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AN OVERVIEW OF THE INDONESIAN RICE ECONOMY

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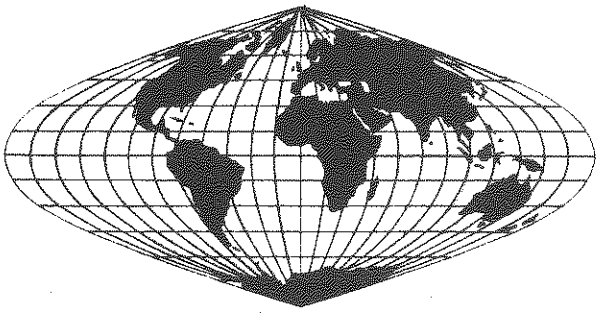

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The Department of Agricultural Economics offers training in International Economics and Development leading to the MPS, MS, and PhD degrees. A component of the Program in International Agriculture of the New York State College of Agriculture and Life Sciences, the course of study and research is flexible and designed to enable students to draw on the expertise of faculty in many disciplines and with wide-ranging international experience, as well as on a core of faculty within the Department who address themselves exclusively to international questions. The geographical focus is on the developing countries of Asia, Africa, and Latin America.

Indonesia*

Overview

Indonesia is a vast, insular, Asian nation, which includes more than 13,000 islands. The Indonesian archipelago is part of the island studded arc sweeping from the tip of Northeast Asia into the expanse of the Pacific Ocean. Geographical diversity and spatial fragmentation have given Indonesia a rich and varied cultural heritage, and Indonesia has historically benefited from frequent contacts with mainland Asia. When Dutch colonists arrived in the seventeenth century, they established a base of operations on the islands of Java and Madura and, through the hegemonic abilities of the local elite (priyayi), forced the natives to contribute labor toward the production of export crops--sugar, tobacco, tea, coffee, and indigo--on government estates.

At the start of WW II, Indonesia was still managed by Dutch bureaucrats. The Dutch made some cautious efforts towards institutional reform throughout the 1930s, but the Indonesians were still denied the essential right of participation in the governing of their country, and there was a strong indigenous undercurrent of political dissatisfaction. Although the Japanese wartime occupation was harsh, it did allow indigenous elements, particularly the charismatic Sukarno, to help develop a national identity and to gain wide popular support. After the war, the Dutch did not want to allow Indonesia its autonomy, but after a long independence war and subsequent world pressure, especially from the U.S., the Dutch acquiesced. By 1950, Indonesia was an independent nation under the leadership of Sukarno. Sukarno was charged with the difficult job of uniting the islands,

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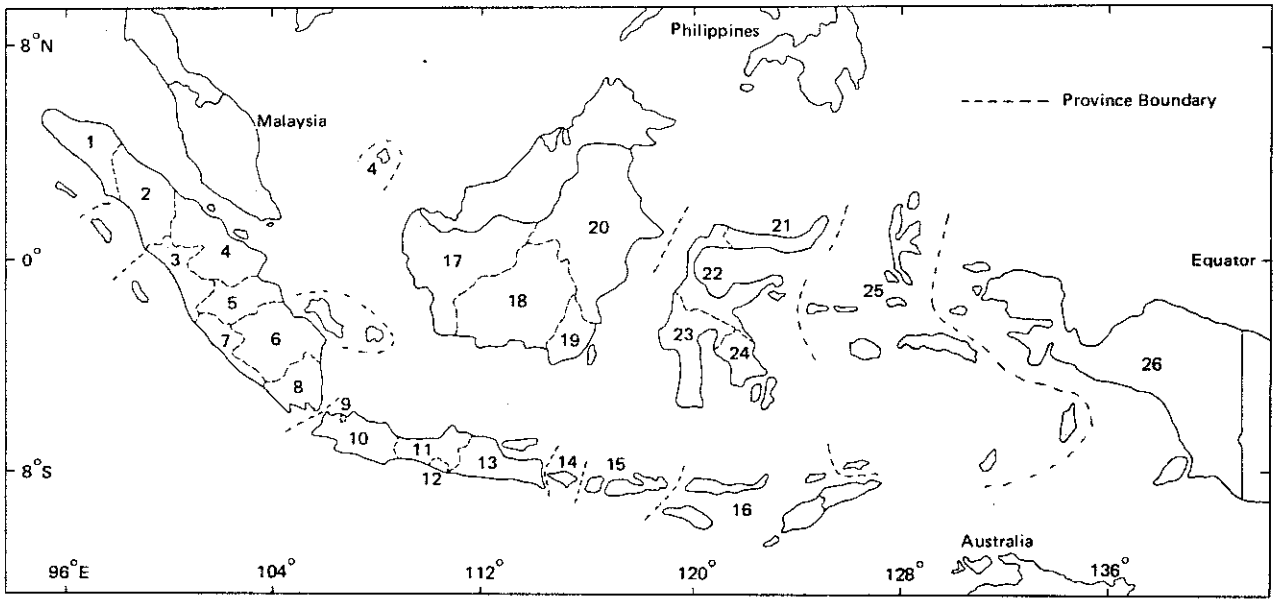
as well as organizing a new political leadership to fill the functions of the departed Dutch bureaucrats. The new government was hounded by serious economic problems and numerous "rumblings" in the Outer Islands* that chafed under the concentration of power on Java. In 1957, Sukarno declared martial law and, in 1959, suspended democratic rule and enacted the policy of "Guided Democracy." "Guided Democracy" was an attempt to harmonize splintering regional concerns and signaled increased involvement of the army in government affairs. However, bureaucratic decay was rampant, and serious economic decline hampered reform efforts. Increasing friction between the communist leadership and the powerful army led in 1965 to a violent purge of communist party members by the army. Perhaps half a million persons, many of them Chinese, lost their lives. Subsequently, Suharto, a powerful army officer, eased Sukarno out of power. Suharto still heads the Indonesian government today.

