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By

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ABSTRACT

AGRO-INDUSTRY STRUCTURE AND ITS CONTRIBUTIONS TO REGIONAL INCOME AND EMPLOYMENT IN INDONESIA

By

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Agro-industry has been important in fueling economic growth in Indonesia. In addition to providing employment opportunities for an Indonesian population that still depends largely on agriculture and agro-industry for a livelihood, agro-industry contributes to the economy by adding value in processing agricultural commodities. Of course, the increasing quantity of raw material from agriculture has permitted an expansion of agro-industry activities which implies a need for more labor, given that markets exist for the products.

The performance of Indonesian agro-industry sectors is evaluated in this study by two techniques of economic analysis to determine the appropriateness of expansion of an agro-industry sector for the Indonesian economy. First, the theory of backward and forward linkages is used as the underlying foundation to measure agro-industrial interdependence. Second, total value added and labor requirements to satisfy a unit increase in sectoral final demand are examined. This study uses an input-output

technique as the main framework for the analysis of appropriateness for changing the Indonesian agro-industry structure. Using input-output tables for 1971, 1975, and 1980, the study delineates 32 agro-industry sectors out of 66 sectors included in the transactions table representing the Indonesian economy.

The study finds that certain agro-industries are relatively more appropriate than others in terms of backward and forward linkages and value added - labor requirements. These are the spinning industries sector, the wheat flour and products sector, the rubber products sector, the sugar cane and brown sugar sector, the rice milling, cleaning, and polishing sector, the tobacco leaves and processing sector, and the beverages industries sector. A major problem in evaluating Indonesian agro-industry and the development opportunities in targeting an agro-industry sector for expansion is that labor supply by occupation and skill level is not included in the Indonesian input-output table. Therefore, it is essential that further research focus on labor supply in order to produce a comprehensive analysis.

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CHAPTER ONE

INTRODUCTION

PROBLEM STATEMENT

Given that most Indonesians still depend on agriculture and agro-industry for their livelihoods, these are two particularly important sectors of the Indonesian economy. The importance of these two sectors can be seen in the principal needs for Indonesia which are shown in the national guidelines of state policy. One of the national guidelines states that the general pattern of national development should emphasize the agricultural sector and encourage industries converting agricultural raw materials into industrial raw materials and finished goods. It is important to stress here that both agriculture and agro-industry sectors are considered to be sectors that can raise national income while at the time promoting employment opportunities. It is important that both the agriculture and agro-industry sectors selected for basic national development are those in which the nation has a real comparative advantage. That is, the government should not provide incentives for expansion in those sectors for which evident comparative advantage does not exist.

In order to examine comparative advantage and employment opportunity in both agriculture and agro-industry sectors, therefore, it is necessary to consider the basic attributes of these sectors as well as their current development. According to Pelzer (1971), the development of a plantation economy brought about the division of Indonesian agriculture into two major sectors: a highly scientific estate use of labor and capital; and a peasant agriculture, tradition-bound and, at least in Java, highly labor intensive. The plantations, because they were able to finance the construction and operation of factories, took over the cultivation of crops requiring complicated and costly processing, while the peasants concentrated on the production of domestic food crops and the export crops that demanded little processing.

Agriculture still provides well over half of all employment in Indonesia; therefore, trends in the size of the agricultural work-force of great importance, despite the somewhat misguided interpretation often placed on a decline in agriculture's share of total employment as evidence of success in industrialization. To draw any clear interpretation of the trends in agricultural employment, two items of information are needed and these are not available in Indonesia, at least not in any reliable form. The first is a comparison of labor productivity in agriculture and labor productivity in other sectors to which the agricultural labor force migrates. For evaluating the

success of economic policy, at least in so far as it influences economic structure and employment, there has been great interest in Indonesia in measuring the growth of labor force and, more specifically, employment in different sectors. The second is a measure of agricultural employment refined enough to give trends in total hours worked in the agricultural sector, not just trends in the very questionable measure of the total number of persons who reported agriculture as their main activity in response to questions in various censuses and surveys.

Within the agro-industry sector, there have been a number of important changes in recent years that would be expected to affect the level and pattern of demand for labor. According to Austin (1981), agro-industry is an enterprise that processes agricultural raw materials, including ground and tree crops as well as livestock. Agro-industrial growth permits diversification of exports required for a viable improvement of long-run balance of payments. To gain perspective on the problem and prospects of agro-industry in Indonesia, it is worth examining the main features and structural relationships underlying Indonesia's agro-industry sector.

In terms of production activity, the agro-industry sector utilizes processing technologies that do not require as much labor as the agricultural sector. The labor force in the agro-industry sector must have additional skills that are needed in processing agricultural products. Additional

labor skills mean that labor productivity tends to be higher than in the agricultural sector. Besides that, increasing value added can be earned by agro-industry activity where raw materials from agricultural sector are processed to supply consumer products. Therefore, it is the agro-industrial sector that could offer the best chances of raising labor productivity and increasing value added. The expansion of this sector together with the construction and services sectors, will increase the availability of non-farm employment opportunities. The growing importance of agro-industry employment alternatives for the rural population strengthens the conclusion that agricultural development policies cannot be formulated in isolation from policies concerned with the growth of labor demand in agro-industry sectors.

RESEARCH OBJECTIVES

This research attempts to explain problems faced by the Indonesia's agro-industry sectors by achieving the following objectives:

a. To analyze the linkage among sectors of the economy, especially the agro-industry sector and the agricultural sector, including the relative importance of both sectors in terms of their impacts on each other and the economy as a whole.

b. To measure both total labor requirements of and total value added by the agro-industry sector.

c. To make recommendations to improve performance of the agro-industry sector in Indonesia.

ORGANIZATION OF THE DISSERTATION

Chapter Two describes various aspects of Indonesian agro-industry with emphases on current government policies as well as current problems. The third chapter deals with the analytical framework and research methods and describes the model, variable specification, and data. Chapter Four is devoted to the presentation of data generated by the study. This chapter covers the descriptive analysis of interdependence of agro-industry and other sectors, especially the agricultural sector. Chapter Five deals with the future development of agro-industry in Indonesia. The last chapter summarizes the findings, draws conclusions, and makes recommendations for agro-industry policies and for future research.

CHAPTER TWO

AGRO-INDUSTRY IN INDONESIA

LABOR FORCE

Indonesia's population increased from 131 million in 1966 to 136 million in 1978 and 165 million in 1985. Average annual population growth was 1.8 percent from 1970 to 1978 and 2.21 percent for the period 1980 to 1985 (Central Bureau of Statistics, 1985). According to a World Bank Report (1985) that contains comprehensive aggregate data on the growth of the Indonesian economy over the periods 1961 - 1971 and 1971 - 1980, employment (measured by the number of employed persons) grew at an estimated rate of 2.9 percent per annum during 1971 - 1980, up from 2.4 percent during the '60s. These rates fall within the lower end of plausible employment growth rates given in a previous World Bank report. The acceleration in employment (and labor force) growth during the 1970s is associated with an increase in the proportion of the working age population rather than with an increase in labor force participation rates.

With the increase in the total labor force, the nation is confronted with the problem of how to provide jobs.

Since average productivity in manufacturing industries will probably increase, with the consequence that workers must be diverted to occupations elsewhere. The agricultural sector might continue to provide the bulk of employment, but it might not be able to absorb productively the remaining increase in labor force.

The ratio of labor force to population did not change during the period from 1961 to 1982. But there has been a substantial reduction of the proportion of the labor force engaged in agriculture, from 73.4 percent of the total labor force in 1961 to 65.9 percent in 1971 and 54.66 percent in 1982. This reduction is significant and implies a shift to the other sectors and a major expansion in non-agricultural employment. During this same period there was, however, an increase in absolute numbers of laborers in the agricultural sector due to population growth. During the last decade and in terms of absolute numbers, agriculture, in particular food agriculture, has remained by the far the largest single source of additional employment, accounting for more than 40 percent of incremental employment. Within the sub-sector of food agriculture, rice is the most labor intensive food crop, in terms of both man-day inputs per hectare and per ton produced. However, labor productivity in agriculture did not increase during the decade. It is furthermore expected that the rate of labor absorption in food production will decrease. Hence the accelerated expansion of non-farm activities, especially labor-intensive

manufacturing and its regional distribution, have become critically important and will determine the rate and quality of future employment growth.

According to Hugo et al. (1987), knowledge about the industrial work-force distribution and trends in industrial composition over time can provide a basis not only for evaluating the success of government policies, but also for forecasting labor absorption in other sectors. However, extreme care must be taken in the use of census data for this kind of analysis in a country at Indonesia's stage of development. This is because seasonal change in the participation rate of agricultural employment might be taken to indicate labor force responsiveness in labor market. In the case of agricultural sector, there is labor force responsiveness due to the fluctuation of demand and supply of labor especially at the peak season, e.g., harvesting season in the rice field.

The presumed trade-off between industrial growth and efficiency on the one hand and employment creation on the other might be far less sharp than believed in some quarters (Stewart and Streeten, 1971). The conflict may be unavoidable when use of relatively labor intensive technologies means the combination of employment and outdated machinery and equipment. But if new techniques that are adapted to the country's factor endowment are implemented, if double or triple shifts of workers are used, and if the machines are run at faster speeds, the situation

may be different. There is no reason to believe that the more labor-intensive activities necessarily involve higher capital-output ratios than the relatively small scale production that may be typical for a country such as Indonesia. The International Labor Office, in its study "Employment Aspects of Industrialization" with special reference to Asia and the Far East, has shown that those industries with relatively lower capital-labor ratios tend to have relatively higher levels of output per unit of capital invested (ILO, 1970).

TRENDS IN AGRO-INDUSTRY PRODUCTION

In the first phase of its industrialization, Indonesia was probably correct in directing industrial investment and growth primarily to meeting demand of the domestic market. There was an obvious market for imported products, so that import substitution could be expected to attract investments. And, although the low purchasing power of the Indonesian population called for low output volumes, the loss of efficiency in terms of higher costs was not large because economies of scale are not very significant in production of light consumer goods. On the other hand, the structural characteristics of Indonesia did not favor a vigorous expansion of manufactured exports.

Industries producing goods based on domestic raw materials are those in which Indonesia, in principle, has developed, or may reasonably be expected to develop, a

comparative advantage. While the material inputs and the labor component in processing costs are substantial, costs can be kept comparatively low because wages in Indonesia are among the lowest in the world. Labor productivity can be raised and domestic raw materials are, or could be, available at relatively favorable prices. Provided Indonesia's comparative advantage is not curtailed by adverse world market conditions, the promotion of resource-based industries should result in an improvement of the export position.

From the national point of view, industrial development should take place in selected lines rather than across the board. There is substantial evidence within the developing world that wide scale industrialization is bound to become inefficient and that it will slow down economic progress in the long run. Indonesia, as a late-comer among the industrializing countries, should avoid costly mistakes made elsewhere and should try to establish, from the very beginning, a pattern of industrial development that relies on efficient lines of production and promises of substantial social returns. This strategy calls for manufacturing specialization according to the classical concept of comparative advantage (Donges et al., 1974). Although this concept is in principle a theoretical one, it can be easily adjusted to become operational under the conditions prevailing in Indonesia. Comparative advantage alone

provides a criterion for guiding industrialization with a view to obtaining the highest benefits.

According to Donges et al. (1974), three groups of relatively labor-intensive industries can be distinguished: The first group consists of the most labor-intensive industries in which total value added per employee, as well as both components of value added, rank below the industrial average. The industries that most consistently belong to this group are canned foods, textiles, shoes, leather manufactures, wood products, paper products, and miscellaneous manufactures. In the second group are the labor-intensive industries using relatively more skilled labor. Examples are various non-metallic mineral manufactures, a number of non-electrical machines, some electrical appliances and some steel products. The third group consists of a few labor-intensive industries using relatively more physical capital than those industries cited above; examples are beverages and plastic articles. Arranging the industries according to the two-digit International Standard Industrial Classification, the following can be classified as relatively labor-intensive industries: food processing (ISIC 20); tobacco manufactures (22); textiles (23); clothing and footwear (24); wood processing (25); furniture (26); paper and paper products (27); printed matter (28); leather and leather manufactures (29); rubber products (30); electrical machinery (37); and miscellaneous manufactures (39).

In Indonesia, with abundant labor but scarce capital, growth of labor productivity is not the most meaningful criterion for assessing overall efficiency (Papanek, 1980). It reveals only the productivity of those workers who were effectively employed. It would be more useful to know the output, or value added, per unit of such scarce inputs as capital. At least in the case of agro-industry sector there are economic accounting systems that incorporate an analysis of both total output and value added requirements. Therefore, when one is concerned with the efficiency of agro-industry sector, it is necessary to consider the links between output and value added which will generally be based on the availability of inputs. Indeed, input availability is a reflection of the supply of resources. If labor productivity were seen as the result of having spread a given capital stock over a large number of previously unemployed workers, per capita income of the whole labor force would increase.

Labor productivity is an important factor of agro-industrial development in Indonesia. Rapid agro-industrialization can significantly improve the efficiency of Indonesia's agriculture through the supply of inputs and the processing of the sector's output.

According to the Table 2.1, the manufacturing sectors in Indonesia generated value added at increasing rates for the period 1974/1975 - 1986. The value added growth of sector 31 was 200.14 percent during 1974/1975 - 1979 and

284.39 percent for the period 1979 - 1986; the value added growth of sector 32 was 198.34 percent during 1974/1975 - 1979 and 515.76 percent for the period 1979 - 1986; and the value added growth of sector 33 was 261.62 percent 1974/1975 - 1979 and 762.24 percent for the period 1979 - 1986. Thus,

Table 2.1 Some Indicators for Manufacturing Sector in Indonesia 1974/1975, 1979 and 1986

Industry Code	Year	Value Added*)	VA/L**)
31	1974/1975	289,691	159.1
	1979	889,770	431.8
	1986	3,420,233	1,925.2
32	1974/1975	85,609	128.8
	1979	255,411	417.1
	1986	1,572,723	2,067.3
33	1974/1975	41,475	24.3
	1979	149,982	167.0
	1986	1,297,708	1,187.4

*) = in million Rupiah
**) = Value Added/Labor ; Labor = persons engaged
31 = manufacture food, beverages, and tobacco
32 = manufacture of textile, wearing apparel, and leather
33 = manufacture of wood and wood products

Source : Central Bureau of Statistics. Statistical Year Book of Indonesia. 1988.

the trend during 1974 to 1986 was that the value added - labor ratios of manufacturing sectors consistently increased in positive terms. The point, of course, is that the problem of employment growth at the national level can be solved by considering the entire structure of the manufacturing sectors. It seems apparent that the

development of the agro-industry sector as one of the manufacturing sectors provides great opportunities to increase employment potential for the growing labor force. In addition, a processing plant can open new crop opportunities to farmers and create additional farm revenue.

In this study, the major theme is the economic development of agro-industry sector in comparison to other sectors of the national economy. The major contrast that is highlighted in this study is that between those sub-sectors of the agro-industry sector that satisfy both value added and labor requirements and those that do not.

CHAPTER THREE

THE ANALYTICAL FRAMEWORK AND THE RESEARCH METHODS OF THE STUDY

THE INPUT-OUTPUT MODEL

An input-output model allows the quantification of regional economic interdependencies when data are organized into sectors representing the important economic sectors of the region (Diamond and Chappelle, 1981). Input-output analysis is concerned with interdependence of producing and consuming units in a modern economy and with showing interrelations among different sectors that purchase goods and services from other sectors and, in turn, produce goods and services that are sold to other sectors (O'Connor and Henry, 1975). More specifically, Pedersen and Chappelle (1989) describe input-output analysis as the study of interdependence among sectors (industries) in a region that can be used to measure the effects felt throughout an economy when demand or supply changes in one or more sectors. In regional planning, Williamson and Tait (1968) explain that input-output techniques have been applied in a number of planning efforts that use such criteria as output, employment, and income. According to Chenery and Clark (1962) and Heesterman (1970), input-output analysis is

probably only the first of several quantitative methods for handling inter-industry economics. In terms of economic transactions, Hewings (1985) shows that in input-output analysis, profits are contained within the value-added entry, and hence, the system represents a relatively complete picture of the transactions in economic system.

The input-output model is based on the Leontief input-output system which is, in turn, based on two sets of basic conditions (Leontief, 1953). First, there are balance requirements, i.e., the combined inputs of each commodity or service must equal its total product. Second, there is a definite relationship between quantities of all the inputs absorbed by one particular industry and the level of its total output. According to Richardson (1972), the input-output model has two characteristics: 1) it provides a descriptive framework for showing the relationships among industries and between inputs and outputs; and 2) it makes certain economic assumptions about the nature of production functions. It is an analytical tool for measuring the impact of autonomous disturbances on the economy's output and income. The static input-output system in its simplest form is founded on three assumptions (McGilvray, 1964; Fedorenko, et al, 1972; Skolka, 1988):

1. Each sector produces a single output with a single input structure and there is no substitution among the outputs of different sectors.
2. The inputs into each sector are simple proportions only

of the level output of that sector, i.e., the amount of each kind of input absorbed by any particular sector goes up or down in direct proportion to the increase or decrease in that sector's total output.

3. The total effect of carrying out production in several sectors is the sum of the separate effects.

In terms of availabilities of resources, according to Miller and Blair (1985), there is a fundamental assumption that the inter-industry flows from sector i to sector j depend entirely and exclusively on the total output of sector j for that same time period.

The input-output format is useful for thinking about and probing into the problem of unemployment in a city or region, and in particular, the problem of providing new jobs for an unskilled population. One of the major advantages of an input-output approach is that it allows us to set up a classification of sectors, commodities and services that is useful and appropriate for addressing the problem at hand. According to Nickel et al. (1978), input-output models have been developed to specify impacts at the national, regional, and specific industry levels.

According to O'Connor and Henry (1975), when doing an input-output study it is necessary to produce three main tables:

1. Transactions Table.

The basic table of an input-output system is known as the transactions table in which are entered in value

terms the various economic flows within the economy during some particular base year usually at producer prices in nominal terms. To prepare this table, the economy is divided into a number of sectors usually based on national census of production and other national statistical data.

2. Table of Technical Coefficients.

Technical coefficients are calculated from a transactions table. These coefficients are calculated by dividing every item in quadrant I and III of a transaction table by the sum of the column in which the item is recorded.

3. Table of Interdependency Coefficients.

Because of the inter-relationships between different sectors of an economy, a change in the final demand for the products of one sector causes ramifications throughout the system; the change affects not only the outputs of the sector concerned but also those of most, or perhaps all, of the other sectors of the economy. One of the main aims of input-output analysis is to study these changes, but unfortunately, the technical coefficients cannot be used directly for this purpose as they show only what are known as the direct or first order effects of changes in final demand. To study second and high-order effects, other operators known as total or interdependence coefficients are required.

These coefficients are obtained by inverting the (I-A)

matrix of coefficients.

The key to Leontief's input-output system is the construction of the input-output (or transactions) table. The transactions table shows the flow of commodities from each of the producing sectors to all other consuming sectors, both intermediate and final. In an n sector model, the flow of commodities from the i-th sector can be expressed as:

$$(1) \quad X_i = \sum_j^n X_{ij} + (C_i + I_i + G_i + E_i)$$

where X_i = gross output of the i-sector, X_{ij} = the amount of output of i-th sector purchased by the j-th sector as intermediate input, and C_i, I_i, G_i, and E_i are private household consumption demand, private business investment demand, government expenditure, and export demand respectively, comprising the final demand for output of the i-th sector. Since the sector is a producing sector, it also requires inputs from various sectors in the following relationship:

$$(2) \quad X_j = \sum_i^n X_{ij} + (L_j + V_j + M_j)$$

where L_j = wage payment, V_j = other value added and M_j = imports of commodity j from abroad. The crucial assumptions underlying equations (1) and (2) are: 1) each sector produces only one homogenous commodity (no joint products); and 2) the value of goods and services delivered by the i-th

industry to the other producing sectors is a linear and homogenous function of the level of output of the purchasing sectors, j. The latter implies constant returns to scale, fixed proportion and no substitution among inputs, which rules out external economies and diseconomies. The system also assumes equilibrium at given prices, and in static versions there are no capacity constraints so that supply of each commodity is perfectly elastic (Richardson, 1972).

The input-output structure of any particular industry is presented by a set of technical coefficients, a_{ij}, each of which states the amount of a particular input absorbed by that industry per unit of its own output,

$$(3) \quad X_{ij} = a_{ij}X_j$$

$$(4) \quad [A] = a_{ij} = \frac{X_{ij}}{X_j}$$

where a_{ij} = direct coefficient that quantifies input requirements to be purchased from sector i by sector j and [A] = matrix of a_{ij}s which may be considered a quantification of technical production relationships.

