total economic sector equal to the Ma (accounting multiplier).

THE IMPACT OF FORESTRY SECTOR PERFORMANCE ON ECONOMIC INCOME GROWTH

Construction of SAM framework based on a condition that people have basic needs and basic wants that fulfilled by purchasing various commodities. Those commodities provided by production sector that produce various commodities as output of production process. To produce output, production sector re quire production factors such as labor which provided by households and capital that provided by banking services.

The core of the production activities are the production activity, production factors and institutions as owners of production factors. In SAM framework, income received by production factors can be specified by economic sector that referred as factorial income distribution. Value added generated by output sales, wage and salary, and capital earning, where total value added mean Gross Domestic Product (GDP).

Accounting multiplier can be used to identify the impact of forestry sector performance on economic income growth. Accounting multiplier can provide information about contribution of the increased output of forestry sector production on increasing of economic income (GDP). This accounting multiplier originated from addition of accounting multiplier of labor production factors and accounting multiplier of non-labor production factors (government and private capital). High amount of accounting multiplier of production factors reflects high impact forestry sector performance on GDP growth.

Tables 2 show the contribution of forestry sector performance on production factors income growth. Accounting multiplier provide information about impact of improvement 1 unit output of forestry sector on distribution and increasing of production factors income. By analyzing the impact of increased of forestry sector production on production factors income in the year 2000 and 2005, the forestry sector's performance in that period can be identified.

Tabel 2 shows that during 5 year (2000-2005) forestry sector give positive contribution on production factors income growth for whole economic sectors. Positive contribution given by the 16 production factors in which 15 production factors included in the group of labor production factor and 1 production factor is non-labor production factor (private sector and government capital).

Decreasing of income only happened at 1 production factor (managers, technicians, military officers, professionals recipients wages and salary in rural area). Its means that generally forestry sector during year 2000 and 2005 boost production factors income growth both labor and non-labor production factors.

The highest production factor income growth impact occurred in non-labor production factor as private sector and government capital (0.7755). Its means, that every improvement of 1 unit forestry sector output will improve non-labor production factor (private sector and government capital) income equal to 0.7755 units. This fact indicates that production factor income growth in Indonesia economy during 2000-2005 is more driven by macro sector growth than micro sector.

Highest growth of labor production factor occurred in agriculture labor non-recipients wages and salaries in rural area (0.0742). Its means, that every improvement of 1 unit forestry sector output can improve income of agriculture labor non-recipients wages and salaries in rural area equal to 0.0742 unit. While for the production factor managers, technicians, military officers, professionals recipients wages and salary in rural area every improvement of 1 unit forestry sector output during 2000-2005 causing decreasing income equal to 0.0051 units. This shows that the growth factor is more based on informal activities when compared with formal activities.

During the period 2000-2005, the growth impact of the economic sector the value added by the forestry sector has increased 146.72% or 29.30% per year. It means that forestry sector has provided an increase of economic income (GDP) of Indonesia. Increased impact of economic growth (GDP) is the increased performance of forestry sector.