Although Indonesia includes many islands, only about 3,000 are inhabited. The most important island groupings are Sumatra, Kalimantan (Borneo), Irian Jaya, Sulawesi (Celebes), Java and Madura, Bali, East Nusa Tenggara, West Tenggara and Moluccas (Figure 1). Administratively, Indonesia is divided into 27 provinces (propinsi) including Timur Timur (East Timor). Each province contains between 4 and 35 districts (kabupaten) which are subdivided into subdistricts (kecamatan). Subdistricts are further subdivided into villages (kelurahan desa), and small settlements (kampung). Most villages are led by a lurah (village headman) who acts as an intermediary between the villagers and the regional and central bureaucracys as well as overseeing local concerns.

The Indonesian islands are covered with mountains, many of which are volcanic. The terrain tends to be harsh and is dominated by steep, uncultivated slopes, tropical forests, and vast tidal swamps, although conditions vary from island to island. Where cultivable lowland does exist, it tends to have very rich soils, some so fertile that for centuries double-cropping has been possible without the

*The Outer Islands include all those islands outside of Java and Madura.

Figure 1.



Provinces, 1971

1 Aceh
2 Sumatera Utara
3 Sumatera Barat
4 Riau
5 Jambi
6 Sumatera Selatan
7 Bengkulu
8 Lampung
9 D.K.I. Jakarta
10 West Java
11 Central Java
12 D.I. Yogyakarta
13 East Java
14 Bali
15 Nusatenggara Barat
16 Nusatenggara Timur
17 Kalimantan Barat
18 Kalimantan Tengah
19 Kalimantan Selatan
20 Kalimantan Timur
21 Sulawesi Utara
22 Sulawesi Tengah
23 Sulawesi Selatan
24 Sulawesi Tenggara
25 Maluku
26 Irian Jaya

FIGURE 1. MAP OF INDONESIA SHOWING PROVINCES, 1971 *

* Does not include East Timor.

aid of chemical fertilizers or animal manures. Only about 9 percent of the total surface area is cropped (as compared to 25 percent on Taiwan), and most of this is planted to food crops. Of the total, 75 percent is devoted to food crops, primarily rice and corn, but also including cassava, peanuts and soybeans. The remaining 25 percent is used for the production of "estate" export crops including coffee, tea, sugar, rubber and oil palm. Forestry is also an important industry, and strong efforts are being made to develop indigenous processing plants. Plywood production in 1981 totaled 1.4 million cubic meters and is certain to rise in the future.

The Indonesian climate is highly influenced by its equatorial location, although the monsoon does affect different islands to varying degrees. Temperatures are roughly constant, ranging between 70-90° F. Rainfall tends to be urographic, convectional, intense, and non-seasonal. Some parts of Indonesia experience distinct wet and dry seasons (E. Java has a dry season June-October), but most areas receive rainfall throughout the year. Rainfall averages about 2,500 millimeters, but may be as low as 700 and as high as 7,000 millimeters depending on the location. Thus, agricultural seasons are not generally fixed, and planting and harvesting takes place throughout the year. Where transport facilities are adequate, this has helped Indonesia to avoid problems of oversupply at harvest and price rises prior to harvest.

At least 49 major ethnic groups inhabit the archipelago, making for immense cultural diversity. Currently, Indonesia has a total population of about 147 million persons (1980 census), making it the fifth most populous nation after China, India, the U.S. and the Soviet Union. Population growth has tended to be high, leveling out to a steady 2.3 percent annual growth in the 1970s. Although the population density is moderately high at 77 persons/sq. km., distribution is very unequal. The Outer Islands have a population density of about

40 persons /sq. km., while Java has over 690 persons/sq. km. Java has only about 7 percent of the total land area, but it supports 64 percent of the population. The uneven population distribution is partly explained by the focal position Java has historically filled as a center of commerce and administration. Major cities, such as Jakarta, Bandung, Semarang, Surabaya and Yogyakarta, are located there. Perhaps more importantly, Java has a high proportion of fertile paddy land, much of which supports multiple crops of rice annually. Java can, in a manner of speaking, be considered the bread basket of Indonesia.

At present, about 31 million persons, or 61 percent of the total labor force, is directly employed by agriculture. Thus, except for urban centers, a majority of the population makes its living from agricultural enterprises. Land holdings tend to be very small, typically well below 1 ha. per farm family, and some have holdings as low as 0.2 ha. Agriculture, and rice growing in particular, make very intensive use of labor. This helps to provide a meager living, even for those who are landless. Many farmers with very small holdings earn a large portion of their income from household sidelines such as vegetable gardens or small livestock. Tenancy is widespread, with about 60-70 percent of cultivated land owned by only 10 percent of the population. Tenancy rates vary from area to area, but probably average about 30-40 percent of all farm families. Small land holdings, high tenancy rates and an abundance of landless laborers all contribute to serious problems of income distribution and malnutrition. Although the government has made some effort to relieve the plight of small and landless farmers through the instigation of programs offering extension education and agricultural inputs, much more needs to be done. This effort is especially important because the small farmers are the backbone of Indonesian rice production.