INTER-INDUSTRIAL LINKAGE ANALYSIS

Agro-industry's performance in the national economy and its impact is more complex to analyze than most other sectors. This is because agro-industry is an intermediate sector that is characterized by both backward and forward linkages to other sectors. These two types of linkage must

be considered to estimate the total economic impact of each agro-industry. Such estimation is especially useful in identifying key national economic sectors. Backward linkage means that mutual attraction is important mainly to the supply activity (Hoover and Giarratani, 1984). In other words, a market-oriented activity is attracted by the presence of an activity to which it can sell. While forward linkage means that an impact of change is transmitted to an activity further along in the sequence of operations. According to Nickel et al. (1978) and Miller and Blair (1985), the term "backward linkage" is used to indicate the economic interconnections of a particular sector to those sectors from which it purchases inputs. In contrast, the term "forward linkage" is used to indicate the economic interconnections of particular sector to those sectors to which it sells its output.

For example, the paddy sector in Indonesia has both backward and forward linkages. The paddy sector is the main agricultural sector on most islands of Indonesia and produces the staple food for most of the population. The backward linkage can be seen in the paddy sector activity on any island of Indonesia. The usual orientation in rice porduction is to focus on the availability of physical inputs that are needed in the paddy field, e.g. seeds, fertilizers, pesticides, and mechanical technology. The paddy sector activities are likely to be stimulated by any changes in aggregate supply of seeds, fertilizers,

pesticides, and mechanical technology, and thus, are the sources of production input from which paddy sector purchases physical inputs.

On the other hand, the paddy sector has impacts on one or more activities further along in the sequence of operations. The supply of the paddy sector is an inducement to establish a considerable range of activities from handpounding of rice, rice milling, and cleaning and polishing of rice, to processing and preserving of rice and trade activities. These further activities are categorized as forward linkages in economic analysis.

Schultz (1976) emphasizes that backward linkages indicate to what extent the economic branches have been specializing. On the other hand, forward linkages give an indication of the direction of supply. The intersectoral linkages can be analyzed by using the input-output technique (Czamanski, 1973; Diamond and Chappelle, 1981). Further explanations about the input-output framework as the underlying bases of linkage analysis are given by Chenery and Watanabe (1958), Mudahar (1982), Miller and Blair (1985), and Haji (1987). Chenery and Watanabe (1958) have developed two linkage indexes:

(5) $$L_{Dj}^{s} = \sum_{i} X_{ij}/X_j = \sum_{i} a_{ij}$$

L_{Dj}^{s} = direct backward linkage index

X_{ij} = the number of units of commodity i used in production of X_j units of commodity j

a_{ij} = the number of units of commodity i used in production of one unit of commodity j

(6) $L_{D_i^f} = \Sigma_j X_{ij} / Z_i$

$L_{D_i^f}$ = direct forward linkage index

X_{ij} = the number of units of commodity i used in production of X units of commodity j

Z_i = total demand which is the sum of intermediate demand $(\Sigma_j X_{ij})$ and final demand (Y_i) for output from i^{th} sector.

One of the major themes of this study is to evaluate economic linkages of the agro-industry sector at the national level for the years 1971, 1975, and 1980. This effort relates to that part of the Indonesian development targeting program that emphasizes the agricultural sector and encourages industries converting agricultural raw materials into both industrial raw materials and finished goods.

It is possible to use the approaches to linkage developed by Chenery and Watanabe (1958) in economic impact analysis at national level. Of course, it is essential that evaluation of economic impacts be based on both the correct sectors and periods required by the objectives of the study. The 32 agro-industry sectors employed here, which come from a 66 x 66 national input-output matrix, are all significant in examining agricultural development. A simple way to examine the importance of each agro-industry sector during a

period of time is to compare its contribution with those of other sectors of the national economy. For comparison, it is necessary to determine that the sector classification is the same for each year of analysis. Fortunately, the sector classification of the Indonesian economy for the years analyzed (1971, 1975, and 1980) does employ the same framework and definition. To determine optimal development strategies, therefore, the orientation of linkage analysis can be focused on a sectoral comparison of each agro-industry sector for the years 1971, 1975, and 1980. Although these comparisons are essential they do not constitute a complete evaluation of agro-industry sectors in the national economy. In terms of development strategy, the highest priority should be given to those sectors that have high forward and backward linkages and the lowest priority to sectors that have low forward and backward linkages (Hirschman, 1958). This is because any sector with either a high backward or a high forward linkage index is likely to induce more investment and to stimulate new activities through multiplier effects.

EMPLOYMENT AND VALUE ADDED REQUIREMENTS

According to Chappelle et al. (1986), the inverted Leontief matrix (i.e., $[I - A]^{-1}$) is a multiplier matrix itself in that it provides information on the amount of sales generated by each sector of the regional economy when its final demand is increased by one dollar. This assertion

will be used in estimating the output level of the Indonesian economy for 1971, 1975, and 1980 with a modification on the inverted Leontief matrix by inserting an import coefficient matrix ($\hat{M}$).

Imports are a part of supply for goods and services in a given country. Imported goods and services are often used in the production process and final consumption. The import data collected by the Indonesian Central Bureau of Statistics were recorded at "cost, insurance, freight" (c.i.f.) price by individual code number. According to Kreinen (1983), c.i.f. covers the cost of the commodity up to the port of entry. Essentially, it includes ocean freight and other intercountry transportation costs, which the f.o.b. (free on board) price excludes. Therefore, every import commodity must first be grouped according to I-O classification. By summing the import value of individual commodities in an I-O table, one arrives at import value for that item. Import at producer's prices consists of c.i.f. value, import duty and sales tax on import goods. Finally, imported goods and services are separated from domestic production to form a non-competitive type import. Non-competitive imports are imports of commodities that are not domestically produced (Miller and Blair, 1985).

Input-output accounts provide a quantitative approach to output level (X) calculation. That is, in the first step of its calculation the total import and final demand should be separated. The rationale of division between final

demand (F) and total import (M) is that if $(I-A)^{-1}F$ calculation is based only on F rather than (F - M), X represents an output level that comes from the assumption goods and services are domestically produced.

(7) $AX + F = X + M$

where F_i is final demand for sector i and M_i is import in sector i.

(8) $(I - A)\ X = F - M$

(9) $X = (I - A)^{-1}(F - M)$

The second step of X calculation is that imports of commodities should be considered in terms of the place where they were produced. The reason for this is that commodities imported are not coming solely from abroad but are also domestically produced (competitive imports) and imports are endogenous variables. Up to this point, according to the Central Bureau of Statistics (1976), it is assumed that imports are proportional to domestic consumption. μ is an import coefficient with respect to domestic consumption. Given the above considerations, the Central Bureau of Statistics (1976) developed a mathematical model for the import coefficient, μ.

$$(10) \quad \mu = \frac{\text{Import}}{\text{Intermediate demand + Final demand - Export}}$$

where Intermediate demand + Final demand = Total output. With simplification of F• = final demand - export

$$F^{\bullet} = F - E$$

therefore,

$$(11) \quad \mu_i = M_i / (\sum_j X_{ij} + F_i^{\bullet})$$

solving for M_i

$$(12) \quad M_i = \mu_i (\sum_j X_{ij} + F_i^{\bullet})$$

and equation (7) can be restated

$$(13) \quad X = AX + F - M$$

and substituting simplification of $F^{\bullet}$ in equation (10) and substituting equation (12)

$$(14) \quad X = AX + F^{\bullet} + E - \hat{M}(AX + F^{\bullet})$$

if equation (14) is stated in a matrix form, then:

$$E = \begin{bmatrix} E_1 \\ E_2 \\ .. \\ E_i \\ E_n \end{bmatrix} = \text{export}$$

$$\hat{M} = \begin{bmatrix} \mu_1 & 0...0...0...0 \\ 0 & \mu_2 \; ..0...0...0 \\ .. & 0... \mu_3 \; ..0...0 \\ .. & 0...0... \mu_i \; ..0 \\ 0 & 0...0...0... \mu_n \end{bmatrix}$$

$\hat{M}$ = import coefficient matrix

(15) $X = AX + F^{o} + E - AX\hat{M} + F^{o}\hat{M}$

(16) $X = (AX - AX\hat{M}) + (F^{o} + F^{o}\hat{M}) + E$

(17) $X_1 = [I-(I-\hat{M})A]^{-1}[(I-M)F^{o}+E)$

$[I-(I-\hat{M})A]^{-1}$ is the inverted matrix that will be used in the analysis, i.e., the amount of economic activity generated in the Indonesian economy by an additional rupiah of final demand for products of the specific sector.

In the Leontief inverse, the j-th element can be interpreted as the total effect (direct and indirect) on the gross output of the i-th sector when the j-th final demand changes by one unit. With each output change, there will be associated a change in employment, and the simplest assumption is that of a fixed proportional relationship between output and employment. According to Thomas (1982) and Alauddin and Tisdell (1988), this assumption can be formalized for each sector as:

(18) $L_j = \frac{E_j}{X_j}$

where E_j is employment in the j-th sector in any period and L_j is the labor requirement per unit of gross output (X_j). Therefore:

(19) $E = L = \hat{l} X$

where L is a vector of employment requirements and $\hat{l}$ is a diagonalized matrix formed from the vector n whose elements

are defined by equation (18). Substituting for X, the solution to the input-output model is then:

$$(20) \quad L = \hat{l}\,[I - A]^{-1} f = Lf$$

so that l_{ij}, the i, j-th element of L, measures the employment created directly and indirectly in the i-th sector when the j-th final demand changes by one unit, and $\sum_i l_{ij}$ measures the total employment created throughout the economy, when the final demand for the j-th sector increases by one unit.

The calculation of total labor requirements uses equation (20) with a justification as consistencies of equation (17):

$$(21) \quad L = \hat{l}\,[I - (I - \hat{M})A]^{-1}$$

where l is the diagonalized matrix of the labor coefficient. Then L is total (direct and indirect) labor input required to sustain a unit increase in the final demand for the output of the j-th sector. According to Alauddin and Tisdell (1988), this total labor requirement approach is also applicable for total capital requirement:

$$(22) \quad K = (\hat{k})\,(I-A)^{-1} = (K_{ij})$$

where k is the diagonalized matrix of capital coefficients. Then ΣK_{ij} measures total (direct and indirect) capital required to sustain a unit increase in the final demand for the output of sector j.

Columns of the transactions table point out

dissemination of costs spent by sectors to other sectors for inputs (ΣX_{ij}). A sector also pays for other items - - for example, labor (L) and capital (K) - - and uses other inputs, such as inventoried items, as well. All of these together are termed the value added (V) (Miller and Blair, 1985). Hence, columns of the transaction table can be exhibited by the following equation:

$$(23) \quad X_j = x_{1j} + x_{2j} + \ldots + x_{nj} + V_j = \sum_{i}^{n} x_{ij} + V_j$$

where X_j = total outlay of sector j

V_j = changes against final demand or payments to a factor of production in sector j.

The Central Bureau of Statistics (1980) defines value added as consisting of: 1) wages and salaries which are the compensations of employees, excluding unpaid family workers, before direct taxes; 2) operating surplus which consists of land rent, interest on capital and profit before direct taxes; 3) depreciation of fixed capital which is an estimate of the consumption of fixed capital used in the process of production; and 4) net indirect taxes which are obtained by deducting subsidies from indirect taxes, sales taxes, entertainment taxes, license and transaction fees, real estates taxes, etc. Thus, it is clear that the compensation of employees is but one component of value added (VA). However, it should be noted that there is an implicit circumstance in which the total labor cost for each sector of the economy was paid in order to meet final demand. The

reason for this assertion is that if the objective of this study is to measure both the total value added and the total labor requirements for particular sectors of the national economy, it is necessary to include all value added components in the analysis. From this perspective, the Alauddin and Tisdell approach, which considered only the value of K, must be changed by inserting the V value rather than the K value. It is evident, therefore, that equation (22) should be changed to a new form with the focus of the inverted matrix analysis on equation (17), i.e.:

$$(24) \quad V = \hat{v}[I - (I - \hat{M})A]^{-1}$$

where $\hat{v}$ is the diagonalized matrix of value added coefficients. Then V measures total (direct and indirect) value added required to sustain a unit increase in the final demand for output of sector j.

Both analysis for total (direct and indirect) labor and value added requirements should be followed by further analysis in terms of direct requirements. According to Alauddin and Tisdell (1988), the direct labor requirement (say, α_j) of a unit increase in final demand is given by:

$$(25) \quad \alpha_j = (l_j + \sum_i l_i a_{ij})$$

where l_j is a vector of employment and $l_i\, a_{ij}$ is the direct production requirements from each sector multiplied by labor output ratios (coefficients) for each sector.

To estimate direct value added requirements (say, β_j) stemming from the final demand for a sector's production,

the direct production requirements from each industry must be multiplied by the value added output ratios (coefficients) for each sector:

$$(26) \quad \beta_j = (v_j + \sum_i v_i a_{ij})$$

where v is a vector of value added.

THE CONCEPT OF APPROPRIATE TECHNOLOGY

It is widely recognized that appropriate technology is a problem for developing countries. Indonesia must keep in mind its means and its development objectives. Indeed, Indonesia must evolve an approach to industrialization that combines the use of advanced technologies with the use of inexpensive alternative technologies that would encourage employment and production in rural areas and small scale industries.

Appropriate technology may be defined as the set of techniques that makes optimum use of available resources in a given environment. In contrast, most groups working with appropriate technology associate it with a specific set of characteristics rather than with social maximization in abstract. Characteristics of appropriate technology include: more labor use in comparison with a less appropriate technology (higher L/O); less capital use (lower K/L); less skill use; more use of local materials and resources; smaller scale; and production of products needed by consumers. According to Jequier and Blanc (1983),

appropriate technologies are characterized by high potential for employment. In terms of human resources, Congdon (1977) emphasizes that appropriate technology must create jobs for all people in society, and in this way, make maximum use of human resources. Choi and Lee (1983) describe appropriate technologies as small-scale and labor-intensive technologies requiring a small amount of capital investment and having high employment generation effects.

An appropriate technology should be an efficient technology and, at the same time, one that fully reflects the abundance or scarcity of particular resources in the composition of the necessary inputs. It should substitute, for example, more direct labor for capital within a given total of cost in an economy in which labor is plentiful and capital is scarce (Robinson, 1979). In view of both the abundance of domestic labor and the scarcity of domestic capital, it is important that the Indonesian government accept foreign investment programs. The accomplishment of direct foreign investment in Indonesia is done by multinational corporations (MNCs). According to Gillis et al. (1983), perhaps the most common host country objectives are those of job creation, transfer of usable technology and skills, and saving or earning foreign exchange. For example, Indonesia typically requires MNCs in natural resources to fill all unskilled jobs with Indonesians after three years, but only 75 percent of skilled and supervisory jobs and 50 percent of technical and managerial positions

must be held by Indonesians. In 1980, capital in the amount of $467,000 was required for creating one job in pulp and paper. Yet in textiles, a job could be created for only $10,000 of investment.

The introduction of advanced technologies into industrial structures brings about well-known consequences, especially in a country where development programs are at the early stage. In particular, the adoption of production processes characterized by high capital intensity accentuates the imbalance of factors in underdeveloped economies. Particularly in the industrial sector, reduction of manpower per unit of output is the main purpose of technical advance, and use of such new technologies tend to limit employment possibilities (Rad-Serecht, 1979). The diminishing use of labor in production leads in turn to an increased concentration of incomes that is detrimental to the wage-earners. This, in turn, tends to reduce the size of the home market and encourages an industrial development in which capital-intensive industry is more desirable than labor-intensive industry.

One explanation for the diminishing use of labor is that the quality of human resources is improved which leads to more productive workers. Labor quality can be enhanced by education of both children and adults. According to Gillis et al. (1983), education can be defined broadly as all forms of human learning, or more narrowly as the process that takes place in specialized institutions called schools.

In any economy there is a strong tendency for people with certain levels of education to hold certain types of jobs. The proportion of people who hold jobs at a period of time in a given place is the labor force participation rate. For example in Indonesia, as Table 3.1 shows, there is a positive correlation between education level and labor force participation rates both in urban area and rural area.

Many theories of technological development for developing countries consider the selection and development of appropriate technologies based on the above perspectives. Since the agro-industry sector is often characterized by new processing technologies, using fewer human resources and at

Table 3.1 Labor Force Participation Rates by Sex and Educational Attaintment in Indonesia, 1977.

Sex		No School	Elementary Inc.	Elementary Com.	High School J	High School S	Academy & University
M	urban	74.41	48.07	67.23	59.11	77.62	86.51
	rural	88.13	65.87	81.67	60.62	81.76	83.21
F	urban	33.32	20.18	19.50	20.01	40.48	49.04
	rural	47.06	33.12	31.81	20.21	61.50	63.71

Inc. = Incomplete Com. = Complete
J = Junior S = Senior
M = Male F = Female

Source: SAKERNAS, 1977

relatively higher cost than the agricultural sector, it is necessary to evaluate the agro-industry sector as including one type of technology that could be appropriate for the development of developing countries.

In evaluating the agro-industry sector in terms of low cost of final product and high potential for employment, Alauddin and Tisdell (1988) determine an appropriate technology for each sector of the economy, total capital-labor ratio and direct capital-labor ratio. In Figure 3.1, they identify 47 Bangladesh industries in some of which are appropriate technologies in terms of total as well as direct capital ratios, i.e., total K/L versus direct K/L. To pursue the point of identifying appropriate technologies in terms of total as well as direct capital ratios, Alauddin

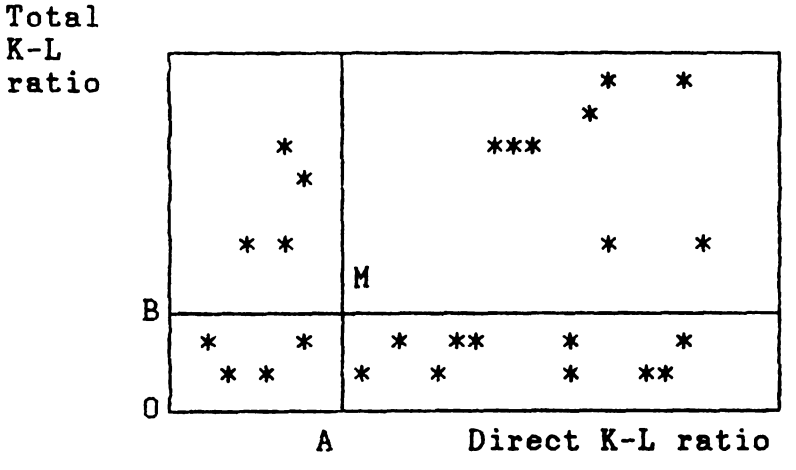

Figure 3.1 Total K-L ratios and direct K-L ratio for selecting appropriate industries in Bangladesh.

and Tisdell (1988) have employed a linear regression estimate to relate the observed direct ratios to the observed total ratios.

(27) $Total\ K/L = a + b\ Direct\ K/L$

where

(28) $Total\ L = (\hat{l})(I - A)^{-1}$

$\hat{l}$ = diagonalized matrix of labor coefficient

(29) $Total\ K = (\hat{k})(I - A)^{-1}$

$\hat{k}$ = diagonalized matrix of capital coefficient

(30) $Direct\ L = \alpha_j = (l_j + \sum_i l_i a_{ij})$

(31) $Direct\ K = \beta_j = (k_j + \sum_i k_i a_{ij})$

In Figure 3.1, the lines OA and OB mark the ratio of available labor to employed labor. In essence, this ratio depicts the average absorption of labor at the national level in order to satisfy a unit increase in final demand. This quantification of optimum capacity is certainly necessary if we manipulate the open static Leontief model to determine the total (direct and indirect) output and input (labor and capital) requirements to satisfy a unit increase in final demand. Since the focus in economic impact analysis is on evaluating both labor and capital requirements in which the optimum capacity to absorb labor is fulfilled, then it stands to reason that there must be a comparison between these requirements and the ratio of available to employed labor. Figure 3.1 shows that all

sectors falling within the area circumscribed by OAMB appear to fulfill the average labor and capital requirements with respect to the optimum capacity in absorbing labor. This means that any economic sector in the area circumscribed by OAMB is categorized as an appropriate technology in Bangladesh's economy. The analysis indicates sectors that might be given preference in Bangladesh for expansion in terms of the appropriateness of their K/L ratio as well as capital and labor requirements per unit of final demand.*

Related to the problem of agro-industry in Indonesia, equations (21), (24), (25), and (26) are applicable for estimating both total (direct and indirect) labor and total value added requirements, and both the direct labor requirement and the direct value added requirement. Also, equations (27), (28), (29), (30), and (31) can be corrected by replacing K with V to be used in selecting appropriate agro-industries for Indonesia. The reason for this assertation is that value added for each sector (V) consists of capital (K), labor (L), and other inputs that are depicted in equation (23). Therefore, an important consideration when evaluating economic impact is looking at not only capital required in development, but also at value added as well.