Table 2. The Impact of Forestry Sector Performance on Economic Income Growth

No.	Production factor	Impact on Income growth		Change (Incrasing/ Decreasing)
		2000	2005	
1	Agriculture labor recipients wages and salaries	0.0549	0.1087	0.0538
2	Agriculture labor recipients wages and salaries in urban area	0.0136	0.0378	0.0242
3	Agriculture labor non-recipients wages and salaries in rural area	0.1305	0.2047	0.0742
4	Agriculture labor non-recipients wages and salaries in urban area	0.0115	0.0267	0.0152
5	Production operator, manual workers recipients wages and salaries in rural area	0.0324	0.0473	0.0149
6	Production operator, manual workers recipients wages and salaries in urban area	0.0606	0.0714	0.0108
7	Production operator, manual workers non-recipients wages and salaries in rural area	0.0185	0.0315	0.013
8	Production operator, manual workers non-recipients wages and salaries in urban area	0.0162	0.0242	0.008
9	Administration, sales, services labor recipients wages and salaries in rural area	0.0267	0.0332	0.0065
10	Administration, sales, services labor recipients wages and salaries in urban area	0.1192	0.1337	0.0145
11	Administration, sales, services labor non-recipients wages and salaries in rural area	0.0381	0.0454	0.0073
12	Administration, sales, services labor non-recipients wages and salaries in urban area	0.0558	0.0796	0.0238
13	Managers, technicians, military officers, professionals recipients wages and salary in rural area	0.0239	0.0188	-0.0051
14	Managers, technicians, military officers, professionals recipients wages and salary in urban area	0.0524	0.0538	0.0014
15	Managers, technicians, military officers, professionals non-recipients wages and salary in urban area	0.0023	0.0067	0.0044
16	Managers, technicians, military officers, professionals non recipients wages and salary in urban area	0.0040	0.0080	0.004
17	Non-labor (Private and government capital)	0.0538	0.8293	0.7755
	Total	0.7144	1.7608	1.0464

Souce: data analysis

POLICY IMPLICATION

During 2000-2005 period, Indonesia forestry sector has been able to demonstrate its performance through increased Indonesia economic income (GDP) that indicates by the increased impact of production factor income and added value. Almost all of production factors both labor and non-labor (private and government capital) has increased the impact of income growth. This could be the basis for policy in order to provide more incentives to boost output of forestry sector.

Increased impact of factor income growth caused by the forestry sector's performance was more driven by the growth of macro sector (government and private capital) than the micro sector (real). Therefore, to prevent growing income and capital disparities it's important to accelerate the distribution of credit/assistance for small and medium scale businesses for the people who live around and has economic activities in forestry sector.

The contribution of the forestry sector to increase economic growth through increasing the impact of the production sector growth during the years 2000-2005 were still rely on informal activities. This requires policies that can promote economic growth while enhancing the formal activities. Strategies that can be done are to increase among business units and scale the forestry sector.

REFFERENCES

Defourny, J., Thorbecke, E., 1984. "Structural path analysis and multiplier decomposition within a social accounting matrix framework". *Economic Journal*. 94, 111–136.

Hartono, D., Resosudarmo, B.P., 1998. "*Eksistensi matriks pengganda dan dekomposisi matriks pengganda Pyatt dan Round dari sistem neraca sosial ekonomi. Ekonomi dan Keuangan Indonesia"* [Multiply matrix existence and Pyatt & Round multiply matrix sosio-economy balance sheet]. *Ekonomi Keuangan Indonesia* [*Indonesian Financial Economy*], 2 46 (4), 73–496.

Hartono, D., Resosudarmo, B.P., 2008. "The economy-wide impact of controlling energy consumption in Indonesia: An analysis using asocial accounting matrix framework". *Energy policy*, 36, 1404-1419.

Pyatt, G., Round, J., 1979. "Accounting and fixed price multipliers in a social accounting matrix framework". *Economic Journal,* 89, 850–873.

Sadoulet, E., de Janvry, A., 1995. Quantitative Development Policy Analysis. Baltimore: Johns Hopkins University Press.

Simangunsong, B.C.H., 2004. The Economic Performance of Indonesia's Forestry Sector in The Period 1980-2002. Briefing Paper#4. GTZ-SMCP. Jakarta.

Thorbecke, E., 1985. The social accounting matrix and consistency-type planning model in Pyatt, G. and J. I. Round Eds. Social Accounting Matrices A Basis for Planning. Washington DC: The World Bank.

Vitalaya, A. 2004. *Pemiskinan Masyarakat Sekitar Hutan* [impoverishment in the society surounding the forest]. Working Paper presented in LEI Strive for CBO Congress: Sertification in Cross-road: Trade Politic, Poverty Everlasting and Eradication. Jakarta.