II. The Statistical System

The Indonesian statistical system is generally organized along the lines of most Asian statistical systems; that is, a central agency coordinates while satellite agencies submit data for particular categories. However, coordination between the center and the periphery agencies is sometimes minimal. Other agencies maintain their own statistical collection apparatus and methods, so there are usually several competing series for every data category. Unfortunately, not all of the series are readily available, often making direct comparison difficult. In addition, Indonesia lacks the historical tradition of statistical reporting found in such countries as Japan or India. Although the Dutch collected rudimentary statistics, they were biased towards income-producing estate crops, and in any case the Dutch made little effort to include Indonesians in the planning phase of statistical collection. In the following section we will discuss the development of the collection of agricultural statistics in Indonesia and the peculiarities of particular data categories associated with rice.

Regular collection of statistics in Indonesia did not begin until 1920, although some figures for cultivated area, total sawah area and total rice production were collected from 1916 onwards. In the pre-war era, data were largely limited to Java and Madura, while for all practical purposes information for the Outer Islands is nonexistent. This is, of course, because Indonesia as a distinct national entity was not created until after the war and because the Dutch, exerting only nominal control over the Outer Islands, were only able to regularly collect statistics for Java and Madura. For this reason we present historical and post-WW II data for Java and Madura, while our data series for Indonesia begins after WW II.

The Dutch focused the collection of agricultural statistics on commercially

important export crops such as sugar, coffee, tea and indigo and to a lesser extent on the accurate assessment of cultivated land that formed the basis for the calculation of the local land tax. Numbers were relatively easy to collect since the Dutch controlled the land on which estate crops were produced. With the exception of the important food crops rice and corn, little attention was paid to other agricultural commodities. Rice area statistics, because of their association with the land tax, are probably more accurate than those for production.

The Dutch generally relied on the local elite for primary data collection, as they did for other political interactions with the general populace. Statistical collection methods were not consistent from area to area, and local collectors were not supervised. Because of this, a strong, well-organized bureaucracy for the collection of statistics, like those in India under the English, or in Taiwan under the Japanese, never developed.

In 1950, with the official creation of the Indonesian Republic, statistical collection, with the Biro Pusat Statistik (BPS) (Central Statistical Bureau) as head, was revived. BPS cooperates with the Ditjen Pertanian Tanaman Pangan (DPTP)(Directorate General of Food Crops, Ministry of Agriculture) to collect rice statistics. In addition, BULOG (the food planning agency), various other line programs associated with paddy production (for example BIMAS, INMAS and INSUS), and the President's Palace (Bina Graha) also collect and compile rice statistics. Although BPS ostensibly coordinates its activities with the other agencies (with the exception of the President's Palace, all other agencies report their findings to the President's Palace, where the data is placed on a computer file for planning purposes and is not made public), in practice, such cooperation seldom exists. Estimates from the different agencies can be

widely divergent, creating a frustrating problem for users of Indonesian statistics. However, most general users need not concern themselves with this problem, as only BPS estimates are easily available. The other agencies--DPTP, BULOG and the line programs--produce statistics largely for their own internal planning purposes, and such estimates are seldom published in a systematic way in English. BPS, as one of its ordinary services, regularly publishes general statistical compendia for public consumption, which are considered to be the standard statistical references. The two most important sources are the annual publication The Statistical Pocketbook of Indonesia and the more recent Statistical Yearbook of Indonesia.

In addition to its responsibilities as a centralizing agent, BPS also administers regular, decennial, country-wide population and agricultural censuses. Population censuses have regularly occurred, with the exception of the 1940s decade. The agricultural census was initiated in 1963, primarily as a means to help inventory agricultural resources and to study interrelationships between farmers and resources. The agricultural census is also an important source for statistics not normally collected on an annual basis.

BPS and DPTP, the primary agencies gathering rice statistics, rely on a hierarchical system of collection for primary data generation. Both agencies maintain parallel offices at the kecamatan level, where primary data is gathered at the village level from village lurah. Reports are made on a weekly basis for Java and Madura where staffing is better and on a monthly basis for the Outer Islands. In addition, three annual crop cuttings are made for the purpose of yield estimation, although official crop estimation procedure changes frequently as the capacities of the statistical and extension systems continue to improve.

BPS, as the coordinating agency, is responsible for the aggregation of rice

statistics at the national level, and it publishes the only official, national-level rice production, area and yield series that appear in government statistical publications. To a certain extent, BPS is dependent on the DPTP Extension Service data collection apparatus, especially in the Outer Islands, where BPS is understaffed. However, as mentioned, although the two agencies exist in tandem, cooperation can be problematic, and, depending on the locality, collection methods may differ while final estimates can be drastically divergent. DPTP lower level series serve as the main basis for most regional government planning decisions regarding fertilizer distribution and the like. DPTP also publishes occasional numbers for specific provinces or districts. The quality of DPTP data tends to be irregular, but BPS adjusts DPTP numbers that it uses for consistency.