(32) $Total\ V/L = c + d\ DirectV/L$

where

(33) = (21) $Total\ L = \hat{f}\,[I - (I - M)\,A]^{-1}$

(34) = (24) $\quad Total\ V = \hat{V}\,[I - (I - M)\,A]^{-1}$

(35) = (25) $\quad \alpha_j = (l_j + \sum_i l_i a_{ij})$

(36) = (26) $\quad \beta_j = (v_j + \sum_i v_i a_{ij})$

By adapting Alauddin and Tisdell's (1985) approach of Figure 3.1, all the above equations, i.e., equations (32), (33), (34), (35), and (36) are useful in selecting appropriate agro-industry sectors for Indonesia. Figure 3.2 is a modification of Figure 3.1 with direct value added-labor ratios in the horizontal axis and total value added-labor ratios in vertical axis. In this modification, the selection of appropriate agro-industries is based on agro-industries that fall within the area circumscribed by OCND. At this point, it is important to stress that each industry is facing three major factors of labor situations: the labor requirement for each industry's activity; the current labor employed in each industry's activity; and the total available labor at the national level. The main question posed here is why the decision-maker needs to be concerned with relationships among these three factors. The major reason for this is that both labor and value added of each agro-industry exists within the context of labor and value added for the national economy.

The ratio of available to employed labor for the national economy on the vertical and horizontal lines represent the limit of the national economy in absorbing

labor to generate optimum value added. Every single point beyond this limit shows that the total available supply of labor exceeds that actually employed in the national economy. That is, national economic activities cannot be expanded beyond this limit to reach the optimum value added that is generated by utilizing national labor. This implies that if economic activities are conducted in circumstances in which total available supply of labor exceeds that actually employed, the optimum value added is not achieved.

Although the above approach concern total effects on the national economy, there is no doubt that each agro-industry sector is part of the national economy activities. In the case of value added generation, if an agro-industry sector utilizes more labor than the national capacity for absorbing labor, a decreasing value added will be created not only in the agro-industry sector but also in the national economy. In other words, each agro-industry sector should maintain the condition that its value added labor-ratio is less than the ratio of available to employed labor at national level.

The labor requirements that are important in production activity show the appropriate number of persons needed to get to the optimum allocation of production inputs. Too often, however, the focus of optimum allocation of production inputs is solely dependent upon the capital-labor ratios that are commonly derived in economic analysis, and do not include value added. In this study, where value

added-labor ratios are taken into account, however, it is possible to derive a comprehensive analysis that reveals the importance of value added in the national economy rather than capital considerations. On the other hand, both current labor employed in each industry and total available labor at the national level must be considered by this study. The reason for this is that when calculating the

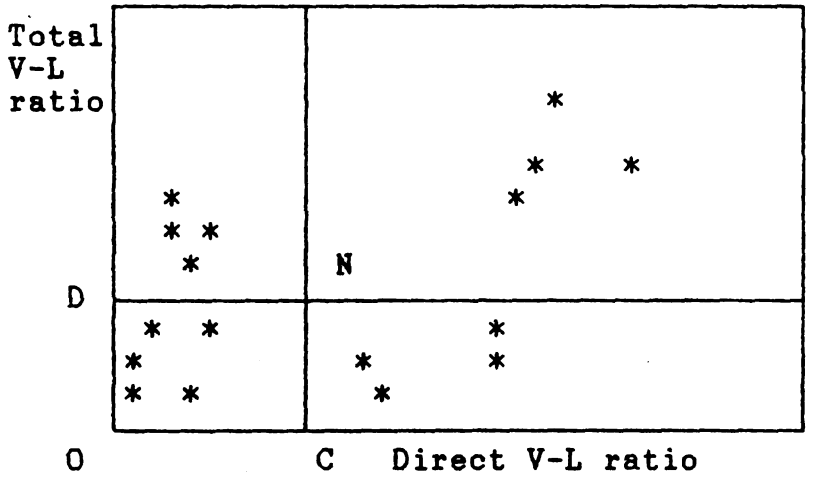

Figure 3.2 Total V-L ratios and direct V-L ratios for selecting appropriate agro-industries in Indonesia.

ratio of available to employed labor, the actual proportion of supply and demand of labor in agro-industry sector must be known.

This study is concerned with the development of methods to evaluate the appropriateness of agro-industry sector performance in Indonesia so that government agencies can evaluate one sector by directly comparing it with others.

Also, since the main concern is with the repercussion of employment strategies in Indonesian economy, it is necessary to consider evaluation of labor supply by occupation and skill level in the context of agro-industry economic impact assessment. This effort fits within that part of the employment targeting program that focuses on the creation of employment opportunities.

According to Arndt (1984), in relation to the allocation of labor between occupations, sectors, and regions, the recognition of the wage system is most important. Conceptually and operationally, however, as noted by Thompson (1965), occupational mix seems quite simple and straightforward, but bisecting observed earnings into an industry - mix component and an earnings - rate component may not really come off clearly. In the Indonesian case, McCawley and Manning (1976) notes that the wage situation in Indonesia reflects the difficulties of setting an effective minimum wage in a labor surplus economy. In addition, McCawley and Manning (1976), note that it is difficult to escape the conclusion that, given these institutional realities and the present labor market situation, minimum wages will be unlikely to affect a significant proportion of the industrial labor force.

In view of these positions, labor supply by occupation and skill level data are important in evaluating the national economy, but these data are not available in the Indonesia input-output tables of 1971, 1975, and 1980. From

the perspective of this study, the consideration of value added - labor ratio requirements, backward and forward linkage indexes, and labor supply by occupation and skill level are required to determine the appropriate agro-industry sectors in Indonesia.

From the perspective of this study, there are four conditions that an agro-industry sector should satisfy in order to be categorized as an appropriate agro-industry: (1) the total value added - labor ratio should be less than the ratio of available labor to employed labor; (2) the direct value added - labor ratio should be less than the ratio of available labor to employed labor; (3) the backward linkage index should be at least 0.5; and (4) the forward linkage index should be at least 0.5. This study is based on the proposition that these four conditions as guidelines to development strategies, although useful, are not adequate in themselves as a basis for decision-making. The major reason for this limitation is that agro-industry development exists within the context of labor supply by occupation and skill level, and these data are not available for the years of analysis.

VARIABLE SPECIFICATION AND DATA

Information for constructing agro-industry sectors of the input-output transactions matrix were obtained from various Indonesian government agencies, including the Central Bureau of Statistics, Ministry of Agriculture,

Ministry of Trade, and Ministry of Labor. Only secondary data were used to estimate Indonesian economic activity for 1971, 1975, and 1980.

To determine the sectors of the national economy that are needed in input-output analysis, both aggregation and disaggregation methods must be applied. Aggregation has a dominant role to play in the input-output studies (Malinvaud, 1954). A description of one sector in the input-output table must be clearly recognized whenever data are being aggregated. However, among sector descriptions there is both variation and similarity in terms of raw material sources, kinds of technology in processing activity, and other basic attributes. In addition, according to Barna (1954), the grouping of commodities and activities must follow certain principles. One necessarily loses information by aggregation, and the methods used should aim at minimizing information loss. As will be argued, the choice between various alternative methods, each of which is of a compromise, must depend on the purposes of the analysis. According to the Central Bureau of Statistics (1984), the main condition that a sector must meet is that the output of each of the resulting sectors be as homogenous as possible. Two main criteria to consider are: 1) grouping economic activities with similar input structures. With this criterion, two units with similar outputs but using different input structures should be placed in different sectors; and 2) grouping vertically chained production

processes. With this criterion vertically connected units, such as the series cording cotton, spinning yarn, weaving, dying, finishing, and printing of textiles, should be placed under the same sector provided that a change in the output of one unit is always followed by proportional changes in the output of the related units.

Sectors used in this study are derived from the 175 sectors of the Indonesian Input-Output Table for 1971, 1975, and 1980. For the purpose of this analysis, a 66-sector input-output table has been used to represent the economy of Indonesia; it includes 32 agro-industry sectors (Appendix 1: Table 1).

This section has presented a brief description of scope of the analysis and definitions of agro-industry sectors. Examples of simple agro-industry referred to this sector are: handpounding paddy, roasting and skinning coffee and maize, chipping cassava, smoking rubber, drying coconut, extracting coconut oil and producing brown sugar, slicing tobacco, sawing wood in the forest area, and salting and drying fish. The agro-industry sector also covers all production activities whose objectives are to transform raw materials or semi-finished agriculture products into new products that have higher value or utility. The transformation process may be mechanical, chemical, or other forms and may be performed by power-driven machines or by hand tools.

In the 1971, 1975, and 1980 Input-Output Tables,

according to the Central Bureau of Statistics (1984), employment is defined as the number of people who worked, full or part time, during the year (man-year). As a general rule, a person is included in the labor force if he or she worked for at least one hour per day during the previous week. Those who sought employment during the previous week and have been employed are also considered as part of the labor force.

CHAPTER FOUR

INTERDEPENDENCE OF AGRO-INDUSTRY AND OTHER SECTORS

BACKWARD LINKAGE ANALYSIS

The preceding section dicusses backward linkages arising from agro-industry development. It is important to recognize that agro-industry activities cannot be separated from the backward linkage analysis from which the dynamics of agro-industry structural changes can be considered. One of the uses of backward linkages is in taking into account production linkages, that is, the derived demand for agro-industry inputs (e.g., raw materials) produced in different agricultural sectors and other sectors that sustain agro-industry activities (e.g., trade).

The relative strength of backward linkage analysis in Indonesian strategy development is to provide information that contributes to determining potential sectors from which an agro-industry sector is supported. Such information is necessary if a model is needed to explain the changing structure of the agro-industry economy. The comparison of agro-industry backward indexes for the years 1971, 1975, and 1980 is shown in Table 4.1, which summarizes data in Appendix 1: Tables 11, 12, and 13. Table 4.2, which is also

summarized from the same tables in Appendix 1, shows the agro-industry forward indexes for the years 1971, 1975 and 1980. In 1971, there were 16 agro-industry sectors that had backward linkage indexes of > 0.5 or greater. Of these, the five highest were: (1) processing and preserving of food (0.8473); (2) rice milling, cleaning and polishing (0.8472); (3) oil and fats (0.8060); (4) handpounding of rice (0.7980); and (5) wheat flour and products (0.7470). The 1975 input table for Indonesia indicates that 13 agro-industry sectors had backward linkage indexes of 0.5 or greater. The oil and fats sector was the agro-industry sector with the highest backward linkage index (0.8530) followed by rice milling, cleaning and polishing (0.8350), handpounding of rice (0.7920), wheat flour and products (0.7520), and processing and preserving of food (0.7320). The 1980 input-output table for Indonesia indicates that the sugar cane and brown sugar sector was the agro-industry sector with the highest rank as measured by the backward linkage index (0.8630) followed by rice milling, cleaning and polishing (0.8010), oil and fats (0.7960), handpounding of rice (0.7810), and slaughtering (0.7670).

Although the number of agro-industry sectors that have high backward linkage indexes varies in each year of the analysis, each of these sectors shows a trend in which the backward linkage maintains a relatively a high ranking. The main question posed here is what the economic consequences are for each agro-industry sector that has a

Table 4.1 Agro-industry Sectors with Backward Linkage Index $\Sigma_i a_{ij}$ above 0.5 for 1971, 1975, and 1980 in Indonesia.

CODE*	1971 COEFFICIENT	RANK	1975 COEFFICIENT	RANK	1980 COEFFICIENT	RANK
1	-	-	-	-	-	-
2	0.7980	4	0.7928	3	0.7811	4
3	-	-	-	-	-	-
4	-	-	-	-	-	-
5	-	-	-	-	-	-
6	-	-	-	-	-	-
7	0.5786	14	0.5825	12	0.5040	14
8	-	-	-	-	0.8630	1
9	-	-	-	-	-	-
10	0.7140	6	-	-	-	-
11	0.5720	15	0.5250	13	-	-
12	-	-	-	-	-	-
13	-	-	-	-	-	-
14	-	-	-	-	-	-
15	-	-	-	-	-	-
16	-	-	-	-	-	-
17	-	-	-	-	-	-
18	-	-	-	-	-	-
19	0.6290	13	0.6040	9	0.7670	5
20	-	-	-	-	-	-
23	-	-	-	-	-	-
27	0.8473	1	0.7320	5	0.6750	10
28	0.8060	3	0.8530	1	0.7960	3
29	0.8472	2	0.8350	2	0.8010	2
30	0.7470	5	0.7520	4	0.7590	6
31	0.5650	16	-	-	0.6390	12
32	0.6740	9	0.7140	7	0.7300	7
33	0.6370	12	-	-	-	-
34	0.6730	10	0.5970	11	0.5720	13
35	0.7040	7	0.7220	6	0.7050	9
36	0.6850	8	0.6640	8	0.6520	11
42	0.6510	11	0.6000	10	0.7100	8

Source: Summary of Appendix 1: Tables 11, 12, and 13

* Sector description is the same as sector description in Appendix 1: Table 1.

\- Value is less than 0.5.

high backward linkage index during the years under analysis. In summary, seven agro-industry sectors had backward linkageindexes in the top 10 for all three years (1971, 1975, and 1980). These were: (1) rice milling, cleaning, and polishing sector; (2) the oil and fats sector; (3) the handpounding of rice sector; (4) the wheat flour and products sector; (5) the processing and preserving of food sector, (6) the food products not elsewhere classified sector; and (7) spinning industries. Since the highest priority in development should be given to those sectors that have high backward linkages, it is necessary to examine the basic attributes of each of these sectors in terms of purchasing inputs.

It should be recognized that the rice milling, cleaning, and polishing sector has significant backward linkages with other sectors of national economy from which it requires inputs. The 1971, 1975, and 1980 input-output tables for Indonesia show that the rice milling, cleaning, and polishing sector has a great dependency on other sectors, including, for example, paddy, handpounding of rice, agricultural machinery, electricity and water supply, trade, transport and communication, and financial services. Therefore, we must examine these upstream activities.

First, the availability of paddy is of great importance in rice milling activity. As noted by Mears (1981), from 1968 to 1978, with irrigation rehabilitation proceeding and the profitability from rice improving relative to other substitute crops, the area harvested increased on Java - the

main island - at the relatively slow annual rate of 0.7 percent. And with the BIMAS (Bimbingan Massal or mass guidance) intensification program, yields increased rapidly, so that total production on Java expanded at an average rate of 3.6 percent a year. Generally, the total paddy production processed by rice mills increased in order to provide rice for consumption. That is, there were potentially adequate supplies of paddy available in the area of rice mill activity for the year of 1971, 1975, and 1980.

Second, paddy is delivered to rice mills through various channels and by various means. Some paddy is gathered at village assembly centers by local traders and then delivered and sold to the rice mill; in other cases, the individual farmers may deliver directly (Esmay et al., 1979). In terms of paddy distribution based on the region, Mears (1981) points out that the paddy marketed from the farms generally flows toward rice millers with regional excess supply moving toward deficit areas. For 1971, 1975, and 1980, the input-output tables for Indonesia show that both wholesale trade and retail trade contribute significantly to the rice milling, cleaning, and polishing sector. These marketing channels provide for the delivery of paddy from the farm-gate to the milling sites.

Third, the financial service sector contributed significantly to rice milling activity during the years 1971, 1975, and 1980. Marketing of paddy from the farm-gate to the rice mill requires continuous credit or financing, but farmers are sometimes faced with inadequate credit

facilities. According to Mears (1981), the need for financial support from the financial service sector continues during production, after harvest, through processing and marketing, including transport, and until the rice finally is consumed. In fact, the dependency of the rice milling, cleaning, and polishing sector on the financial sector is clear in the Indonesian input-output table for the years 1971, 1975, and 1980.

The oil and fats sector is another agro-industry sector that showed high backward linkage indexes in the 1971, 1975, and 1980 Indonesian input-output tables. Three major agro-industry sectors have a vital influence on the oil and fats supply, i.e., coconut, palm oil, and groundnut. According to Gwyer and Avontroodt (1974), Indonesian consumers have traditionally obtained the bulk of their edible oil from domestically produced copra. Consumption is increasing quite rapidly on account of population growth, income growth, and a relatively high income elasticity of demand. The annual increase in oil consumption was about 7 percent in the 1970s due to population increase and higher incomes per person (Moll, 1987). It is implicit from these conditions that the supply of copra should be increased to meet domestic demand. One alternative is to increase coconut supply by intensifying national production. According to by Moll (1987), coconut was the major source of vegetable oil in Indonesia until 1978. Production of coconuts increased at an annual average at 1.4 percent between 1955 and 1974. It is evident from what is said

above that there is a significant interdependency between edible oil supply and coconut production in the period of 1971, 1975, and 1980.

Palm oil has attributes different from those of coconut oil. Its main use is as cooking oil, but through fractioning it can be used to make a number of sophisticated and specialized products such as margarine, soap, cosmetics, and lubricants. In regard to these uses and the increasing of annual vegetable oil consumption, there are problems in balancing supply and demand of vegetable oils. In 1978 the government decided on a policy of substituting palm oil for coconut oil as the main cooking oil for domestic consumption (Arndt, 1981). The point, of course, is the crucial need to increase of palm oil supply as a source of vegetable oils. According to Moll (1987), oil palm was considered more profitable than rubber in the late 1960s and early 1970s and large areas with aged rubber stands were replanted with oil palm. Other considerations of shifting from rubber to oil palm production are summarized by Collier and Werdaja (1972). First, farmers' returns from rubber are so low that they are forced to switch to other activities. If farmers have other crops, they put more time into their production. Second, the costs of transport are high, and the port facilities are distant; the size of holdings is small, and there are many links in the marketing chain.

In regional development, the government policy ties palm oil production with the transmigration program, an attempt to solve the problem of population distribution by

making use of enormous uncultivated areas outside Java, Bali, and Southern Sumatra. Many transmigration areas are totally devoted to producing palm oil with transmigrants being smallholders. The Indonesian government hopes that through encouraging transmigrant to cultivate the oil palm, the uncultivated areas can be brought into productive use. As noted by Kreitman and Worth (1984), the government "can own a processing plant and provide initial financing through government banks, pay a minimum guaranteed price for the harvested palm oil and take care of the marketing and distribution of the processed oil. This is commonly known as the "nucleus estate policy," in which the estate is a collectivized grouping of small private plots.

Indonesia produces oil bearing crops in addition to coconut and oil palm. The most important of these are groundnuts and soybeans, the greater proportion of which are consumed domestically (Gwyer and Avontroodt, 1974). While a proportion of the groundnut crop is crushed for oil, soybeans are consumed without prior oil extraction.

In view of the situation described, it is likely that coconut, palm oil, and other oil bearing crops continued to be important to the oil and fats sector during the period of 1971 to 1980; the backward linkage indexes of the oil and fats sector were higher than other sectors, i.e., 0.8060; 0.8530; and 0.7960 for 1971, 1975, and 1980 respectively. Therefore, the development of oil and fats sector cannot be separated from the upstream sectors that produce raw materials.

The handpounding of rice sector shows a high backward linkage index for each of the three years of analysis: 0.7980 for 1971; 0.7929 for 1975; and 0.7810 for 1980. According to the 1971, 1975, and 1980 input-output tables, this sector was mainly affected by three other sectors of economy, paddy, trade, and financial services. The handpounding of rice appeared to be driven in an integral part of paddy sector by absorbing paddy to be processed. At present, there are three rice processing techniques used in Indonesia: handpounding of rice; small rice mills; and large rice mills (Timmer, 1984). Handpounding of paddy with a mortar and pestle was probably the earliest form of rice milling in Indonesia. The small rice mills can be thought of as ranging from the now obsolete double Engelberg - type huller/polisher combinations to the smaller self - contained Japanese rice milling units. On the other hand, the major feature of the large rice mills is the combined use of mechanical and sun drying with modern milling equipment, either Japanese - type or conventional multi-stage. Handpounding, the traditional technique, has declined drastically in recent years. According to Mears (1981), a rapid shift from handpounding came about with the arrival of small mills that could be economically located near villages. It is clear that there are circumstances in which handpounding is not desirable in some areas because its productivity is lower than that of rice mills. The 1971, 1975, and 1980 Indonesian input-output tables, however, show that handpounding has a high backward linkage index. This

means that handpounding activities tie in well with the agro-industry sectors that supply inputs to the handpounding sector. The paddy sector is, of course, the key sector in terms of supplying raw material to the handpounding sector. Because of this, the existance of handpounding sector activities does not depend solely on its productivity but its raw material supply as well.