Another problem associated with non-cooperation between the two agencies is that they tend to be out of phase when making changes in how data is collected, and for some years data may not be strictly comparable. For example, in 1977 BPS changed its original definition of sawah area (land actually planted to rice, excluding bunds) to include bunded land. Thus, rice area appeared to increase, while yields decreased. DPTP did not make this adjustment in its data collection procedure until several years later.

Not only are there inconsistencies between BPS and other series, but there are historical inconsistencies within the BPS rice area, production, and yield series. Specifically, political instability during the early years of the Indonesian republic, including the period of regional pacification in the early 1950s and the 1963-65 period of hyper-inflation, caused severe disruptions in statistical reporting, with subsequent declines in the quality of the reported data for those periods. Efforts in the early 1970s to improve the overall quality of statistical collection and data analyses by instigating the use of

modern sampling techniques, substituting crop-cutting for interviews in the determination of yields, and the introduction of computer technology have made post-1970s and pre-1970s data somewhat non-comparable. Important definitional changes to improve the accuracy of raw data were also instigated at this time. Most of these changes only concern sawah land. The most important definitional changes include the following: In 1971 bunded area was excluded from sawah area estimates; in 1970 BPS substantially modified its procedure for estimating sawah yields for Java and Madura; in 1977 bunded area was included in sawah area estimates; in 1977 production estimates were made in terms of gabah rather than in stalk paddy. These definitional changes are noted in more detail in the footnotes to the tables.

Area, production and yield statistics are reported in total, are broken down into padi sawah (wet land paddy) and padi ladang (dry land paddy), and are widely available down to the province level. At the national level, area is generally reported in hectares for both planted and harvested area, and production in metric tons of dry unmilled rice (gabah kering). Prior to 1977, at the lower levels, rice production was reported in dry stalk paddy (padi kering), the traditional form for unprocessed rice in Indonesia. Currently, with the introduction and popularization of the sickle in place of the ani-ani for rice harvest, production is reported in dry gabah (rough rice). Indonesia is peculiar throughout Asia for measuring rice production in stalk paddy form (the panicle of unhusked rice, with a short piece of straw attached). This problem is compounded by the fact that the Indonesian term padi is frequently translated into English as paddy, a common term for unmilled rice. Statistics for most other important food and estate commodities are also regularly published, including maize (jagung), cassava (ubi kayu), sweet potatotes (ubi jalar),

peanuts (kacang tanah) and soybeans (kacang kedele).

Currently, at least three agencies, including DPS, DPTP and the Department of Public Work and Electric Power (DPWEP), collect statistics for irrigated area, although no regular year-by-year series exists. In addition, many irrigation projects sponsored by the Indonesian government or international agencies make their own estimates. BPS probably collects the most reliable numbers during its agricultural census. DPTP numbers frequently remain constant through time, while DPWEP figures for some provinces show a greater irrigated area than the total cultivated area of the province, making these estimates suspect to say the least.

Since 1979, BPS has regularly included complete breakdowns of total irrigated area by province and by types of irrigation, including technical irrigation, semi-technical irrigation and village/simple irrigation (for a definition of these terms, see p. 26). Unlike many other countries, Indonesia's irrigated area figures are for total planted and irrigated, not cultivated area. This is probably due to the frequency of multiple cropping throughout most of the important rice growing regions in Indonesia. Breakdowns of irrigated areas by crop are not available prior to the 1970s, although we may assume almost all irrigated area was planted to rice. Evidence suggests that currently perhaps as much as one half of the 150,000 ha. sugar cane crop may be irrigated, but this would account for only a small fraction of total irrigated area in 1978 (2 percent).

Indonesian rice price statistics are generally rather difficult to work with, especially if the researcher is interested in the price spread between farm-gate prices and retail market price. Prices tend to be inconsistent through time, and it is difficult to choose a representative rice price for Indonesia as

a whole because of the size and diversity of the Indonesian rice market. Problems associated with rice price statistics will be discussed in detail to give the reader some basis for choosing an appropriate series.

There are many agencies that regularly collect rice price statistics such as BPS, DPTP, BULOG, line programs and other media sources including newspapers and radio, each with its own particular bias. Prices are regularly collected through random interviews at the farm gate (harga produsen) and at major city markets (harga konsumen) on a weekly or daily basis and aggregated monthly. Prices are generally reported in rupiahs/quintal of rice for wholesale prices and rupiahs/kg. for retail prices. These series are widely available on a monthly and annual basis. Prices are usually differentiated by quality of rice (e.g., Bulu) and may be an average for all of Indonesia or for major markets. True farm harvest price series are not generally available, except for recent years. Although a regular series for Java and Madura titled "Prices of Food Articles in Rural Markets of Java and Madura" is available in most standard statistical sources, it really represents a retail price for rice in rural markets. In many years this price is higher than retail prices for major cities (for example, compare Java and Madura farm harvest price series and retail price series 1949-1965). Procurement price series are very difficult to obtain as BULOG rarely releases numbers. Since rice may be procured in milled or rough form there are two separate prices (most government purchased rice is milled). Procurement prices for rice bought through cooperatives (KUD) are also slightly higher than for rice bought from middlemen.

The historical rice price series for Java and Madura goes back to the early 1920s. Although it is quite complete, it suffers from the same problems as the modern series. Prior to 1940, rice prices were reported in Dutch guilders/liter,

kg. or quintal (centaar).