On the other hand, both the trade and financial service sectors have significant contributions to handpounding activities. The organization and structure of both paddy and rice markets have changed since the Indonesia government established KUD (Koperasi Unit Desa or Village Cooperative Center). From the perspective of the national rice market, KUD has the particular task of stimulating cooperative development and helping insure high farm prices. The cooperatives were given subsidized credit for purchasing paddy from the farmers and were paid preferential prices by the government for their paddy and milled rice.

The wheat flour and products sector is the fourth agro-industry sector that shows a high backward linkage index for the years analyzed. Despite the relatively small quantities in which it is consumed, wheat flour is an important commodity in Indonesia (Timmer, 1971). This is because the total supply of wheat flour, all of which is channeled through the central government, is derivable from aid terms ranging from grants to loans.

The availability of wheat flour, all of which comes from abroad, cannot be isolated from its consumption. As

noted by Magiera (1981), sharply increasing wheat imports have led to a rapid expansion of the Indonesian processing industry over the past decade. Such firms manufacture bread, cakes and the wide range of snacks consumed in Indonesia. The wheat flour and products sector generates a high backward linkage index. This is because of wheat flour's use as an ingredient combined with other agricultural products in order to produce a wide range of snacks.

The fifth agro-industry sector that shows a high backward linkage index in the years of analysis is the food processing and preserving sector. There are many agro-industry sectors involved in the food processing and preserving sector. Of particular importance are those sectors from which raw materials are supplied. These include, for example fisheries, fruit and vegetable farming, and slaughtering. In addition, the internal trade sector supports the continuity of the processing and preserving food sector. The main task of the internal trade sector is to sustain the delivery of raw materials from farms to processing and preserving operations.

Fish, which is a major source of protein in Indonesia, is one of the raw materials that the processing and preserving food sector uses. The escalation of development of aquaculture, as described by Neal and Smith (1982), was basically motivated by the need to produce additional fish protein to meet demands of the rapidly increasing population.

It is important to note that many agricultural products, such as fruits and vegetables, are still processed in traditional ways. This is primarily because of a high cost marketing system, a lack of processing knowledge, and a lack of storage facilities.

The food products not elsewhere classified sector is the sixth agro-industry sector that shows a high backward linkage index in the 1971, 1975, and 1980 input-output tables. This sector consists of tea processing, cocoa, coffee grinding, chocolate, and sugar confectionery, soybean products, and others. According to Singh (1977), a basic attribute of many of the crops processed in this sector is the high capital costs of establishing new plantings. Among recurrent costs, labor costs predominate because both cultivation and harvesting are highly labor intensive.

Tea processing is a significant part of the food products not elsewhere classified sector in the 1971, 1975, and 1980 input-output tables. Although the best teas produced in the country are exported, Indonesian teas are considered to be of inferior quality in the world market. The quality of tea produced by a given factory is subject to both exogenous and endogenous influences. The exogenous factors, over which producers have little control, include climate, soils, slope, and land elevation. Endogenous factors include the choice of clones or seedlings, the fertilizers applied, disease control, the plucking procedures adopted, the technique of transporting the delicate leaves to the factory, and methods of manufacture.

In addition to the export market, Indonesia, unlike some other major exporting countries, such as Sri Lanka and East Africa countries, has a very large domestic market. The country has a large population, and the habit of tea drinking in widespread.

The final agro-industry sector that has a high backward linkage index for the years 1971, 1975, and 1980 is the spinning industries sector. This sector consists of several industries such as cotton yarn, silk yarn, sisal yarn, coconut yarn, regenerated cellulose rayon, and threads. Cotton yarn industries are the focus of this backward linkage analysis because, as noted by Boucherie (1969), Indonesia's raw cotton requirements are met almost entirely by imports. The lack of raw cotton, together with the low capacity of utilization, results in sales and profit performance that does not permit the buying of spare parts, much less the purchase of large pieces of machinery to increase production. In terms of prospective demand for textiles in Indonesia, traders, including those not in the import business, argue that even an increase in the per capita income of the lower income groups would result in little increase of sales of domestic products at existing prices and quality (Boucherie, 1969). In contrast, the 1971, 1975, and 1980 input-output tables show that the spinning industries sector, to which cotton yarn industries provide a significant contribution, has a high backward linkage. This means that the development of spinning industries and the increasing consumption of textiles

occurred simultaneously. That is, the improvement of domestic products quality was achieved at prices affordable by consumers.

FORWARD LINKAGE ANALYSIS

Having determined the backward linkage index of each agro-industry sector, I now turn to the forward linkage index. Table 4.2 summarizes data from Appendix 1: Tables 11, 12, and 13, which depict the forward linkage index for each agro-industry sector and its rank for the years 1971, 1975 and 1980. The table shows that there are seven agro-industry sectors with forward linkage indexes in the top 10 for the years 1971, 1975, and 1980. These are (1) the paddy sector; (2) the other farm food crops sector such as peanuts and soybeans; (3) the cloves sector; (4) the other crops sector such as cotton and cocoa; (5) the livestock sector; (6) the spinning industries sector; and (7) the rubber products sector. One of the purposes of this study is to analyze each agro-industry sector that has a high forward linkage index. This analysis is critical in order to evaluate and determine agro-industry development at national level.

The Indonesian input-output table for the years 1971 and 1980 clearly show that paddy sector generates the highest forward linkage index compared with other sectors, i.e., 0.9999 and 0.9672 respectively. However, in 1975, the paddy sector shows a forward linkage index of 1.0000 which means that the entire sector's output is equal to the sum of its

intermediate demand and its final demand. This is always true in a demand-driven model but not in a supply-driven model. The downstream sectors that are determined by the paddy sector activity are varied and include not only farm activities, such as handpounding rice, rice milling and livestock, but also paper and paper products.

For human consumption availability, paddy has to be processed, which consists of separating the grain from the husk and polishing the grains. According to input-output data analyzed in this study, handpounding and rice milling are the two sectors that the output of paddy sector mainly flows into. These sectors are the main downstream sectors needed in order to support the supply of rice for national consumption.

Conceptually, the economic demand for rice depends on the tastes of consumers, their incomes, the price of rice, the price of substitutes and complements goods, and the population. According to the Weitz-Hettelsater Engineers (1972), these factors take on different values in different parts of Indonesia and change continuously over time. Precise estimation of the aggregate demand function for rice is impossible given the data available. It is necessary, therefore, to rely heavily on population growth rates, past consumption trends, and the few empirical observations and studies.

With the vast majority of Indonesians still depending on rice as a basic necessary foodstuff, it remains the most important agricultural product of the Indonesian economy.

Table 4.2 Agro-industry Sectors With Forward Linkage Coefficient $\Sigma_j X_{ij} / Z_i$ above 0.5 for 1971, 1975, and 1980 in Indonesia.

CODE*	1971 COEFFICIENT	RANK	1975 COEFFICIENT	RANK	1980 COEFFICIENT	RANK
1	0.9999	1	1.0000	2	0.9672	1
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	-	-	-	-	-	-
5	-	-	-	-	-	-
6	0.5656	10	0.5966	8	0.5797	10
7	-	-	-	-	-	-
8	0.7549	7	0.5148	11	0.7446	8
9	0.6809	8	0.5831	9	0.5220	11
10	-	-	-	-	-	-
11	0.5309	11	0.8061	4	0.7861	6
12	-	-	-	-	-	-
13	-	-	-	-	-	-
14	0.9980	2	0.9956	3	0.9559	2
15	-	-	-	-	-	-
16	-	-	-	-	-	-
17	0.8745	5	0.7707	7	0.8369	5
18	0.7920	6	1.0078	1	0.8892	4
19	-	-	-	-	-	-
20	-	-	-	-	-	-
23	-	-	-	-	-	-
27	-	-	-	-	-	-
28	-	-	-	-	-	-
29	-	-	-	-	0.9545	3
30	-	-	0.5240	10	-	-
31	-	-	-	-	-	-
32	-	-	-	-	-	-
33	0.6531	9	-	-	-	-
34	-	-	-	-	-	-
35	0.9484	3	0.8039	5	0.7817	7
36	-	-	-	-	-	-
42	0.9099	4	0.7871	6	0.7102	9

Source: Summary of Appendix 1: Tables 11, 12, and 13.

* Sector description is the same as sector description in Appendix 1: Table 1.
- Value is less than 0.5.

There is general recognition that the population in Indonesia was growing at an increasing rate during the period under analysis. With this growth, the number of persons who need rice as a basic necessary foodstuff also increases. As noted by the Mears (1981), among the starchy staples, rice is an important source of calories. The dietary proportion of calories supplied by rice rose to 74 percent in 1972 and averaged above 70 percent from 1968 to 1977. The absolute total of rice calories available for the average diet increased from 981 per day in 1968 to 1,232 in 1973.

In view of these facts, it should be possible to depict the significant forward linkage of paddy sector with those sectors in which paddy is processed. In short, the implication of a growing population, which requires rice as the main source of calories, is that paddy processing sectors are very useful in terms of producing rice for domestic supply. The 1971, 1975, and 1980 Indonesian input-output tables illustrate this kind of implication.

The livestock sector and the poultry sector are other downstream sectors to which the output of the paddy sector activity moves. The main sub-sectors of the livestock sector are cattle raising, milk cow raising, and other livestock raising (water buffalo, goats, sheep, swine, and horses). The poultry sector contains sub-sectors such as chickens, ducks, and geese. In the years 1971, 1975, and 1980, all these sub-sectors contributed to the paddy sector in terms of demanding inputs from paddy sector activity.

According to Weitz-Hettlesater Engineers (1972), rice bran and polishings are sometimes used in feed for poultry, dairy cattle, and hogs together with corn meal, soybean meal, oil cake meal, and other products. In addition, poultry are often herded into the stubble of the harvested fields to pick up the leftover grains.

Other sectors that have significant linkages on paddy sector activity are the paper products and printing sector and the trade sector. These sectors have different attributes in terms of absorbing paddy sector output. The paper products and printing sector requires paddy stalk as raw material in producing pulp, printing paper, cardboard, boxes, paperbags, etc. The internal trade sector deals with the distribution of paddy from farm-gate to the places where it needed. In general, rice distribution flows from the farmer's house through local assembly points, regional assembly points and finally to terminal distributors, wholesalers, and retailers (Mears, 1981). The rice distribution involves not only private enterprises but also government involvement. According to Weitz-Hettelsater Engineers (1972), the Government of Indonesia has been involved in the rice trade for many years by establishing BULOG (Badan Urusan Logistik, the National Food Stock Authority). BULOG's administrative structure extends up to the President of Indonesia with one of its tasks being to stabilize prices by withdrawing rice from the market when and where prices are low and returning these quantities of rice to the market when and where prices are high.

The cloves sector is another of the agro-industry sectors that had a high forward linkage index for the years 1971, 1975, and 1980. According to Gwyer (1976), Indonesia occupies a unique position in the market for cloves, being the largest producer, consumer and importer of this spice. The main end use of cloves is in the manufacture of "kretek" cigarettes. "Kretek" cigarette smoking appears to be a habit unique to Indonesia and is especially popular in Java. The practice started at the end of the last century in the small town of Kudus in Central Java where smokers began to mix cloves with tobacco in their handrolled cigarettes (Castles, 1965). The new product, called "kretek" because of the crackling noise it makes as it burns, became popular throughout much of Indonesia.

It should be noted that, to the extent that the principal end use for cloves is in the manufacture of "kretek" cigarettes, the supply of cloves is largely absorbed by "kretek" cigarettes industries. This implies that cloves' forward linkage index will be high. One way to look at the cloves' forward linkage is to consider this sector on the basis of national cigarette production. According to Gwyer (1976), the production of "kretek" cigarettes has increased rapidly from 13 billion units in 1969 to more than 29 billion units in 1973. That is, the high forward linkage index of the cloves sector is maintained parallel to the manufacturing of "kretek" cigarettes development.

Another agro-industry sector that generates a high forward linkage index is the livestock sector. This sector consists of the raising cattle, water buffalo, goat, sheep, swine, etc. with the primary objective of supplying the domestic demand for meat through the slaughtering sector. The domestic demand for meat and meat products has been rising steeply in urban areas where annual per capita consumption, now estimated at around 3.3 kg, is growing at 8 percent a year (Leake, 1980). In rural areas, by contrast, consumption per capita is estimated at around 1.5 kg per year, with demanding growing at only about 4 percent a year.

Thus, it is clear that there is a high forward linkage of the livestock sector as a result of the increasing demand for fresh meat as well as other uses of livestock such as transportation, source of traction, and manure. Leake (1980) notes that beef marketing is likely to continue to take its traditional form of live transport from rural areas to urban slaughter houses for immediate sales of fresh meat. Of course, these two downstream activities of livestock sector (i.e. supply of meat and transportation) will be required in order to fulfill needs of Indonesian as its population increases.

To determine optimal development strategies for the agro-industry sector, however, it necessary to consider another factor beyond just backward and forward linkages. The backward and forward linkages alone do not provide adequate guidelines to appropriate agro-industry development strategies. This is because backward and forward linkages

are concerned mainly with a sector's mutual linkages to other sectors, that is, with exogenous linkages, in terms of both demanding inputs and producing outputs. There are also endogenous linkages in each agro-industry sector in which the production activity cannot be separated from the consideration of technology use and its consequences.

ANALYSIS OF APPROPRIATE AGRO-INDUSTRY

The usual orientation in evaluating appropriate development strategies for agro-industry is to acknowledge both backward and forward linkages. Although these acknowledgements have been important, and continue to be crucial, this orientation does not provide a comprehensive analysis of technologies in terms of employment generation effects and value added.

According to Choi and Lee (1983), the concept of appropriate technology means employing the technologies that are aimed at employment generation, regional development and the development of resources. In the case of efficiency, as noted by Robinson (1979), an appropriate technology shall be an efficient technology, and at the same time one which fully reflects the abundance or scarcity of particular resources in the composition of the necessary inputs, substituting, for example, more direct labor where desirable for capital within a given total cost in an economy in which labor is plentiful and capital is scarce.

Appropriate employment analysis varies greatly among economists. Breyev (1972) describes input-output analysis

as a major tool of labor analysis and planning. The main question posed here is what are the advantages of analyzing the Indonesian input-output tables for 1971, 1975, and 1980 in terms of appropriate agro-industry and its effect on domestic employment. As noted by Diamond and Chappelle (1981), a very important use of input-output analysis is to develop multipliers, e.g. income multipliers, employment multipliers, and output multipliers. Employment multipliers are often included in regional analysis to evaluate impacts on employment of industrial expansion. However, according to Chappelle et al. (1986), multipliers do not reflect comparative advantage or opportunities for expansion in various industrial sectors.

Since the majority of the Indonesian population still depends on agriculture, which covers a huge array of crops, products, and techniques, the agricultural sector will remain the major sector of the Indonesian economy. Therefore, when the government is concerned with agricultural development, it is necessary to aim at creating as many employment opportunities as possible in the agro-industry sector. Hoyle (1974) states that relationships between agriculture and industry have occupied a good deal of attention and represent another kind of continuum; the two sectors have sometimes been thought of as mutually exclusive, and many have argued that industrial expansion offers the fastest road towards a higher level of development. It is evident from what we have said that it is essential that the agro-industry sectors promoted for

economic development be those that provide for the most rapid growth of the national economy. As noted by Johnston and Kilby (1975), because agriculture is both the largest and the slowest growing sector of an underdeveloped economy, the optimal net flow of resources will, over the long run, be from agriculture to those sectors where the growth potential and returns on investment are higher. This implies that it is extremely important that comparative advantage analysis of each agro-industry sector be conducted before advocating changes in the national economic structure.

Table 4.3 summarizes value added - labor ratios (total and direct requirements) for final demand of 32 agro-industry sectors in 1971. In fact, these value added - labor ratios are closely related to national employment. This is because Indonesian employment has a unique character in that labor is abundant and normally available throughout the whole year. To keep track of the national employment base it is necessary that value added - labor ratios be compared with the ratio of available to employed labor at at national level. These comparisons depict the capacity of each agro-industry sector in terms of generating value-added in which its labor requirement does not exceed the ratio of available to employed labor at the national level. In the case of appropriate technology for agro-industry sectors, the consideration of both value added - labor ratios and the ratio of available to employed labor at the

Table 4.3 Value-Added - Labor Ratios (Total and Direct Requirements) for Final Demand by Thirty-Two Agro-Industry Sectors, 1971.

CODE*	TOTAL	RANK	DIRECT	RANK
1	0.0554	25	0.0576	25
2	0.0451	28	0.0445	26
3	0.0339	30	0.0326	28
4	0.0134	32	0.0132	30
5	0.0229	31	0.0221	29
6	0.0386	29	0.0375	27
7	0.1255	16	0.2498	12
8	0.1578	13	0.1869	17
9	0.2236	8	0.2200	15
10	0.3209	7	0.7118	10
11	0.0752	22	0.1162	21
12	0.1883	11	0.2418	13
13	0.1370	15	0.1401	20
14	0.5331	2	0.7549	14
15	0.3583	5	0.3656	8
16	0.1901	10	0.1931	16
17	0.2006	9	0.2298	14
18	0.1613	12	0.1547	19
19	0.4612	3	1.1558	3
20	0.9655	1	4.8319	1
23	0.1230	17	0.2849	9
27	0.0697	24	0.0070	32
28	0.1419	14	0.2570	11
29	0.0532	26	0.2829	10
30	0.0969	20	0.1154	22
31	0.1181	18	1.7097	2
32	0.0497	27	0.1656	18
33	0.3376	6	0.7396	5
34	0.1112	19	0.0019	31
35	0.0873	21	0.0911	24
36	0.0726	23	0.0941	23
42	0.4112	4	0.6363	7

Source: Summary of Appendix 1: Tables 14 and 17.

* Sector description is the same as sector description in Appendix 1: Table 1.

national level should be integrated with the backward and forward linkage indexes for each agro-industry sector.

Figure 4.1 shows these relationships agro-industries for that satisfy the value added - labor ratios requirement

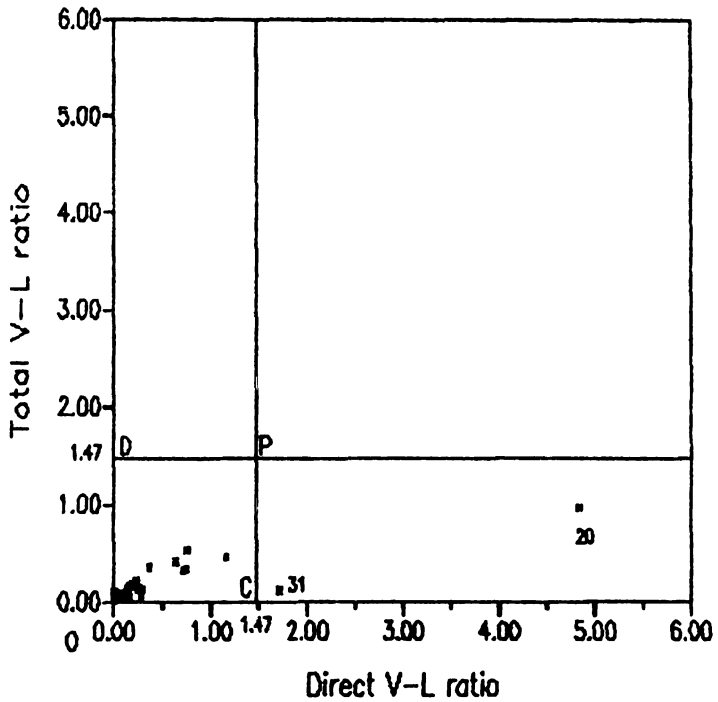

Figure 4.1 Total V-L Ratios and Direct V-L Ratios for Selecting Appropriate Agro-Industries in 1971.

and their ratios of available labor to employed labor at national level. Figure 4.1 is constructed from data in Table 4.3 which summarizes value added - labor ratios (total and direct requirements) in 1971 and a calculation of available to employed labor ratio at the national level in 1971. The lines OC and OD depict the average ratio of available to employed labor at the national level (1.4699) as an estimation of the optimum level of economic activities

to absorb labor at the national level. This means that in order to satisfy a unit increase in final demand and to fulfill the total (direct and undirect) and direct value added and labor requirements, the utilization of labor in economic activities at national level cannot exceed the above estimation. From Figure 4.3, it is clear that only two agro industry sectors have higher value added - labor ratios than the value added - labor ratio requirements, i.e., the poultry and poultry products sector and the sugar refining sector.