Some of the problems readers should keep in mind when comparing Indonesian rice price statistics include the following: Price spreads for different qualities of rice are large. Bulu, the #1 rice, commands a much higher price than Cere, a commercial grade of rice. While rice prices for Jakarta as the main market are easiest to obtain, they may not be representative of Indonesia as a whole. The correlation between prices on Java and Outer Island cities seems to be quite low. This is probably because of differences in production, marketing, transport and associated costs. Since Indonesia has been subject to several periods of hyperinflation and governmental disruption, rice prices, as a sensitive barometer of economic health, tend to rise and fall rapidly within single years. A better indication of trends may be obtained by averaging several years to smooth out rapid rises in price. It is difficult in many cases to distinguish retail prices from wholesale and farm gate prices. Retail prices for Javanese city markets are easiest to obtain and probably contain the most reliable price data, but main market (Jakarta) and average market prices for rice are not comparable. We have used a main market series for wholesale prices in tables because no "average" series is available. As is obvious from comparing market wholesale and average Javanese retail prices in both the Java and Madura and Indonesia tables on a year-by-year basis, main market prices are sometimes slightly higher than retail prices. This indicates a possible lack of correlation between Jakarta prices and prices in other Javanese markets (also indicating problems with the collection procedures). Thus, the reader must use careful judgment when comparing price series, especially for the pre 1970s.

Rice imports, as with other rice statistics, are collected by a variety of agencies. The BPS import series is the most widely available (used in the

Indonesia and Java and Madura tables), but it tends to record rather low imports, especially for crisis years. For example, during the political upheaval 1961-1964 BULOG numbers place imports at over 1 million metric tons, while BPS shows low import levels except for 1964. (Part of the difference in the two series may be explained by BULOG's use of the April-March fiscal year and BPS's use of the calendar year.) BULOG estimates are probably more reliable (Table 1), but were not used in the tables because they are not widely available. The differences among most rice import series, especially for the earlier periods, are probably explained by rice importing in the Outer Islands. Although all rice imports are contracted by the central government, provincial governments had some leeway in dealing directly with rice exporters. Rice imports are reported on an annual basis in milled rice in metric tons. Under Dutch rule, rice imports were divided into milled rice (rijst gepelde) and unmilled rice (rijst ongepelde).

Although BPS does collect wages for a variety of agricultural tasks, the figures are not aggregated past the kabupaten and are not published for public use. In place of paddy worker wage rates, average estate wage rates are reported in the tables. Although this series cannot replace paddy worker wage rates, it should follow basic trends of agricultural wage rates.

III. The Rice Economy

a. Rice Production

The production and marketing of rice exerts a substantial influence on every sector of the Indonesian economy and society. Rice provides the bulk of all calories consumed by every income level in Indonesia. The production of rice employs almost all rural Indonesians during at least part of the year.

Table 1. Indonesian Rice Imports, 1911-1974.

Year	Imports (metric tons)	Year	Imports (metric tons)
1911	620,000	1961	1,063,760
1921	764,000	1962	1,024,800
1931	608,000	1963	1,042,800
1941	82,000	1964	1,009,700
1950	334,400		
1951	528,900	1966	308,500
1952	765,800	1967	353,800
1953	292,874	1968	628,400
1954	256,619	1969	604,200
1955	125,000	1970	956,600
1956	624,576	1971	489,900
1957	554,122	1972	734,500
1958	920,980	1973	1,656,700
1959	891,019	1974	1,070,800
1960	893,843	1975	627,700
		1976	1,280,800
		1977	1,964,100
		1978	1,852,300
		1979	1,949,400
		1980	2,049,500*

Source: BULOG. From Mark Pitt, Economic Policy and Agricultural Development in Indonesia, Ph.D. thesis, University of California, Berkeley, 1977, p. 37 and Leon Mears, The New Rice Economy of Indonesia (Yogyakarta: Gadjah Mada University Press, 1981), p. 502.

*preliminary

Because the price of rice in urban markets is frequently an important factor in the popularity of the government, successive governments since the Dutch have been interested in manipulating the supply and pricing of rice. However, early efforts at intervention were made on a small scale and had little effect on the market.

Initially in the post-WWII period, policy emphasis was heavily tilted towards the vocal urban consumer groups, especially the army, at the expense of the farmers. Efforts were made to maintain low rice prices in the cities, while farmers were pressured to sell rice at low and unprofitable prices. Government investment in the rural sector was negligible; yields stagnated; and production did not keep pace with high population growth. This downward spiral necessitated ever increasing rice imports that drained away capital needed to accelerate development in other areas of the economy. In the late 1960s, the government began to amend its basic policies to accommodate the needs of rice farmers. The government hoped that this would increase production and hence supply. This signaled a shift in emphasis from the demand side to the supply side of the rice economy. Farmers became the target of large-scale, mass programs to improve rice production, mainly through the supply of modern inputs, particularly fertilizer and water, and for the first time a minimum guaranteed floor price for rice was enstated. The Indonesian government, through BULOG the official food logistics agency, is still struggling to maintain an equitable balance between the producers' needs and the demands of politically powerful urban consumers.

In the following section we will discuss the production and marketing of rice in Indonesia, while emphasizing the key role the government has played in the manipulation of the rice economy. Finally, we will summarize the effects of government intervention and recent production gains on patterns of rice consumption in Indonesia.