At this point it may be important to compare the 1971 input-output data with the data for the years, 1975 and 1980. By adapting the framework of analysis used for 1971 input-output data, Figure 4.4, which based on Table 4.4, and Figure 4.5, which based on Table 4.5, show circumstances in which agro-industry sectors do not satisfy the value added - labor ratio requirement for 1975 and 1980 respectively. In 1975, only one agro-industry sector, the cigarettes sector, can be classified as an agro-industry sector where the value added - labor ratio is higher than the available to employed labor ratio (1.4313, lines OC and OD). On the other hand, in the 1980 data, there are six agro-industry sectors that have value added - labor ratios higher than their available to employed labor ratios (1.3928, lines OC and OD): the rubber sector; the processing and preserving food sector; the sugar refining sector; beverage industries sector; the cigarettes sector; and the rubber products sector.

Table 4.4 Value-Added - Labor Ratios (Total and Direct Requirements) for Final Demand by Thirty-Two Agro-Industry Sectors, 1975.

CODE*	TOTAL	RANK	DIRECT	RANK
1	0.0623	25	0.1365	27
2	0.0508	28	0.0814	29
3	0.0590	26	0.0612	32
4	0.0712	23	0.0894	28
5	0.0535	27	0.0666	31
6	0.0685	24	0.0718	30
7	0.3845	11	0.4238	16
8	0.1760	19	0.4388	11
9	0.2926	13	0.4198	18
10	0.1741	20	0.4269	12
11	0.0005	31	0.4251	14
12	0.4188	8	0.4251	15
13	0.4212	7	0.4255	13
14	0.4381	4	0.4203	17
15	0.4146	9	0.4167	19
16	0.4124	10	0.4135	20
17	0.2682	15	0.4026	21
18	0.0026	30	0.4581	8
19	0.0005	32	0.4519	9
20	0.4260	6	0.4490	10
23	0.3690	12	0.4598	7
27	0.4349	5	0.5936	5
28	0.1965	18	0.3405	24
29	0.0303	29	0.3817	22
30	0.2174	17	0.5768	6
31	0.6875	3	1.3413	2
32	0.2765	14	0.3776	23
33	0.9428	2	1.3268	3
34	2.6074	1	2.6894	1
35	0.1680	21	0.2570	25
36	0.0845	22	0.1861	26
42	0.2555	16	0.9639	4

Source: Summary of Appendix 1: Tables 15 and 18.

* Sector description is the same as sector description in Appendix 1: Table 1.

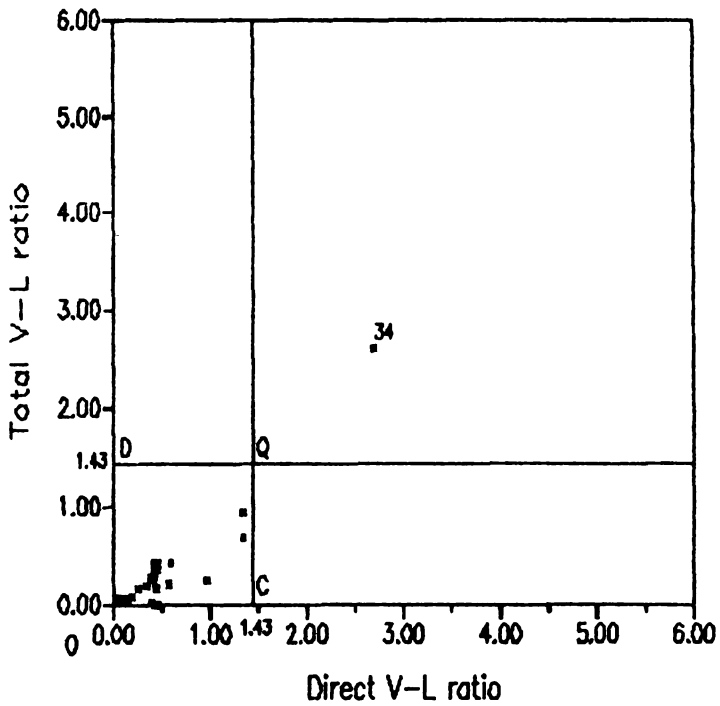

Figure 4.2 Total V-L Ratios and Direct V-L Ratios for Selecting Appropriate Agro-Industries in 1975.

Table 4.5 Value-Added - Labor Ratios (Total and Direct Requirements) for Final Demand by Thirty-Two Agro-Industry Sectors, 1980.

CODE*	TOTAL	RANK	DIRECT	RANK
1	0.3600	28	0.3194	27
2	0.2937	29	0.2783	28
3	1.2103	9	0.1211	32
4	0.1994	31	0.1939	30
5	0.1524	32	0.1479	31
6	0.2118	30	0.1940	29
7	1.4261	5	1.4404	6
8	0.8809	23	0.8383	23
9	0.9621	17	0.9533	16
10	1.0118	15	0.9945	14
11	0.4752	26	0.4367	25
12	1.0907	12	1.0930	12
13	1.0397	13	1.0366	13
14	1.2418	8	1.1821	9
15	0.8867	22	0.8864	21
16	0.8935	20	0.8918	19
17	1.1651	10	1.1946	8
18	1.0062	16	1.3294	7
19	0.5615	24	0.5242	24
20	1.3304	6	0.9793	15
23	0.9513	19	0.9398	17
27	1.5224	3	1.5574	4
28	1.0953	11	1.1024	11
29	1.0304	14	1.1071	10
30	0.8872	21	0.8887	20
31	1.4769	4	1.4915	5
32	0.9588	18	0.8597	22
33	2.6553	2	2.8120	3
34	4.8175	1	5.2468	1
35	0.5255	25	0.9298	18
36	0.4313	27	0.4066	26
42	1.3125	7	4.6465	2

Source: Summary of Appendix 1: Tables 16 and 19.

* Sector description is the same as sector description in Appendix 1: Table 1.

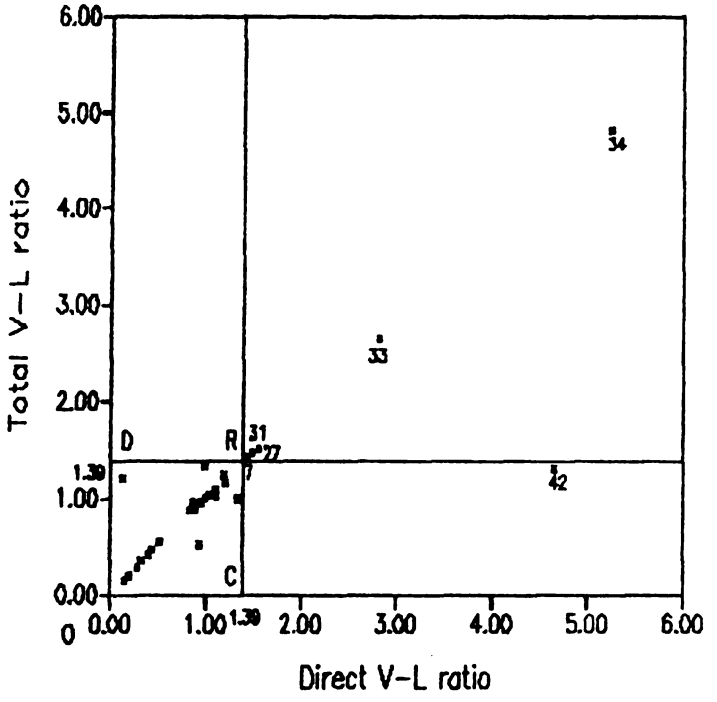

Figure 4.3 Total V-L Ratios and Direct V-L Ratios for Selecting Appropriate Agro-Industries in 1980

The 1971, 1975, and 1980 input-output tables for Indonesia show that only seven of 32 agro-industry sectors can be classified as appropriate agro-industry sectors in terms of value added - labor ratio requirements, backward and forward linkage indexes. These are: (1) the spinning industries sector; (2) the rice milling, cleaning, and polishing sector; (3) the wheat flour and products sector; (4) the rubber products sector; (5) the sugar cane and brown sugar sector; (6) the tobacco leaves and processing sector; and (7) the beverages industries sector. The spinning industries sector is the only sector out of these seven agro-industry sectors that shows a significant economic impact in terms of appropriate agro-industry to the Indonesian economy in the all years examined (1971, 1975, and 1980). The other six agro-industry sectors appear have fluctuating impacts on Indonesian economy. For example, in 1980 analysis, the rice milling, cleaning, and polishing sector shows a higher ranking in terms of appropriateness than in the 1971 and 1975 analysis. As noted above, the spinning industries sector can be categorized as an appropriate agro-industry sector for 1971, 1975, and 1980. A reason for this is provided by Grant (1984) who mentions that over the last 15 years, the growth rate of Gross Domestic Product (GDP) in industry as a whole has been around 10 percent. The textiles industry constitutes about 13 percent of this growth, and those involved with the industry think of it as being the spearhead of the whole industrialization process. This confidence in the

importance of textiles comes as a result of the labor intensive nature of the industry and because textiles are beginning to become a major foreign exchange earner. Also, until around 1976, garment making was very much a home industry with just a few old-fashioned machines, but since then exports have been increasing and the industry is booming. Although the textile industry output is increasing in order to fulfill export requirements there is a serious problem in the international trade of textiles. Arndt (1975) points out that the textile industry continued to demand more protection from import competition. This problem stems primarily from the fact that although quality is comparable, in terms of output Indonesian textiles still lags behind.

In deciding on economic development strategies in the textile industry in which most of the raw material comes from the spinning industry, it is necessary to consider international trade circumstances. Determination of appropriate agro-industry development tasks cannot proceed without examining the international trade links.

The rice milling, cleaning, and polishing sector is another agro-industry sector that can be classified as appropriate for the 1971, 1975 and 1980 analyses. A clear understanding of the relationships between rice production and its processing is essential to understanding the economic impact analysis of rice processing. There is no doubt that Indonesian rice production is processed domestically and that rice milling, cleaning, and polishing

sector is an agro-industry sector which is characterized by raw material dependence primarily on the total quantity of national production.

According to Mears (1981), during the period of 1968 - 1978, total rice production in Java expanded at an average rate of 3.6 percent a year and outside Java expanded at 4.1 percent a year. Since the advantage of both private and government rice milling is to absorb the total national production of rice, then it stands to reason that there must be an increase in the number of rice mills parallel with the increase in total rice production. As noted by McCawley and Tait (1979), much of the expansion in the food sector between 1970 and 1973 was due to a rapid increase in employment recorded in rice milling, and it was during this period that the number of rice mills increased rapidly.

The wheat flour and products sector is one of the seven agro-industry sectors that became an important element of the Indonesian government's food stabilization program. According to Magiera (1981), per capita flour consumption rose from 3.3 kg a year in 1968 to 5.6 kg a year in 1977; most of the wheat flour is consumed in some processed form such as bread, biscuits, noodles, and cake. Wheat is not produced in Indonesia, and wheat imports continued to increase during the 1970s. During this period, there were two significant changes in the way in which wheat was imported. One of these changes came after the establishment of three wheat flour mills in 1971 and 1972. Thereafter, only small quantities of wheat flour were imported as

Indonesia switched almost entirely to grain imports. This implies that the Indonesian government was attempting to increase the value added of grain imports and to increase employment opportunities through the milling industry. In addition, wheat bran, the major by-product of the milling industry and an important source of profits, is sold as animal feed in Indonesia and is exported, primarily to Singapore and to the European Community.

Thus, the role of the wheat flour and products sector has been not only to provide an alternative to other staple foods produced in the country, but also to provide additional employment opportunities. This is important in determining whether or not the wheat flour and products sector should be expanded in the future.

Although the sugar cane and brown sugar sector can be classified as an appropriate agro-industry sector in this study, it should be recognized that sugar production and its consumption in Indonesia. According to Arndt (1975), despite a very rapid rise in domestic sugar production in recent years, at an average annual rate over 9 percent since 1970, sugar has had to be imported in the past two years at a government subsidized price. Expansion of sugar production in Java is hampered by the competing demands on land to produce rice.

In 1971, the Indonesian government sponsored the Indonesia Sugar Study (de Boer, 1976). On the basis of this study, the government launched a rehabilitation program design to achieve sugar self-sufficiency in 1982. However,

after recovering rapidly from the low levels of the mid-1960s, sugar production peaked in 1979, following land area expansion. Yields fell with the introduction of the TRI (Tebu Rakyat Intensifikasi), a program of conversion from estate to smallholder production, and declined in 1980, while sugar consumption has continued to rise rapidly (Arndt, 1981). In regard to declining sugar yields, Mubyarto (1977) noted that the sugar industry may present old and new problems. The major old problem that remains is that unless farmers are assured of a reasonable price for their sugar from the mills, or are permitted to sell their sugar in a free market, they will continue, as in the past, to prefer to grow rice rather than sugar. On the other hand, the main new problem is that yields may decline as a result of the change from estate to smallholder cultivation. Another new problem is the near impossibility of efficiently managing literally thousands of small plots of land in commercial cane growing; since consolidation among farmers is so difficult, the rich farmers or private companies are now taking over the role of the mills, renting the land from the small farmers and to dealing with the mill.

The other three agro-industry sectors that are classified as appropriate for the 1971, 1975 and 1980 analyses are the rubber product sector, the tobacco leaves and processing sector, and the beverages industry sector. These three industries have in common that their analysis must be based not only upon their production and consumption but also on international trade. It should be noted that to

the extent that agro-industry development is determined by its production, consumption, and international trade, the framework of analysis that was used for the first-four agro-industry sectors is applicable for the last three agro-industry sectors, including the historical development of agro-industry sector.

STRUCTURAL CHANGES IN EMPLOYMENT

Knowledge of economic impacts of the agro-industry sector can be very useful in guiding economic development efforts. One major concern of agro-industry impacts concerns changes in the employment structure generated by raw material flows from the agriculture sector to agro-oriented industries. According to Lewis (1954) and Mellor (1976), employment linkages involve derived demand for labor in the agricultural and industrial sectors. Employment opportunities induce migration of labor from the rural-agricultural to the urban-industrial sector. Furthermore, as noted by Bulmer-Thomas (1982), with industrial final demand growing rapidly, industry will be generating employment directly and indirectly not only in the industrial sector, but also in the primary and tertiary sectors. According to Soemantri (1982), primary industry is that section of industry that produces raw materials for the manufacturing industry. This includes agriculture, forestry, fishing, mining, and quarrying. Tertiary industry is that group of enterprises that produces all kinds of

Table 4.6 Total Persons Employed in Seven Agro-industry Sectors in 1971, 1975, and 1980.

CODE*)	1971 (PERSONS)	1975 (PERSONS)	1980 (PERSONS)
8	131,673	116,313	261,287
11	234,736	134,538	347,755
29	115,015	493,318	547,061
30	39,019	71,604	122,321
33	9,320	16,314	21,121
35	84,172	102,607	122,073
42	6,643	18,021	24,462

Source: The 1971, 1975, and 1980 Indonesian Input-Output Tables.

*) Sector description is the same as sector description on Appendix 1: Table 1.

services with the purpose of increasing utilities of the goods produced for the ultimate consumers.

Thus, it is extremely important that before the Indonesian government attempts to influence change in the agro-industrial structure, it should examine comparative employment change in each agro-industry. One objective of this comparison is to measure the contribution of each agro-industry in terms of labor utilization at any particular time. Table 4.6 summarizes employment growth in the appropriate agro-industrial sectors from the Indonesian Input-Output Tables for the years 1971, 1975, and 1980. It shows that employment shares changed significantly among appropriate agro-industry sectors in terms of both absolute numbers and percentages. There is a general recognition that among appropriate agro-industry sectors total persons

employed grows at an increasing rate from 1971 to 1980. The highest increasing rate (375.64 percent) is held by the rice milling, cleaning, and polishing sector (Code: 29) followed by the rubber products sector (Code: 42; 268.24 percent), the wheat flour and products sector (Code: 30; 213.29 percent), the beverages industries sector (Code: 33; 126.62 percent), the sugar cane and brown sugar products sector (Code: 8; 98.44 percent), the tobacco leaves and processing sector (Code: 11; 48.15 percent), and the spinning industries sector (Code 35; 45.03 percent).

As noted above, the rice milling, cleaning, and polishing sector has played a major role in absorbing labor. That is, the rapid progress being made in expansion of rice mills means that more employment opportunities will be generated per unit of rice.

The usual orientation in evaluating rice processing techniques in Indonesia is to focus on employment generation. A rapid shift from handpounding was accompanied the arrival of the small mills that could be economically located near villages (Mears, 1981). This is illustrated by the fact that in 1957 about 90 percent of production was hand pounded. By 1968 it was estimated that handpounding had declined to 80 percent. Then came a flood of over 35,000 small mills with the KUDs adding another 1,500 after 1973. A rough sample in 1979 suggested that only 6 percent of the crop was still being handpounded. As noted by Timmer (1984), although the employment potential of the entire rice economy -- production, harvesting, processing, transporting,

storing, selling -- is enormous, the effect of the introduction of rice mills may have been to destroy jobs and distribution of income.

It is true, as describe by Arndt and Sundrum (1980), that the introduction of high-yielding varieties and consequent changes in harvesting methods and of the replacement of handpounding by small rice hullers, was labor displacing. But there are also reasons to believe, though as yet there is little hard evidence, that the new technology is at least potentially labor absorbing because of the shorter growing period of new varieties. The point here, however, is that the introduction of rice milling should be seen not only from labor displacing point of view, but also from the point of view of its ability to create value added and jobs simultaneously in shorter activity time than the existing activity. This type of approach can be applied to other agro-industry sectors as well. From the perspective of this study, the impact of the introduction of rice mills should generate value-added and job opportunities as quickly as possible.

Given the above propositions, the task at hand is to discover the most efficient production techniques in national agro-industry sectors by focusing on the production period. Table 4.6 shows that the seven appropriate agro-industry sectors have similar basic attributes in terms of the production period in processing activities. These agro-industry sectors, which utilize new processing technology, may be characterized as producing outputs in shorter time

than the agricultural sector which depends heavily on the planting and harvest seasons. This implies that the time factor is the crucial consideration in producing outputs. In essence, the faster the agro-industry sectors operate, the more time can be saved by those who work in that agro-industry sector and the more time can be applied to other activities. Therefore, from the employee point of view, the agro-industry sectors provide additional opportunities for those who work in agro-industry activities to become involved in other jobs and engage in multiple activities in several different economic sectors (e.g. agriculture, trade, construction) each day. On the other hand, from the employer point of view, the agro-industry sectors create the most production techniques. This implies that the efficiency of production in terms of output for a given period of time can be increased in agro-industry activities. It is important that the agro-industry sectors selected for expansion be those from which the processing activities have a significant comparative advantage in terms of backward and forward linkages, value-added generated, labor absorption, and the timeliness of processing. This implies that one or more of the agro-industry sectors classified in this study as appropriate agro-industry sectors should be targeted by the government for expansion. The other agro-industry sectors should be targeted for contraction unless the government can provide incentives for expansion.

CHAPTER FIVE

THE FUTURE DEVELOPMENT OF AGRO-INDUSTRY IN INDONESIA

The national development base of Indonesia consists of a series of REPELITA (Rencana Pembangunan Lima Tahun or Five Year Development Plans), each of which has its own policy objectives. According to Robison (1986), the embodiment of the concept of progressively deepening the structure of manufacture is to be found in the policy objectives of the various REPELITA.

REPELITA I: 1969 - 1974

Concentration on manufactures supporting agriculture and provision of basic needs.

REPELITA II: 1974 - 1979

Concentration on the processing of raw materials to a higher stage of value added.

REPELITA III: 1979 - 1984

Resource processing plus the establishment of capital goods (engineering) industries.

REPELITA IV: 1984 - 1989

Resource processing, capital goods and the manufacture of technology.