Rice has been grown throughout Indonesia for many centuries and has been a staple food along with cassava and later corn. Most traditional varieties were indica rices and were low yielding, although suited to the particular ecosystem in which they were grown. The most important rice-growing area was centered on Java and surrounding islands. For the pre-war period, our discussion is limited to Java and Madura because of the limitations of Dutch statistical collection.

The pre-war period is characterized by slow, but steady expansion of rice area with attendant growth in production, but very low gains in per hectare yields. Between 1920-22 and 1936-38, rice area grew at an annual rate of 1.3 percent, while yields only grew 0.7 percent annually. In the pre-war period, Java, like so many other parts of Southeast Asia, was heavily dependent on the opening of new land to both provide employment and to increase rice supplies for the growing population. Surprisingly, total cultivated area grew at approximately half the rate of rice area (0.7 percent) during the same period. Between 1925 and 1938, rice as a percent of the total cultivated area rose from 46 percent to 55 percent, indicating that almost all new cultivated land was being used for rice production. During the pre-war period sawah (puddled, lowland rice) accounted for 95 percent of rice production and about 90 percent of area. Rice area, yield and production dropped drastically during the Japanese occupation. In 1946, yields were at their lowest level ever of .82 mt/ha milled rice. However, in the post-war period, recovery was very rapid, and average yields quickly surpassed the pre-war level. By 1954, yields had reached 1.16 mt/ha milled rice.

In the post-war period, rice area on Java initially continued to expand at about the same rate (1.3 percent) as in the pre-war period, but by 1960, area under rice began a decline that continued to the 1970s. The introduction of "green revolution" technology in the 1960s and increases in the already high

Table 2. Growth in Indonesian Rice Area, Production and Yields, 1952-54 to 1977-79.

	Java			Indonesia			Outer Islands		
Rice	1952-54	1977-79	Annual Percent Growth	1952-54	1977-79	Annual Percent Growth	1952-54	1977-79	Annual Percent Growth
area	4019	4598	.5	6397	8713	1.2	2378	4115	2.2
yield	1.11	2.23	2.8	1.13	1.96	2.2	1.7	1.65	1.4
production	4469	10,270	3.4	7262	17,091	3.5	2793	6821	3.6
Sawah	1952-54	1976-78		1952-54	1976-78		1952-54	1976-78	
area	3776	4272	.5	5313	7376	1.3	1537	3104	2.9
yield	1.14	2.24	2.7	1.22	2.09	2.2	1.43	1.87	1.1
production	4314	9588	3.2	6511	15,375	3.5	2197	5786	4.0

Source: Indonesia and Java and Madura tables.

multiple cropping index allowed Java to improve yield rates, although rapid growth did not begin until the late 1960s and early 1970s (yields rose from 1.24 mt/ha milled rice in 1967 to 1.91 mt/ha milled rice in 1971) when the government began to invest heavily in the dissemination of knowledge and inputs in the rural areas. Javanese rice production grew at an annual rate of about 3.4 percent between 1952-54 and 1977-79 (Table 2). (This growth rate is biased upward because of changes in statistical reporting made in the early 1970s. See Java and Madura table Footnotes T, W and aa.) Although most of the gains in production have largely been cancelled out by equally large population growth, the attainment of a 3 percent growth rate is very impressive, especially considering the land constraints that Java operates under. Most other Southeast Asian countries (including the rest of Indonesia) have, until recently, been able to depend on increases in cultivated area to fuel production gains.

Post war statistics for Indonesia as a whole exhibit the same trends as those for Java alone. This is because over 60 percent of the Indonesian rice crop is produced on Java, although Java has only 8 percent of total cultivated land. Thus, the influence of Java on Indonesian rice statistics is marked. For example, Indonesian rice production grew at 3.5 percent per annum between 1952-54 and 1977-79 (Table 2). This is very close to Java's average growth rate of 3.4 percent for the same period. When Java is netted out of total rice production, the growth rate for the Outer Islands for the same time period is slightly higher at 3.6 percent. Rice production on the Outer Islands grew somewhat faster than for Java because of the opening of new land. Average yields for the Outer Islands at about 1.65 mt/ha milled rice for the late 1970s still remain markedly lower than the 2.23 mt/ha milled rice average attained on Java. Clearly, Indonesia as a whole has been very dependent on regularly improving yields on Java to

increase production. Scope for further rapid improvement at an economical price on Java is limited, and most future gains are likely to accrue from some of the more marginal rice lands outside of Java.

Rice farming in Indonesia is family oriented and very labor intensive, especially on Java. Rice is typically grown in small paddy fields averaging less than 1 ha. in size, and most rural families grow some rice, although increasingly income is provided by household sidelines.

Indonesian farmers use a curious blend of traditional and modern techniques in the production of rice. For example, until recently, rice was harvested by women using an ani-ani, a sickle-shaped knife. Women laborers cut each stalk of padi separately and bound it into bundles that were set out to dry in the sun. (However, modern rice varieties shatter easily. Thus, "stalk" paddy is rapidly disappearing and the ani-ani knife has largely been replaced by the sickle.) In exchange for their labor they received a fixed share of the crop. The rice harvest has traditionally provided many jobs for landless laborers and for poor city people who migrate to the rural areas during harvest time. On the other hand, many Indonesian rice farmers make extensive use of modern inputs, including chemical fertilizers, pesticides and herbicides, as well as modern irrigation systems. The Indonesian government funds an extensive program for rice research and the development of new varieties, and Indonesia has worked extensively with IRRI staff. IR8 (Peta Barn 8) and IR5 (Peta Barn 5), two of the short, stiff-strawed, nitrogen-responsive IRRI varieties, were first released in the 1960s. Following the outbreak of wereng (brown plant hopper) in the mid 1970s, a resistant variety, IR36, was rapidly adopted. This variety matures in only 100 days, which made it possible to increase the area triple cropped on Java.

Rice is grown and harvested throughout the year as Indonesia has a 365 day

growing season. The availability of sufficient supplies of water, rather than sunlight or temperature, is the limiting factor in rice production. The main rice harvest peak takes place April-June, which is the end of the "wet" season on Java. Only about 55 percent of the total crop is harvested during this period.

About 94 percent of all rice output is produced on sawah (puddled) lands, with the bulk under dryland or ladang conditions, primarily on less developed, hilly land. Twelve provinces produce 90 percent of Indonesia's rice, with Java the most important (64 percent). Other important provinces include Aceh, Sumatera, South Kalimantan, South Sulawesi, Bali and West Nusa Tenggara. As mentioned, the potential for increasing production in the Java area is very low, so that future increases are likely to come from the non-Java area, particularly Kalimantan and Sulawesi.

From 1973-75 to 1977-79, Indonesian rice production grew at the phenomenal rate of 4.5 percent per year. Production skyrocketed to 17,872 thousand metric tons of milled rice in 1979, and the 1980 and 1981 rice harvests were particularly abundant. Improved harvests can primarily be attributed to the use of inputs, especially substantial rises in fertilizer application, irrigation advances, and additional hectarage under HYVs, as well as favorable weather conditions. Part of the credit for the increased use of modern inputs can be attributed to the instigation of specific government programs to make inputs available and encourage their use. The original program, BIMAS (Mass Guidance), was initiated in the 1968/69 wet season in Java when the Swiss CIBA firm contracted with the Indonesian government to provide inputs and extension services for 300,000 ha. of paddyland. Later, under government management, BIMAS provided the farmer with an input package and the credit to purchase it, as well as timely advice from experts on its use. Payment was to be in kind (later changed to cash). BIMAS

had several important logistics problems that hampered its usefulness. BIMAS was inflexible in that everyone received the same inputs, and some questionable practices such as mass aerial pesticide sprayings (including humans and livestock) angered farmers. In addition, BIMAS credit was difficult to get at the appropriate time. The government realized that BIMAS was not reaching enough farmers and instigated an alternate program called INMAS. INMAS still made advice and inputs available, but the farmer obtained his own credit. This program proved more suitable to farmers' needs and, in 1979, 66 percent of the total area under government programs was in the INMAS program. By 1979, two-thirds of rice area was under INMAS and BIMAS programs, but serious management problems continued to plague the execution of the programs. In 1979, the government instigated an additional program, INSUS, to improve linkages between farmers, cooperatives, and government staff.

Chemical fertilizer use on paddy fields in Indonesia is only moderate by Asian standards. Currently, about 150 kg. are applied per hectare. Little use is made of organic material (compost or cover crops) because of the low number of livestock and the high multiple cropping index (fields are seldom fallowed). Currently, about 20 percent of total annual fertilizer consumption is applied to estate and industrial crops, with the bulk applied to food crops. Rice accounts for about 90 percent of the fertilizer applied to food crops. Fertilizer use is concentrated on the Javanese rice crop, which accounts for 64 percent of the total tons applied (Table 3).

Prior to the 1970s, fertilizer use on rice was very low, even by world standards. Probably less than 40 percent of the paddy crop received any fertilizer at all while it is estimated that 100 percent of sugar cane and oil palm area was fertilized. In the 1970s, with the instigation of the BIMAS and INMAS programs and heavy government subsidy of fertilizer prices, Indonesian fertilizer use

Table 3. Fertilizer Usage on Indonesia and in Java and Bali.

	Total Indonesia		Food Crops* Indonesia		Bimas-Inmas Indonesia		Food Crops* Java & Bali		Rice Java & Bali	
year	tonnes	percent of total	tonnes	percent of total	tonnes	percent of total	tonnes	percent of total	tonnes	percent of total
1970	589,434	100	439,431	75	395,069	64	375,069	64	n.a.	n.a.
1971	589,831	100	507,353	85	469,203	79	449,745	76	426,709	72
1972	849,221	100	558,251	66	528,274	62	500,621	59	482,894	57
1973	954,917	100	832,096	87	802,798	84	723,175	76	675,318	21
1974	1,060,086	100	875,418	83	796,943	75	737,813	70	648,388	61
1975	1,126,673	100	920,551	82	902,898	80	809,365	72	710,657	63
1976	1,143,635	100	914,085	80	873,027	76	799,019	70	695,563	61
average percent		100		80		75		70		64

*Food crops include rice, maize, soybeans, cassava, peanuts, sweet potatoes, vegetables etc.

NOTE: In 1970 the Ministry of Agriculture began for the first time to systematically collect and publish fertilizer data.