The Government of Indonesia considers that REPELITA IV and REPELITA V, which emphasize industrial strength supported by a strong agricultural sector, as laying the foundations from which the Indonesian economy can "take off". From the purpose of this study, it is important to examine the past performance of the Indonesian economy in each REPELITA and the prospects for the agriculture sector, particularly as the main source of raw material for agro-industry sectors.

Under the First Five Year Plan (1969 - 1974), the rate of growth of GDP in the first year was high at 7.0 percent per year. The sectors showing the highest rates of growth were mining, manufacturing industries, construction, trade, and banking (Mangkusuwondo, 1973). One feature of development during REPELITA I that should be noted is that the growth of the economy took place not only in the non-agricultural sectors mentioned above, but also in agricultural sectors. Agricultural growth between 1969 and 1971 was 4.9 percent. Since agriculture's share of the total GDP is almost 50 percent, the growth of agriculture has a major impact on the overall growth rate. Therefore, the relatively high growth rate of the GDP after 1968 was, to a large extent, due to the development of the agricultural sector.

In 1979 Indonesia's overall rate of growth of GDP fell to 4.9 percent. This compares unfavorably with the 6.8 percent growth in 1978. According to Warr (1980), it seems that this performance can be attributed to: (1) the

relatively tight monetary policy that accompanied the November 1978 devaluation; (2) the effect of the devaluation on business uncertainty; (3) the effect on inflationary expectations, both of consumers and producers; (4) a somewhat disappointing rice harvest in 1979; (5) the April 1979 increase in the domestic prices of petroleum products, and (6) the general economic slowdown among Indonesia's trading partners.

There is no question that the Indonesian economy performed well in the first years of development planning. However, while in the first years of the plan the annual target of 7.5 percent growth in GDP was met or surpassed, in the 1982/1983 period, the growth in GDP was only 2 percent (Cooke, 1984). The main question posed here is will the performance of agriculture sector continues as the most important sector for agro-industry development in Indonesia? According to Cooke (1984), in 1969 agriculture made up 46.9 percent of GDP. In 1983 this figure was 29.3 percent, and it is estimated it will further decrease to 26.5 percent in 1989.

From the perspective of this study, Indonesian agro-industry sectors have certain characteristics that distinguish them from other sectors of the economy. This distinction lies primarily in the fact that agro-industry activities involve processing agricultural outputs. The agricultural products that are required in the agro-industry sector are affected by many factors: (a) seasonal supply due

to weather conditions; (b) perishability of outputs, which requires appropriate storage facilities; (c) the availability of transport and communication infrastructure because of the wide geographic spread of farm activities; (d) seasonal prices variations following the seasonal harvest pattern; (e) institutional involvement to provide finance and credit needs; and (f) whether the commodity can be imported or exported.

Another way to look at Indonesian agro-industry sectors is to consider them on the basis of the number of people typically involved. As noted by Chuta and Liedholm (1984), the evidence available from national censuses and various regional and rural surveys indicates that nonfarm activities provide an important source of primary rural employment in developing countries. In the vast majority of the eighteen developing countries, including Indonesia, one-fifth or more of the rural labor force is primarily engaged in nonfarm activities. According to Abey et al. (1981), the high rate of population growth (still around 2 percent in 1980) shown by the preliminary results of the 1980 Population Census re-emphasizes the importance of expanding employment opportunities in Indonesia. As in many developing countries, unemployment is a problem in both urban and rural areas, particularly among young people. As noted by the World Bank (1985), unemployment rates in 1977 - 1978 were three to four times higher in the urban than in the rural area. Within the urban area it was 6.7 percent for male and

4.64 percent for female, while in rural area the unemployment rates of male and female were 1.96 percent and 1.25 percent respectively. This figure, however, needs to be evaluated with the recognition that unemployment rates in Indonesia are fictional. The very definition of "employed" and the method used to calculate unemployment rates insure that unemployment will be grossly underestimated. For example, even though persons worked only a few hours a day, they are counted as employed.

Even with the rapid growth experienced in non-agricultural sectors in recent years, there is still an urgent need to expand employment opportunities in agriculture as a means of coping with increasing population pressure. With the majority of Indonesians depending on the agriculture and agro-industry sectors for their living, these sectors continue to be important sectors in the Indonesian economy.

Thus, in evaluating agro-industry sectors it is necessary to focus on raw material supply from the agriculture sector and on employment opportunities, but these alone do not provide a comprehensive prediction of agro-industry performance in the future. This can probably be better illustrated by the findings of this study in Chapter 4.

For example, to consider an appropriate agro-industry sector for the year 1971, 1975, and 1980, the rubber products sector is a labor intensive agro-industry and a

major foreign exchange earner. In this study, the rubber products sector can be classified as an appropriate agro-industry sector in terms of value added - labor ratio requirements and backward and forward linkage indexes. At first glance, the figures are quite impressive, especially compared with other agro-industry sectors that are labor intensive but are not classified as appropriate agro-industry sectors, for example, the paddy sector and the cigarettes sector. The point here is that the rubber products sector cannot be separated from domestic rubber production and marketing. According to Montgomery (1978), although peninsular Malaysia exceeds Indonesia in estate rubber land area with over 600,000 hectares in 1972, Indonesia has the largest area under smallholder rubber in the world. Of the world total rubber estate area of 1.7 million hectares, Indonesia accounts for 29 percent; of the world total of 5.2 million hectares of smallholder rubber, Indonesia's share is 36 percent.

Given this, the task at hand is to determine the best way to develop rubber production and its marketing in ways favorable to smallholder rubber. Collier and Werdaja (1972) state that any attempt to improve the quality and increase the quantity of rubber exports in Indonesia must be concentrated primarily on the smallholders. If the farmers are going to increase their income from their rubber smallholdings in the future, they must rely on greatly increased yields. However, most rubber growers cannot

improve yields until they use improved clones or planting materials.

It should be noted that the above example stresses that agro-industry sectors' outputs should be considered on the basis of raw material availability and number of people typically involved in supplying products for both domestic use and export. However, the importance of this study is the point that raw material availability and people's involvement are not the only concerns for agro-industry expansion or contraction in the future. There is another concern in such decisions in that prospects for the expansion of economic activity in the industrial countries remain uncertain and world prices of some of Indonesia's major exports have been receding (Arndt, 1977).

Of course, concerns associated with either expansion or contraction of an agro-industry sector appear to be driven as part of the national economy. In economics, industrialization and growth are considered from four perspectives in order to increase production of a particular sector (Chenery, 1986). These are: (1) the expansion of domestic demand which includes the direct demand for one commodity plus the indirect effects on this sector of the expansion of domestic demand in other sectors; (2) export expansion or the total effect on output from one sector of increasing exports; (3) import substitution or the total effect on output from one sector of increasing the proportion of demand that is supplied from domestic

production; and (4) technological change or the total effect on one sector of changing input-output coefficients throughout the economy as wages and income level rise. Of these four factors, the one with the strongest basis in theory is domestic demand, for which generalized systems of Engel functions have been estimated in many countries. It is evident from what is stated above that expansion of domestic demand is a crucial factor in determining industrial expansion in which agro-industry is a part of the industrialization.

From the domestic demand perspective, population growth is a major factor in determining output from a certain industry sector. Population growth implies that the domestic market will absorb a larger quantity of products of the agro-industry sectors. This does not mean, however, that the expansion or contraction of particular agro-industry sector can be evaluated in isolation from other domestic market factors such as consumer preferences, products quality, products price, and comparative advantage point of view.

From the perspective of comparative advantage and development policy, Chenery (1979) notes that the modern version of the comparative cost doctrine is essentially a simplified form of static general equilibrium theory. The optimum pattern of production and trade for a country is determined from a comparison of the opportunity cost of producing a given commodity with the price at which the

commodity can be imported or exported. In terms of value added, Robison (1986) states that exploiting comparative advantage in resource based, energy-intensive industries, capital investment was channelled into large projects that processed raw materials to a higher stage of value added for export and for domestic use. At this point, it is important to stress that trends in imports and exports are important to consider when looking at comparative advantage of agro-industry sectors.

This study is concerned with the development of agro-industry sectors to determine whether expansion or contraction should be targeted by Indonesian government. As noted in the above discussion, the principal consideration of agro-industry development is essentially concerned with supplies of raw material, domestic demand, and trends in both imports and exports. Another way to look at agro-industry development is to learn from other countries' experience. A major lesson learned from the development experiences in Taiwan and Japan is that rice yield increases resulting from the adoption of improved technology were associated with simultaneous improvement over a period of at least half a century of applied technological research, infrastructure, and institutional innovations (Mears, 1970). Although these experiences reflect the success of rice production, nowadays agro-industrial development in Indonesia can also exercise these other approaches to increase agro-industry output.

In the case of agro-industrial improvement programs, therefore, the Indonesian government can normally expect that the above experiences will be implemented not only by government enterprise but private enterprise as well. First, applied technological research is necessary to maximize the output of processing activities, minimize losses, increase cost effectiveness, and satisfy consumer preferences. Second, a physical infrastructure of processing site (building), storage facilities, and transportation is required to achieve the potential productivity determined by research. Third, institutional innovations are essential to extend research results to processors at the site of processing activities, to consolidate the products and their marketing, and to finance the dissemination of new technology of processing.

With this in mind, the seven appropriate agro-industry sectors determined in this study for the years 1971, 1975 and 1980 can be expanded as appropriate agro-industry sectors as long as the value added - labor ratio requirement is satisfied, both backward and forward linkage indexes are high, and the three factors discussed above, i.e., technological research, infrastructure, and institutional innovations, are maintained. If these factors are provided to the other agro-industry sectors in the same proportion in terms of government involvement, agro-industry development will be beneficial not only as sources of national products but as sources of individual income as well.

Another important consideration, as noted by Todaro (1971), concerns the institutional structure of the economy and the relative roles envisaged for the public and private sectors in the development process. Political stability, for example, is obviously a very important non-economic consideration. In Indonesia development programs, it is necessary for the Indonesian government to maintain political and social stability in order to attract both domestic and foreign investment as sources of funding which contribute to the expansion of national economy.

CHAPTER SIX

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

SUMMARY

A major responsibility of the Indonesian government is to achieve and stabilize food self-sufficiency throughout the country at a price that is affordable by the Indonesian people. This task includes development of the agriculture sector as a raw material supplier as well as the agro-industry sectors necessary for processing raw materials to fulfill domestic consumption and export needs.

Over the past 20 years, the agro-industry sectors of the Indonesian economy have been a national concern to sustain economic development. This concern has spurred Indonesian government efforts to provide for revitalization of the national economy through a target Five Year Development Plan (REPELITA). The agro-industry plan has included efforts at the national level not only in encouraging industries converting agricultural raw materials into industrial raw materials, but also in encouraging industries converting raw materials into finished goods.

Indonesian government efforts targeting the agro-industry program are distinct. Achievement of the program

depends upon the identification of specific sections of targeted agro-industry sectors likely to advance important Indonesian development goals. Of particular significance is the generation of both more value added and more employment opportunities in Indonesia. In addition, the evaluation of both backward and forward linkages of each agro-industry sector to the national economy plays a major role in the evaluation of agro-industry development. To evaluate agro-industry sectors of the Indonesian economy it is necessary to correctly measure the economic impacts of agro-industry changes in the national economy by looking at the appropriateness factors, i.e., value added - labor ratio requirements, and backward and forward linkages. The approach taken in this study is to examine the appropriateness of agro-industry sectors with the goal of determining sectors that should be targeted by the government for expansion or contraction.

Using data from the Indonesian input-output tables of 1971, 1975, and 1980, it was found that only seven of 32 Indonesian agro-industry sectors can be categorized as appropriate. These are the spinning industries sector, the wheat flour and products sector, the rubber product sector, the sugar cane and brown sugar sector, the rice milling, cleaning, and polishing sector, the tobacco leaves and processing sector, and the beverages industries sector. In terms of economic impact analysis these seven agro-industry sectors should be expanded by the Indonesian government. It

appears that the other agro-industry sectors were inappropriate in the years of analysis and should be contracted. This does not mean the other agro-industry sectors currently operating in Indonesia must be curtailed. It is possible to improve the inappropriate agro-industry sectors through a modification of the current development program by providing incentives or subsidizing business expansion. At this point it may be important to stress that there are important analytical tasks where such research do have to place. For example, whenever one is trying to improve industrial targeting, such research which emphasizes value added and employment opportunities can be very useful.

CONCLUSIONS

Theoretically, it is possible to use many evaluation techniques in agro-industry economic impact analysis. The problem is that most economic impact analysis does not depict intersectoral dependencies wherein the flows of both input and output of each sector of the national economy are clearly defined. Therefore, to evaluate each agro-industry sector for the purpose of guiding economic development, it is necessary to examine the basic attributes of each agro-industry sector, especially its linkage to the agricultural sector as the main source of raw materials.

The basic attributes of the various agro-industry sectors are diverse, and these basic attributes must be recognized in evaluating the economic development of

Indonesia. Differences in such characteristics as seasonal quantity due to agricultural product supply, storage facilities requirements, transport and communication infrastructure requirements, domestic and world prices fluctuation, and institutional involvement must be recognized in evaluating the agro-industry economy.

Other factors in the agro-industry sector are the number of people involved in processing activities and the number of people needing agro-industry products. Essentially, these are the population factors in national development.

The first population factor concerns the employment opportunities required to promote the optimum capacity of each agro-industry to utilize domestic labor. In this approach, value added - labor ratios are the main measurement in optimizing capacity of agro-industry activities. However, the generalized data systems maintained by the Indonesian Input-Output Tables of 1971, 1975, and 1980 are not adequate for the conduct of economic impact evaluation in agro-industry. There is serious deficiency in the data for labor supply by occupation and skill level from which the national employment distribution is derived. It is essential that these data be included in the analysis so that it will be possible to measure economic impacts of agro-industry development on employment distribution by occupation and skill level. The implication of this analysis is that the economic evaluation of agro-

industry sectors will fit within the national program of creating employment opportunities.

The second population factor concerns domestic population growth, which implies that domestic demand expands with increasing population growth. The essential idea is that increasing population growth is peculiarly basic in the sense that it determines overall final demand. Final demand is an exogenous variable to be estimated in order to determine, through input-output analysis, the extent to which production levels of agro-industry sectors should be changed. Hence, it is clear that population growth in the economy does affect the evaluation of targeted agro-industry sectors.

RECOMMENDATIONS

It is recommended that the agro-industry sectors to be developed by the Indonesian government be evaluated in terms of value added - labor ratio requirements and both backward and forward linkages. The results of these basic factors of evaluation should be interconnected with the current development programs. The current development programs for the agro-industry sectors appear to have only one major orientation, that is, post-processing. However, the pre-processing development factors of agro-industry sectors are related to post-processing factors. This means that the pre-processing development factors of agro-industry sectors cannot be overlooked.

A general pre-processing orientation can focus on applied technological research, physical infrastructure, and institutional innovations in regard to basic attributes of each agro-industry sector. In the case of agro-industry enhancement or improvement programs, therefore, we can normally expect that growth in the national economy will increase to sustain many of its functions at higher contributions in value added when supporting activities such as applied technological research, infrastructure, and institutional innovations are made. Also, it is important that national political and social stability be maintained in order to stimulate agro-industry development through both domestic and foreign investments.

Finally, it should be noted that this study stresses agro-industry performance and is based on appropriateness in terms of sector linkages and value added - labor requirements. However, it is very important that the labor supply by occupation and skill level be integrated into the analyses that are carried out to determine comprehensive strategies for agro-industry development. Therefore: (a) further studies of labor supply by occupation and skill level are needed; and (b) the findings of labor supply studies should be employed in the analytical framework and research methods used in this study.

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APPENDICES

APPENDIX 1.

Table 1 Sixty-six Sector Classification for 1971, 1975, and 1980 Input-Output Table for Indonesia.

Code	Sector Description	I.S.I.C Code
1.	Paddy	1110-01
2.	Handpounding of rice	3116-01
3.	Maize	1110-02
4.	Root crops	1110-03
5.	Vegetables and fruits	1110-5
6.	Other farm food crops	1110-6
7.	Rubber	1110-10; 3552-01
8.	Sugar cane and brown sugar	1110-11; 3118-01
9.	Coconut	1110-12
10.	Coconut and palm oil	1110-13; 3115-01
11.	Tobacco leaves and processed	1110-15; 3140-01
12.	Roasted coffee	1110-16; 3121-023
13.	Tea leaves and farm processed tea	1110-17; 3121-025
14.	Cloves	1110-18
15.	Nutmeg	1110-19
16.	Other spices	1110-20
17.	Other crops	1110-14
18.	Livestock	1110-22, 23, 24
19.	Slaughtering	3111-01
20.	Poultry and poultry products	1110-25
21.	Logging and saw milling	1220-02; 3311-01
22.	Other forest products	1220-1; 1220-2
23.	Fisheries	1301-01; 1302-01; 3114-01
24.	Coal and metal or mining	2100-01; 2301-01; 2302-01; 2302-02; 2302-03; 2302-04
25.	Petroleum & natural gas mining	2200-1
26.	Other quarrying	2901-01, 02, 03, 09
27.	Processing & preserving of food	3111-02; 3112-01; 3113-01; 3114-01
28.	Oils and fats	3115-01; 3115-02
29.	Rice milling, cleaning and polishing	3116-01
30.	Wheat flour and products	3116-2; 3117-01, 02
31.	Sugar refining	3118-01
32.	Food products not elsewhere classified	3119-01; 3121-01, 02, 03, 04
33.	Beverage industries	3131-01; 3132-01; 3133-01; 3134-01
34.	Cigarettes	3140-02

Table 1 (cont'd.)

Code	Sector Description	I.S.I.C Code
35.	Spinning industries	3211-01; 3211-02 3211-03; 3211-04
36.	Textiles, leather and wearing apparel	3212-01; 3213-01, 02 3215-01; 3220-01; 3221-01; 3231-01; 3233-01; 3240-01
37.	Wood and wood products	3311-01; 3312-01; 3320-01
38.	Paper & paper products and printing	3411-01; 3412-01; 3419-01; 3420-01
39.	Fertilizer & pesticides	3512-01
40.	Chemical industries	3511-01; 3521-01; 3522-01; 3523-01; 3523-02; 3529-01
41.	Petroleum refinery	3530-01
42.	Rubber products	3551-01; 3559-01
43.	Non-metallic mineral products	3610-01; 3620-01; 3691-01; 3699-01
44.	Cement	3692-01
45.	Iron & steel basic industries	3710-01
46.	Non-ferrous basic metal industries	3720-01
47.	Profabricated metal products	3811-01; 3812-01; 3813-01; 3819-01
48.	Machinery, electrical appliances, apparatus and accessories	3821-01; 3822-01; 3823-01; 3824-01; 3825-01; 3829-01; 3831-01; 3832-01; 3833-01; 3839-01; 3839-02
49.	Manufacture & repair of transport equipment	3841-01; 3842-01; 3843-01; 3844-01; 3844-02; 3845-01
50.	Other manufacturing industries, not elsewhere classified	3851-01; 3852-02; 3901-01; 3902-01; 3903-01; 3909-01
51.	Electricity, gas & water supplies	4101-01; 4102-01; 4200-01
52.	Construction	5000-01; 5000-02; 5000-03; 5000-04; 5000-05; 5000-06; 5000-07
53.	Trade	6100-01; 6200-01
54.	Restaurants & Hotels	6310-01; 6320-01
55.	Railways	7111-01
56.	Road transport	7112-01; 7114-01

Table 1 (cont'd.)

Code	Sector Description	I.S.I.C Code
57.	Water transport	7121-01; 7122-01; 7123-01
58.	Air transport	7131-01; 7132-01
59.	Service allied to transport	7191-01; 7192-02
60.	Communication	7200-01
61.	Financial services	8101-01; 8200-01; 8200-02
62.	Real estate & business services	8301-01; 8321-01; 8322-01; 8323-01; 8324-01; 8325-01; 8329-01; 8330-01
63.	Public administration & defence	9100-01
64.	Social & community services	9200-01; 9310-01; 9320-01; 9331-01; 9339-01; 9340-01; 9350-01; 9391-01
65.	Recreational, cultural, personal	9411-01; 9412-01, 02 9413-01; 9414-01; 9420-01; 9490-01; 9510-01; 9520-01; 9530-01; 9591-01; 9599-01
66.	Unspecified and professional sector	9900-01, 02

Source: Input-Output Table Indonesia 1971, 1975 and 1980.

Table 2 Gross Value-Added, Labor and Total Output for Sixty-Six Sector 1971 Input-Output Table for Indonesia.

CODE	GROSS VALUE-ADDED (VA_j) (in Rp 10^6)	LABOR (L_j) (person)	TOTAL OUTPUT (Q_i) (in Rp 10^6)
1	431,599.66	7,489,982	463,796.18
2	76,510.71	1,717,440	379,801.23
3	34,466.95	1,054,739	37,228.70
4	78,753.30	5,954,602	107,804.61
5	155,676.47	7,020,266	165,054.10
6	36,378.77	969,778	41,757.30
7	60,553.20	242,319	143,715.60
8	24,615.47	131,673	39,524.45
9	57,210.49	259,954	59,848.20
10	31,653.51	44,465	68,750.76
11	27,290.94	234,736	63,812.89
12	29,016.85	119,954	45,097.04
13	15,313.63	109,268	29,054.79
14	15,353.25	20,337	16,145.10
15	2,142.48	5,860	2,542.50
16	10,915.99	56,530	11,678.90
17	6,894.23	29,988	7,602.06
18	45,777.53	295,741	49,916.40
19	22,507.69	19,473	64,139.84
20	45,583.65	9,433	49,942.40
21	105,594.90	107,338	149,116.97
22	20,824.47	18,984	21,826.00
23	159,889.74	561,017	222,785.61
24	20,616.25	22,335	29,548.11
25	262,511.75	43,162	279,345.98
26	27,107.63	20,331	31,095.19
27	2,446.10	34,571	9,776.69
28	13,212.23	51,407	68,372.02
29	32,539.30	115,015	213,014.55
30	4,505,23	39,019	17,855.46
31	28,087.88	16,421	64,642.46
32	26,720.12	161,340	82,052.63
33	6,895.89	9,320	18,999.49
34	27,891.30	145,618	85,375.81
35	7,675.51	84,172	25,964.53
36	73,899.78	784,908	235,105.58
37	9,909.58	424,073	34,818.57
38	21,940.73	50,490	40,240.75
39	872.35	2,049	3,232.14
40	24,940.73	26,002	65,279.58
41	63,932.56	104,910	190,770.00
42	4,229.66	6,643	12,122.66

Table 2 (cont'd.)

CODE	GROSS VALUE-ADDED (VA_j) (in Rp 10^6)	LABOR (L_j) (person)	TOTAL OUTPUT (Q_i) (in Rp 10^6)
43	18,218.37	137,736	32,373.60
44	5,086.22	89,781	16,776.55
45	1,392.38	3,014	5,229.81
46	6,514.17	10,207	17,724.40
47	20,141.88	35,756	55,313.88
48	7,925.42	38,059	17,964.73
49	102,886.71	231,833	194,168.81
50	5,632.54	80,058	14,639.32
51	40,259.21	37,359	82,675.87
52	195,693.69	678,472	546,748.20
53	753,611.64	3,323,070	870,018.92
54	69,708.27	938,491	261,290.23
55	3,475.26	66,085	10,445.54
56	211,579.11	670,221	324,958.81
57	48,378.50	159,427	96,402.76
58	15,327.72	9,789	27,086.90
59	40,189.25	9,625	49,182.10
60	9,571.07	36,207	17,382.20
61	39,896.97	61,873	58,718.45
62	122,793.47	31,589	158,137.87
63	185,853.65	1,325,686	185,853.65
64	64,064.93	990,473	88,816.12
65	148,659.06	1,803,413	189,803.48
66	-	1,878,199	-

Table 3 Diagonal Matrix of Value-Added Coefficients for Sixty-Six Sector of Indonesian 1971 Input-Output Table.

CODE	VALUE-ADDED COEFFICIENT ($\hat{v}$)
1	0.930580
2	0.210449
3	0.825816
4	0.730518
5	0.943184
6	0.871195
7	0.136468
8	0.622790
9	0.955926
10	0.460409
11	0.427671
12	0.643431
13	0.527060
14	0.950954
15	0.842666
16	0.943836
17	0.906889
18	0.917083
19	0.350915
20	0.912724
21	0.708134
22	0.854112
23	0.717684
24	0.697718
25	0.939736
26	0.871762
27	0.250197
28	0.193240
29	0.152756
30	0.252316
31	0.434511
32	0.325646
33	0.362951
34	0.326688
35	0.295615
36	0.314325
37	0.284606
38	0.545236
39	0.269898
40	0.367979
41	0.335629
42	0.348905
43	0.562753

Table 3 (cont'd.)

CODE	VALUE-ADDED COEFFICIENT (ϕ)
44	0.303174
45	0.266239
46	0.367421
47	0.364137
48	0.441165
49	0.529682
50	0.379568
51	0.486952
52	0.357922
53	0.866201
54	0.266784
55	0.332702
56	0.651095
57	0.501837
58	0.565872
59	0.817151
60	0.550624
61	0.679462
62	0.776496
63	1.000000
64	0.721320
65	0.783226
66	0.000000

Table 4 Diagonal Matrix of Labor Coefficients for Sixty-Six Sector of Indonesian 1971 Input-Output Table.

CODE	LABOR COEFFICIENT ($\hat{l}$)
1	0.000016149296443
2	0.000004521944281
3	0.000028331341143
4	0.000055235133266
5	0.000042533120959
6	0.000023224154818
7	0.000001686100883
8	0.000003331431557
9	0.000004343555863
10	0.000000646756487
11	0.000003678504453
12	0.000002659908500
13	0.000003760756832
14	0.000001259639147
15	0.000002304818092
16	0.000004841182163
17	0.000003944720247
18	0.000005924726142
19	0.000000303602254
20	0.000000188877587
21	0.000000719824176
22	0.000000869788326
23	0.000002518192266
24	0.000000755885909
25	0.000000154510904
26	0.000000653831027
27	0.000003536063842
28	0.000000751871891
29	0.000000539939643
30	0.000002185269940
31	0.000000254026080
32	0.000001966296947
33	0.000000490539483
34	0.000001705611929
35	0.000003241807188
36	0.000003338534117
37	0.000012179506510
38	0.000001254698285
39	0.000000633945312
40	0.000000398317514
41	0.000000549929234
42	0.000000547982044
43	0.000004254577804
44	0.000005351577052

Table 4 (cont'd.)

CODE	LABOR COEFFICIENT (l_i)
45	0.000000576311568
46	0.000000646420031
47	0.000000646420031
48	0.000002118540050
49	0.000001193976520
50	0.000005394991145
51	0.000000451873080
52	0.000001240922238
53	0.000003819537626
54	0.000003591756952
55	0.000006326623612
56	0.000002062479857
57	0.000001653759706
58	0.000000361392407
59	0.000000195701282
60	0.000002082992947
61	0.000001053723319
62	0.000000199756074
63	0.000007132848884
64	0.000011151950795
65	0.000009501474894
66	0.000050170422461

Table 5 Gross Value-Added, Labor, and Total Output for Sixty-Six Sector of Indonesian 1975 Input-Output Table.

CODE	GROSS VALUE-ADDED (VA_j) (in Rp 10^6)	LABOR(L_j) (person)	TOTAL OUTPUT (Q_j) (in Rp 10^6)
1	1,265,590.05	9,266,359	1,364,486.85
2	127,709.29	1,567,848	616,536.19
3	155,154.92	2,532,922	169,414.76
4	314,295.67	3,513,208	408,959.68
5	535,960.01	8,035,855	567,136.50
6	158,687.44	2,208,992	178,315.05
7	106,720.92	251,780	255,645.88
8	51,149.74	116,313	83,836.05
9	135,910.10	323,677	158,651.05
10	64,383.15	150,614	118,711.81
11	57,963.88	134,538	122,080.17
12	60,303.22	141,719	88,848.18
13	33,571.83	78,627	56,148.00
14	39,084.25	92,975	41,931.05
15	9,256.36	22,213	10,254.09
16	15,693.41	37,950	16,663.39
17	25,964.83	64,489	28,410.69
18	100,208.31	218,104	111,707.74
19	81,839.41	177,769	207,055.76
20	118,862.61	262,978	127,707.79
21	232,400.91	183,389	117,758.81
22	39,563.85	34,531	42,087.03
23	269,812.60	573,486	198,013.90
24	68,488.96	22,639	97,598.33
25	2,390,493.86	11,086	464,583.17
26	85,845.15	356,058	96,765.59
27	16,620.87	27,997	62,024.00
28	9,896.99	29,059	67,450.10
29	188,318.48	493,318	1,145,060.66
30	41,308.46	71,604	166,202.25
31	79,116.08	58,981	136,902.32
32	72,518.12	192,010	253,956.53
33	21,645.72	16,314	33,020.72
34	127,072.68	47,248	315,635.28
35	26,371.53	102,607	95,184.34
36	170,780.21	917,541	509,458.72
37	41,613.53	732,171	115,451.77
38	58,442.20	55,483	121,230.42
39	24,610.48	4,308	34,971.75
40	62,196.57	103,960	208,392.75
41	92,314.63	15,116	340,136.53
42	17,371.95	18,021	43,473.56

Table 5 (cont'd.)

CODE	GROSS VALUE-ADDED (VA_j) (in Rp 10^6)	LABOR(L_j) (person)	TOTAL OUTPUT (Q_j) (in Rp 10^6)
43	51,078.16	259,787	95,802.40
44	18,863.52	93,393	34,440.54
45	4,461.80	8,546	15,308.98
46	17,214.64	27,235	48,790.92
47	54,167.63	172,058	171,964.33
48	45,870.67	46,793	118,331.45
49	270,511.33	889,247	717,409.42
50	14,945.32	178,814	37,302.73
51	83,548.65	58,379	164,699.43
52	722,100.46	1,381,598	1,986,733.49
53	1,839,573.52	4,745,599	2,145,908.05
54	199,921.25	1,282,011	584,801.31
55	6,137.86	33,048	18,709.72
56	149,662.57	912,459	628,452.29
57	161,748.04	368,549	294,605.33
58	56,608.83	10,069	114,910.58
59	92,151.79	175,246	118,456.41
60	33,537.75	39,561	53,963.37
61	230,821.06	57,298	289,006.44
62	376,675.78	27,238	454,491.25
63	705,030.05	1,570,198	705,030.05
64	317,420.80	877,188	408,437.09
65	377,076.93	2,455,954	511,137.97
66	0.00	0	0.00

Table 6 Diagonal Matrix of Value-Added Coefficients for Sixty-Six Sector of Indonesian 1975 Input-Output Table.

CODE	VALUE-ADDED COEFFICIENT ($\hat{v}$)
1	0.927520
2	0.207139
3	0.915828
4	0.768524
5	0.945028
6	0.889927
7	0.417456
8	0.609970
9	0.856660
10	0.542348
11	0.474801
12	0.678722
13	0.597916
14	0.932107
15	0.902699
16	0.941789
17	0.913910
18	0.897057
19	0.395252
20	1,074415
21	0.731375
22	0.940048
23	0.677897
24	0.701743
25	0.969938
26	0.887145
27	0.267974
28	0.146730
29	0.164461
30	0.248543
31	0.577901
32	0.285553
33	0.655519
34	0.402593
35	0.277057
36	0.335218
37	0.360440
38	0.482075
39	0.703724
40	0.298458
41	0.271404
42	0.399598
43	0.533161

Table 6 (cont'd.)

CODE	VALUE-ADDED COEFFICIENT (θ)
44	0.547712
45	0.291449
46	0.352824
47	0.314993
48	0.387645
50	0.400649
51	0.507279
52	0.363453
53	0.857247
54	0.341861
55	0.328057
56	0.667771
57	0.549032
58	0.492633
59	0.777938
60	0.621491
61	0.798670
62	0.828785
63	1.000000
64	0.777159
65	0.737720
66	0.000000

Table 7 Diagonal Matrix of Labor Coefficients for Sixty-Six Sector of Indonesian 1975 Input-Output Table.

CODE	LABOR COEFFICIENT ($\hat{l}$)
1	0.000006791094396
2	0.000002542994273
3	0.000014951011352
4	0.000008590597489
5	0.000014169172677
6	0.000012388141102
7	0.000000984877988
8	0.000001387386783
9	0.000002040181896
10	0.000001268736447
11	0.001102046302852
12	0.000001595069252
13	0.000001400352639
14	0.000002217330594
15	0.000002166257562
16	0.000002269885033
17	0.000002269885033
18	0.000001952451997
19	0.000858556168638
20	0.000002059216591
21	0.000000577132700
22	0.000000820466543
23	0.000001440869276
24	0.000000231960936
25	0.000000004498124
26	0.000003679593128
27	0.000000451389785
28	0.000000430822193
29	0.000000430822591
30	0.000000430824492
31	0.000000430825424
32	0.000000756074278
33	0.000000494053431
34	0.000000149691758
35	0.000001077981945
36	0.000001801011474
37	0.000006341791035
38	0.000000457665659
39	0.000000123185142
40	0.000000498865723
41	0.000000044440978
42	0.000000414527819
43	0.000002711696158
44	0.000002711717064

Table 7 (cont'd.)

CODE	LABOR COEFFICIENT (l)
45	0.000000558234448
46	0.000000558198124
47	0.000001000544706
48	0.000000395440096
49	0.000001239525124
50	0.000004793590174
51	0.000000354457814
52	0.000000695397843
53	0.000002211464280
54	0.000002192216361
55	0.000001766354601
56	0.000001451914512
57	0.000001250992302
58	0.000000087624656
59	0.000001479413398
60	0.000000733108403
61	0.000000198251638
62	0.000000059930747
63	0.000002227136276
64	0.000002147669792
65	0.000004804874895
66	0.000000000000000

Table 8 Gross Value-Added, Labor, and Total Output for Sixty-Six Sector of Indonesian 1980 Input-Output Table.

CODE	GROSS VALUE-ADDED (VA_j) (in Rp 10^6)	LABOR(L_j) (person)	TOTAL OUTPUT (Q_j) (in Rp 10^6)
1	3,135,130.10	9,815,521	3,436,221.00
2	300,688.90	1,080,352	1,373,919.90
3	337,576.80	2,786,333	382,653.50
4	614,545.20	3,167,928	714,214.70
5	1,315,675.40	8,891,353	1,397,649.50
6	398,836.50	2,055,538	449,878.00
7	475,115.10	329,830	958,076.10
8	219,039.70	261,287	339,869.00
9	390,992.40	410,137	412,592.00
10	191,095.10	192,138	335,141.90
11	151,878.10	347,755	235,068.00
12	389,088.70	355,952	527,021.00
13	172,639.10	166,533	194,556.30
14	269,883.70	228,304	290,117.90
15	23,008.80	25,596	25,293.80
16	49,930.10	55,986	51,894.90
17	77,958.90	65,259	85,492.40
18	538,978.20	405,426	597,148.50
19	173,251.30	330,448	746,299.50
20	478,739.90	488,840	577,475.10
21	1,194,663.00	427,494	1,391,982.00
22	217,437.50	84,282	233,330.20
23	792,590.10	844,157	1,011,105.90
24	305,856.60	55,683	430,759.10
25	11,808,649.30	28,611	13,238,896.40
26	322,228.90	284,570	371,850.90
27	72,573.70	46,597	223,407.90
28	48,064.80	43,600	235,966.50
29	605,859.60	547,061	3,045,961.10
30	108,713.60	122,321	451,650.60
31	113,892.40	76,360	316,105.20
32	220,006.00	255,910	816,707.80
33	59,394.00	21,121	109,841.50
34	522,174.80	99,521	1,222,090.90
35	113,507.50	122,073	385,980.90
36	462,913.50	1,138,333	1,332,168.60
37	334,460.40	1,092,836	711,008.40
38	125,898.50	82,692	368,485.10
39	116,234.40	13,761	319,784.40
40	296,044.30	130,692	707,428.70
41	94,025.30	23,027	1,623,111.50
42	113,665.20	24,462	393,089.40

Table 8 (cont'd.)

CODE	GROSS VALUE-ADDED (VA_j) (in Rp 10^6)	LABOR (L_j) (person)	TOTAL OUTPUT (Q_j) (in Rp 10^6)
43	128,294.90	308,649	289,664.80
44	115,662.50	110,959	215,569.00
45	145,211.00	12,442	363,702.10
46	73,516.50	40,409	379,977.70
47	151,977.20	190,724	495,562.30
48	452,209.30	98,765	1,217,005.50
49	435,289.60	503,683	1,440,868.80
50	62,270.00	293,934	109,818.70
51	230,600.90	62,951	523,477.30
52	2,582,425.90	1,578,467	7,532,682.10
53	5,730,663.20	5,578,120	6,375,656.90
54	1,008,671.30	1,353,099	2,315,097.30
55	21,873.50	55,462	51,298.50
56	1,269,734.70	1,239,002	2,058,972.60
57	317,067.80	469,241	633,897.90
58	151,108.80	11,347	438,551.60
59	300,609.90	195,256	429,347.60
60	150,328.40	43,655	265,192.70
61	765,151.60	96,626	930,890.40
62	1,589,255.10	191,363	1,841,169.80
63	2,468,094.20	2,022,547	2,468,094.20
64	1,297,114.60	1,200,927	1,779,902.20
65	0.00	3,581,832	2,077,625.90
66	0.00	0	0.00

Table 9 Diagonal Matrix of Value-Added Coefficients for Sixty-Six Sector of Indonesian 1980 Input-Output Table.

CODE	VALUE-ADDED COEFFICIENT (v)
1	0.912377
2	0.218854
3	0.882199
4	0.860448
5	0.941348
6	0.886543
7	0.495905
8	0.644482
9	0.947649
10	0.570191
11	0.646102
12	0.738279
13	0.887347
14	0.930255
15	0.909661
16	0.962138
17	0.911881
18	0.902586
19	0.232147
20	1,206239
21	0.858246
22	0.931887
23	0.783884
24	0.710040
25	0.891966
26	0.866554
27	0.324848
28	0.203693
29	0.198838
30	0.240713
31	0.360299
32	0.269381
33	0.540724
34	0.427279
35	0.193705
36	0.347488
37	0.470402
38	0.341665
39	0.223620
40	0.418479
41	0.057929
42	0.289158
43	0.442908

Table 9 (cont'd.)

CODE	VALUE-ADDED COEFFICIENT (ϕ)
44	0.536545
45	0.399258
46	0.193475
47	0.306676
48	0.371575
49	0.302102
50	0.567025
51	0.440517
52	0.342829
53	0.898834
54	0.435692
55	0.426396
56	0.616683
57	0.500187
58	0.344563
59	0.700155
60	0.566864
61	0.821956
62	0.863176
63	1.000000
64	0.728756
65	0.000000
66	0.000000

Table 10 Diagonal Matrix of Labor Coefficients for Sixty-Six Sector of Indonesian 1980 Input-Output Table.

CODE	LABOR COEFFICIENT (1)
1	0.000002856487112
2	0.000000786328228
3	0.000000728160856
4	0.000004435540181
5	0.000006361647180
6	0.000004569100956
7	0.000000344262841
8	0.000000768787386
9	0.000000994049812
10	0.000000573303428
11	0.000001479380435
12	0.000000675403826
13	0.000000855963030
14	0.000000786935243
15	0.000001026180329
16	0.000001078834336
17	0.000000763331010
18	0.000000678936646
19	0.000000442782020
20	0.000000846512689
21	0.000000307111730
22	0.000000361213422
23	0.000000834884852
24	0.000000129267147
25	0.000000002161132
26	0.000000765279847
27	0.000000208573645
28	0.000000184771991
29	0.000000179600917
30	0.000000270831036
31	0.000000241565150
32	0.000000313343401
33	0.000000192286158
34	0.000000081435023
35	0.000000316266945
36	0.000000854496195
37	0.000001537022629
38	0.000000224953465
39	0.000000043032118
40	0.000000184742293
41	0.000000014186949
42	0.000000062230119
43	0.000001065538512
44	0.000000514726143

Table 10 (cont'd.)

CODE	LABOR COEFFICIENT (1)
45	0.000000034209316
46	0.000000106345714
47	0.000000384863820
48	0.000000081154111
49	0.000000349568955
50	0.000002676538695
51	0.000000120255453
52	0.000000209549133
53	0.000000874909062
54	0.000000584467443
55	0.000001081162217
56	0.000000601757401
57	0.000000740246970
58	0.000000025873808
59	0.000000454773708
60	0.000000164616145
61	0.000000103799545
62	0.000000103935552
63	0.000000819477231
64	0.000000674715161
65	0.000001724002382
66	0.000000000000000

Table 11 Backward Linkage Index (Lj^B) and Forward Linkage Index (Li^F) for Sixty-Six Sector of Indonesian 1971 Input-Output Table.

CODE	Lj^B	Li^F
1	0.069419	0.989957
2	0.798550	0.029441
3	0.074183	0.121926
4	0.269481	0.247533
5	0.056815	0.100631
6	0.128804	0.565622
7	0.578659	0.425497
8	0.377209	0.754901
9	0.044073	0.680926
10	0.714133	0.465991
11	0.572328	0.530904
12	0.356590	0.462683
13	0.472939	0.332987
14	0.049045	0.998002
15	0.157935	0.244499
16	0.064335	0.115321
17	0.106368	0.874512
18	0.108414	0.792098
19	0.629714	0.190562
20	0.154571	0.469538
21	0.268782	0.569384
22	0.045896	0.757949
23	0.282315	0.321750
24	0.302281	0.374981
25	0.060263	0.370398
26	0.128237	0.844258
27	0.847279	0.428212
28	0.806759	0.337771
29	0.847243	0.036008
30	0.747683	0.385020
31	0.565488	0.039779
32	0.674353	0.171105
33	0.637048	0.653184
34	0.673310	0.089830
35	0.704384	0.948423
36	0.685674	0.303401
37	0.715307	0.529382
38	0.454763	0.623622
39	0.730101	0.999363
40	0.632020	0.536058
41	0.664871	0.663390
42	0.651094	0.909985
43	0.436940	0.887461

Table 11 (cont'd.)

CODE	L_j^B	L_i^F
44	0.675367	1.000000
45	0.733760	0.930316
46	0.632578	0.675929
47	0.610027	0.677734
48	0.558436	0.095038
49	0.470070	0.500718
50	0.620431	0.325823
51	0.513047	0.761932
52	0.642077	0.079875
53	0.133798	0.328422
54	0.733215	0.135586
55	0.671028	0.584693
56	0.348904	0.390626
57	0.498622	0.176174
58	0.434127	0.276443
59	0.182848	0.269933
60	0.449375	0.447562
61	0.320537	0.842705
62	0.223503	0.219728
63	0.000000	0.000000
64	0.278679	0.047427
65	0.216773	0.085295
66	0.999999	0.821186

Table 12 Backward Linkage Index (Lj^B) and Forward Linkage Index (Li^F) for Sixty-Six Sector of Indonesian 1975 Input-Output Table.

CODE	Lj^B	Li^F
1	0.072479	1.000000
2	0.792860	0.063081
3	0.083876	0.110258
4	0.231475	0.230658
5	0.054971	0.073720
6	0.110072	0.596600
7	0.582543	0.493141
8	0.390122	0.514822
9	0.143339	0.583154
10	0.457651	0.127750
11	0.525901	0.806140
12	0.320311	0.267519
13	0.402083	0.293413
14	0.067892	0.995697
15	0.097300	0.431278
16	0.058210	0.214986
17	0.086089	0.770746
18	0.102942	1.007889
19	0.604747	0.128018
20	0.069258	0.263624
21	0.441712	0.480993
22	0.061742	0.948932
23	0.321913	0.252479
24	0.298256	0.507697
25	0.030061	0.086142
26	0.112854	0.892963
27	0.732025	0.362850
28	0.853417	0.285327
29	0.835538	0.048092
30	0.752684	0.524045
31	0.422098	0.260361
32	0.714446	0.108508
33	0.344480	0.389818
34	0.597406	0.000830
35	0.722942	0.803963
36	0.664781	0.337209
37	0.641291	0.684382
38	0.517924	0.551704
39	0.296275	0.998145
40	0.701541	0.670802
41	0.728595	0.469945
42	0.600401	0.787165
43	0.466838	0.915297

Table 12 (cont'd.)

CODE	L_j^B	L_i^F
44	0.452287	0.998344
45	0.708550	0.840458
46	0.647175	0.611459
47	1.731735	0.804051
48	0.612354	0.289305
49	0.622933	0.382902
50	0.599350	0.175040
51	0.971888	0.726104
52	0.596824	0.079683
53	0.142752	0.333363
54	0.658138	0.157714
55	2.489179	0.321210
56	0.332228	0.335032
57	0.450967	0.346397
58	0.507368	0.209159
59	0.222061	0.496457
60	0.378508	0.424080
61	0.201329	0.883217
62	0.171214	0.236293
63	0.021257	0.000000
64	0.296967	0.057611
65	0.319871	0.098061
66	0.000000	0.904726

Table 13 Backward Linkage Index (Lj^B) and Forward Linkage Index (Li^F) for Sixty-Six Sector of Indonesian 1980 Input-Output Table.

CODE	Lj^B	Li^F
1	0.087622	0.967251
2	0.781145	0.063081
3	0.117800	0.141288
4	0.139551	0.172305
5	0.058650	0.069077
6	0.113456	0.579741
7	0.504094	0.382360
8	0.863946	0.744633
9	0.137180	0.522030
10	0.436032	0.261068
11	0.353897	0.786183
12	0.261720	0.196916
13	0.112652	0.225247
14	0.069744	0.955908
15	0.090338	0.302953
16	0.037861	0.141143
17	0.088118	0.836942
18	0.097413	0.889208
19	0.767852	0.243992
20	0.170973	0.287607
21	0.141753	0.390879
22	0.068112	0.762633
23	0.216114	0.185793
24	0.289959	0.620652
25	0.108033	0.131448
26	0.133445	0.945463
27	0.675151	0.233187
28	0.796306	0.274171
29	0.801161	0.954526
30	0.759297	0.309174
31	0.639700	0.205927
32	0.730618	0.224326
33	0.459275	0.480331
34	0.572720	0.023187
35	0.705924	0.781705
36	0.652511	0.366087
37	0.529597	0.534884
38	0.658334	0.796106
39	0.636522	0.906307
40	0.590437	0.685468
41	0.942070	0.559695
42	0.710840	0.710214
43	0.557091	0.911640

Table 13 (cont'd.)

CODE	L_j^B	L_i^F
44	0.463454	0.963855
45	0.600741	0.952256
46	0.806524	0.350710
47	0.693323	0.811085
48	0.628424	0.424453
49	0.697897	0.289809
50	0.434818	0.288934
51	0.559482	0.692433
52	0.657170	0.067679
53	0.101165	0.374479
54	0.564311	0.115184
55	0.573428	0.285799
56	0.383316	0.295650
57	0.499812	0.282490
58	0.655436	0.266738
59	0.299844	0.605654
60	0.433135	0.450758
61	0.178043	0.718324
62	0.136823	0.321166
63	0.000000	0.000000
64	0.271243	0.031917
65	0.455998	0.406334
66	0.000000	0.045140

Table 14 Direct Value-Added Requirement - Direct Labor Requirement Ratio β_j/γ_j and Its Rank for Sixty-Six Sector of Indonesian 1971 Input-Output Table.

CODE	β_j/γ_j	RANK
1	0.0576	56
2	0.0445	59
3	0.0326	61
4	0.0132	64
5	0.0221	63
6	0.0375	60
7	0.2498	34
8	0.1869	41
9	0.2200	38
10	0.7118	16
11	0.1162	47
12	0.2418	35
13	0.1401	45
14	0.7549	14
15	0.3656	26
16	0.1931	40
17	0.2298	36
18	0.1547	43
19	1.1558	8
20	4.8319	2
21	0.9837	11
22	1.0969	9
23	0.2849	30
24	0.9230	13
25	6.0812	1
26	1.3332	7
27	0.0707	53
28	0.2570	33
29	0.2829	31
30	0.1154	48
31	1.7097	5
32	0.1656	42
33	0.7396	15
34	0.0019	65
35	0.0911	50
36	0.0941	49
37	0.0233	62
38	0.4345	24
39	0.4249	25
40	0.9235	12
41	0.6094	20
42	0.6363	19

Table 14 (cont'd.)

CODE	β_j/γ_j	RANK
43	0.1322	46
44	0.0566	57
45	0.4617	22
46	0.6381	18
47	0.5632	21
48	0.2082	39
49	0.4337	23
50	0.0703	54
51	1.0775	10
52	0.2884	29
53	0.2267	37
54	0.0742	52
55	0.0525	58
56	0.3156	27
57	0.3034	28
58	1.5657	6
59	4.1750	3
60	0.2643	32
61	0.6447	17
62	3.8868	4
63	0.1402	44
64	0.0646	55
65	0.0824	51
66	0.0000	66

Table 15 Direct Value-Added Requirement - Direct Labor Requirement Ratio β_j/γ_j and Its Rank for Sixty-Six Sector of Indonesian 1975 Input-Output Table.

CODE	β_j/γ_j	RANK
1	0.1365	58
2	0.0814	61
3	0.0612	64
4	0.0894	59
5	0.0666	63
6	0.0718	62
7	0.4238	37
8	0.4388	31
9	0.4198	39
10	0.4269	33
11	0.4251	36
12	0.4251	35
13	0.4255	34
14	0.4203	38
15	0.4167	40
16	0.4135	41
17	0.4026	42
18	0.4581	27
19	0.4519	28
20	0.4490	29
21	1.2672	12
22	1.1456	13
23	0.4598	25
24	3.0251	7
25	215.5212	1
26	0.2410	51
27	0.5936	20
28	0.3405	47
29	0.3817	44
30	0.5768	21
31	1.3413	10
32	0.3776	45
33	1.3268	11
34	2.6894	8
35	0.2570	50
36	0.1861	54
37	0.0568	65
38	1.0532	14
39	5.6965	4
40	0.5982	19
41	6.1035	3
42	0.9639	16

Table 15 (cont'd.)

CODE	β_j/γ_j	RANK
43	0.1966	53
44	0.2019	52
45	0.4704	24
46	0.6320	18
47	0.3148	48
48	0.9802	15
49	0.3041	49
50	0.0835	60
51	1.4309	9
52	0.5220	23
53	0.3876	43
54	0.1559	56
55	0.1857	55
56	0.4585	26
57	0.4274	32
58	5.6213	5
59	0.5226	22
60	0.8477	17
61	4.0274	6
62	13.8244	2
63	0.4397	30
64	0.3618	46
65	0.1535	57
66	0.0000	66

Table 16 Direct Value-Added Requirement - Direct Labor Requirement Ratio β_j/γ_j and Its Rank for Sixty-Six Sector of Indonesian 1980 Input-Output Table.

CODE	β_j/γ_j	RANK
1	0.3194	57
2	0.2783	59
3	0.1211	64
4	0.1939	62
5	0.1479	63
6	0.1940	61
7	1.4404	24
8	0.8383	48
9	0.9533	40
10	0.9945	38
11	0.4367	53
12	1.0930	32
13	1.0366	35
14	1.1821	28
15	0.8864	45
16	0.8918	43
17	1.1946	27
18	1.3294	25
19	0.5242	52
20	0.9783	39
21	2.7945	15
22	2.5798	16
23	0.9389	41
24	5.4928	7
25	412.7282	1
26	1.1323	29
27	1.5574	20
28	1.1024	31
29	1.1071	30
30	0.8887	44
31	1.4915	23
32	0.8597	47
33	2.8120	14
34	5.2468	8
35	0.9298	42
36	0.4066	55
37	0.3060	58
38	1.5188	22
39	8.4461	4
40	2.2652	17
41	4.0822	11
42	4.6465	9

Table 16 (cont'd.)

CODE	β_j/γ_j	RANK
43	0.4156	54
44	1.0423	34
45	11.6708	3
46	1.8193	18
47	0.7968	49
48	4.5786	10
49	0.8642	46
50	0.2118	60
51	3.6631	12
52	1.6360	19
53	1.0273	36
54	0.7454	50
55	0.3943	56
56	1.0248	37
57	0.6757	51
58	13.3170	2
59	1.5395	21
60	3.4435	13
61	7.9186	6
62	8.3049	5
63	1.2202	26
64	1.0800	33
65	0.0000	65
66	0.0000	66

Table 17 Total Value-Added Requirement - Direct Labor Requirement Ratio ($\Sigma VA_{ij}/\Sigma L_{ij}$) and Its Rank for Sixty-Six Sector of Indonesian 1971 Input-Output Table.

CODE	$\Sigma VA_{ij}/\Sigma L_{ij}$	RANK
1	0.0554	57
2	0.0451	60
3	0.0339	63
4	0.0134	66
5	0.0229	65
6	0.0386	62
7	0.1255	41
8	0.1578	32
9	0.2236	21
10	0.3209	14
11	0.0752	48
12	0.1883	28
13	0.1370	37
14	0.5331	5
15	0.3583	11
16	0.1901	26
17	0.2006	20
18	0.1613	31
19	0.4612	7
20	0.9655	1
21	0.1752	30
22	0.4054	9
23	0.1230	42
24	0.5024	6
25	0.3223	13
26	0.5741	4
27	0.0697	50
28	0.1419	35
29	0.0532	58
30	0.0969	46
31	0.1181	43
32	0.0497	59
33	0.3376	12
34	0.1112	44
35	0.0873	47
36	0.0726	49
37	0.0309	64
38	0.2231	21
39	0.2802	17
40	0.1390	37
41	0.1487	33
42	0.4112	8

Table 17 (cont'd.)

CODE	$\Sigma VA_{ij}/\Sigma L_{ij}$	RANK
43	0.1363	39
44	0.0616	55
45	0.3656	10
46	0.2638	18
47	0.1476	34
48	0.2069	24
49	0.1763	29
50	0.0686	51
51	0.2167	23
52	0.1891	27
53	0.1051	45
54	0.0626	54
55	0.0564	56
56	0.1289	40
57	0.2369	20
58	0.7732	2
59	0.6973	3
60	0.2440	19
61	0.2836	16
62	0.2843	15
63	0.1403	36
64	0.0677	52
65	0.0629	53
66	0.0043	61

Table 18 Total Value-Added Requirement - Direct Labor Requirement Ratio ($\Sigma VA_{ij}/\Sigma L_{ij}$) and Its Rank for Sixty-Six Sector of Indonesian 1975 Input-Output Table.

CODE	$\Sigma VA_{ij}/\Sigma L_{ij}$	RANK
1	0.0623	52
2	0.0508	56
3	0.0590	53
4	0.0712	49
5	0.0535	54
6	0.0685	51
7	0.3845	16
8	0.1760	32
9	0.2926	20
10	0.1741	33
11	0.0005	64
12	0.4188	11
13	0.4212	9
14	0.4381	7
15	0.4146	12
16	0.4124	13
17	0.2682	22
18	0.0026	63
19	0.0005	65
20	0.4260	8
21	0.1392	39
22	0.4195	10
23	0.3690	17
24	0.8517	3
25	0.2444	24
26	0.1882	28
27	0.4349	6
28	0.1965	26
29	0.0303	60
30	0.2174	25
31	0.6875	4
32	0.2765	21
33	0.9428	4
34	2.6074	1
35	0.1680	34
36	0.0845	43
37	0.0454	58
38	0.1789	31
39	0.0687	50
40	0.0999	42
41	0.0732	47
42	0.2555	23

Table 18 (cont'd.)

CODE	$\Sigma VA_{ij}/\Sigma L_{ij}$	RANK
43	0.1588	35
44	0.1839	30
45	0.3072	19
46	0.3237	18
47	0.0725	48
48	0.1873	29
49	0.0327	59
50	0.0800	46
51	0.1431	38
52	0.0458	57
53	0.0172	62
54	0.0522	55
55	0.1460	37
56	0.0207	61
57	0.0818	45
58	0.4055	14
59	0.1499	36
60	0.3924	15
61	0.0827	44
62	0.1194	40
63	0.4490	5
64	0.1949	27
65	0.1023	41
66	0.0	66

Table 18 Total Value-Added Requirement - Direct Labor Requirement Ratio ($\Sigma VA_{ij}/\Sigma L_{ij}$) and Its Rank for Sixty-Six Sector of Indonesian 1980 Input-Output Table.

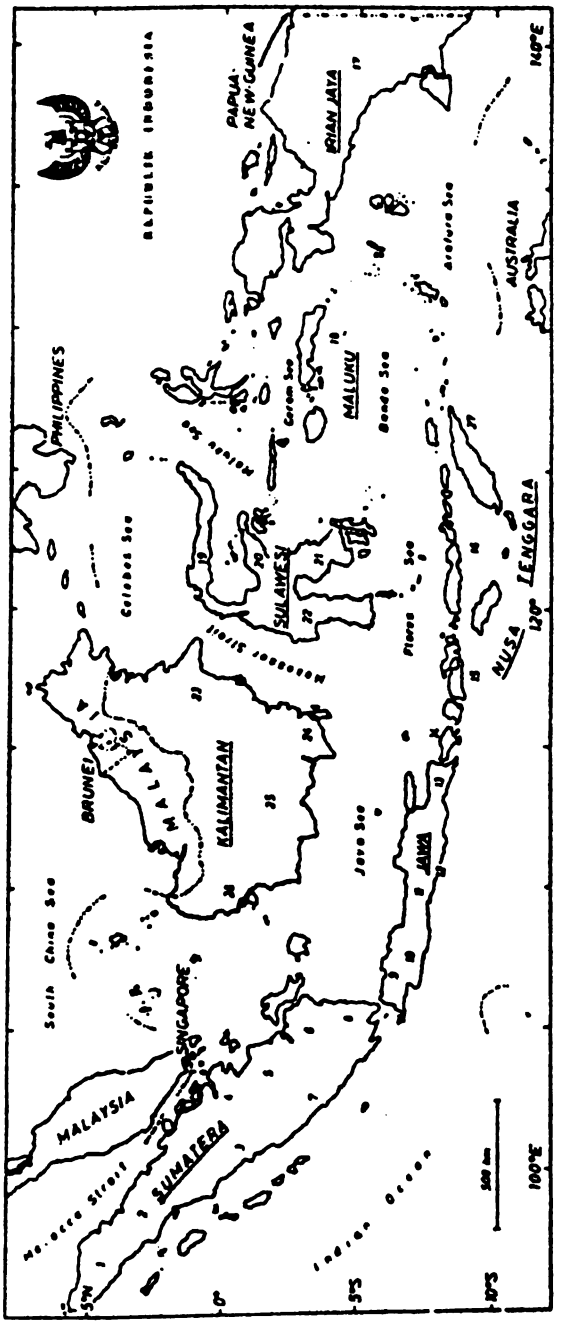
CODE	$\Sigma VA_{ij}/\Sigma L_{ij}$	RANK
1	0.3600	59
2	0.2937	61
3	1.2103	29
4	0.1994	64
5	0.1524	65
6	0.2118	63
7	1.4216	16
8	0.8809	48
9	0.9621	39
10	1.0118	37
11	0.4752	15
12	1.0907	32
13	1.0397	35
14	1.2418	26
15	0.8867	47
16	0.8935	45
17	1.1651	30
18	1.0062	38
19	0.5815	54
20	1.3304	20
21	1.3303	21
22	2.1241	.10
23	0.9513	41
24	3.1367	4
25	5.6505	2
26	1.0688	34
27	1.5224	13
28	1.0953	31
29	1.0304	36
30	0.8872	46
31	1.4769	14
32	0.9588	40
33	2.6553	7
34	4.8175	3
35	0.5255	55
36	0.4313	57
37	0.3432	60
38	1.3202	23
39	0.7736	51
40	1.3760	17
41	1.3284	22
42	1.3125	24

Table 19 (cont'd.)

CODE	$\Sigma VA_{ij}/\Sigma L_{ij}$	RANK
43	0.4448	56
44	0.9238	44
45	2.4385	9
46	1.3416	18
47	0.9312	43
48	2.0530	11
49	0.7419	52
50	0.2155	62
51	1.6753	12
52	1.3343	19
53	0.8479	49
54	0.8025	50
55	0.3997	58
56	0.9320	42
57	0.7028	53
58	6.8783	1
59	1.2922	25
60	2.7439	6
61	2.4636	8
62	3.0055	5
63	1.2203	28
64	1.0731	33
65	0.2357	27
66	0.0	66

APPENDIX 2.

Figure 1. MAP OF INDONESIA



Provinces:

1 Aceh	6 South Sumatera	11 Central Jawa	16 East Nusa Tenggara	22 South Sulawesi
2 North Sumatera	7 Bengkulu	12 Yogyakarta	17 Irian Jaya	23 East Kalimantan
3 West Sumatera	8 Lampung	13 East Jawa	18 Maluku	24 South Kalimantan
4 Riau	9 Jakarta	14 Bali	19 North Sulawesi	25 Central Kalimantan
5 Jambi	10 West Jawa	15 West Nusa Tenggara	20 Central Sulawesi	26 West Kalimantan
			21 South-east Sulawesi	27 East Timor