Collected Fertilizer Data for Indonesia (Kumpulan Data Pupuk Indonesia) 1964-1975, Sekretariat Panitia Urusan Pupuk, Ministry of Agriculture, Jakarta, May, 1976.
Fertilizer Marketing, Distribution and Use in Indonesia, ARSAP, ESCAP, Bangkok, January 1978, pp. 44, 73, 75.
Badan Kengendali Bimas, Archive records. Ministry of Agriculture.

Computed by: Anas Rachman and Roger Montgomery, "Asian Fertilizer Demand Reconsidered: An Application to Java and Bali," Ekonomi Dan Keuangan Indonesia, Vol. 28, no. 3 (Sept. 1980), pp. 239-271.

increased dramatically. Between 1970 and 1974, fertilizer use rose from 589,434 metric tons to 1,060,086 metric tons (Table 3), and the increase was equally impressive on Java. In the middle 1970s, fertilizer use stagnated, although recently it has begun to grow once again (Table 4). The rapid increase in fertilizer application in the early 1970s was largely caused by the introduction and popularization of HYVs. Although HYVs are high yielding, large fertilizer applications are needed to attain those yields.

Urea and triple superphosphate are the main fertilizers used on rice. Fertilizer is primarily distributed through the mass program (76 percent in 1976) under government monopoly, although in 1976 the government permitted private enterprise to retail fertilizer for the first time. The government attempts to set fertilizer prices by equating the price of fertilizer with the price of rice (see rumus tani, p. 31). Currently, Indonesia is largely self-sufficient in urea and, in fact, began exporting in a small way in 1977, but must still depend on imports for supplies of phosphatic fertilizers.

Since water, not temperature, is the limiting factor for multiple cropping, advances in irrigated area have played an important role in increasing yields throughout Indonesia. Currently, about 4 million ha. of sown area are irrigated, although not all the facilities are operable during dry years. Irrigated area is concentrated on Java, accounting for more than 50 percent of total irrigated area. The scope for increasing irrigated area on Java is largely exhausted so that future gains are likely to be on the Outer Islands. Most of Indonesia's irrigation water is collected from surface sources and the potential for tapping ground water supplies is low.

The Department of Public Work and Power (DPWP) is responsible for the planning and instigation of new projects as well as the management of ongoing

Table 4. Estimated Fertilizer Consumption for Rice*

by Nutrient Weight
(tonnes)

	Indonesia	Java & Madura	Java & Madura as a percent of total
1965	74167	64305	87
1966	67176	56615	84
1967	38566	35581	90
1968	97067	88165	91
1969	155813	135866	87
1970	159725	135138	85
1971	183493	160882	88
1972	204876	181687	89
1973	307004	263815	86
1974	317249	262221	83
1975	342101	289926	85
1976	355783	301523	85

*Rice assumed to use 80.96% of total food crop consumption.

Source: IBRD Report No. 624 INO, Indonesia - Appraisal of Second Fertilizer Expansion Project, Feb. 1975.

government projects. DPWP divides irrigated area in Indonesia into three broad categories: technical, semi-technical and simple. Technical refers to permanent structures with separate supply and drainage systems. There are measuring devices to control water flow and most technical systems are large scale. About 45 percent of all irrigated area is classified as technically irrigated. Semi-technical refers to permanent facilities with little capability to measure water flow, and the supply and drainage systems may not be separate. Semi-technical area accounts for about 23 percent of total area. Distinctions between technical and semi-technical areas are rather shady, and it is probably better to group the two categories together. Village or simple systems have no measurement facilities, and water is recycled since separate drainage systems are usually not present. Simple systems are generally small scale and are managed by village units.

Investment in irrigation since WW II has been concentrated on basic rehabilitation projects rather than on the construction of new facilities. Prior to WW II, the Dutch had built many large irrigation facilities to water estate crops, especially sugar. After the war and the loss of Dutch management capabilities, these systems deteriorated rapidly. Aid to Indonesia for irrigation projects, primarily from the World Bank, was targeted for rehabilitation of these facilities, particularly on the west coast of Java. Since the mid 1970s, the government has invested more effort in encouraging village organizations to improve the management of routine maintenance procedures.

b. The Marketing of Rice

Government intervention in the marketing and pricing of rice in Indonesia has been an important aspect of policymaking since the 1930s and continues to be

one of the most prominent issues today. Dutch involvement began in the 1930s after an exceptionally good rice harvest throughout Asia in 1930 and the onset of the world depression sent rice prices plunging, wreaking economic havoc throughout Indonesia. Actually, the problems plaguing the rice economy reached much deeper than the superficial influence of the world depression. The two most important factors were the heavy emphasis that the Dutch placed on estate crops at the expense of food crops and self-sufficiency, and the growing complexity of the indigenous rice market (caused by rapid population growth and urbanization).

Rice production had barely kept abreast of population growth since at least the early teens, and by 1920 Java had become a large net rice importer by Asian standards (about 200,000 metric tons per year). The margin between self-sufficiency and the yearly shortfall widened rapidly, necessitating ever increasing imports. Rice imported from the Southeast Asian mainland proved to be much cheaper than rice produced on small, labor intensive Javanese family farms. The comparatively low price of imported rice and the effects of the Depression sent farm prices spiraling down to the point where farmers were unable to pay their annual land taxes. Production dropped from an all time high of 4,450 thousand metric tons in 1930 to 3,685 thousand metric tons in 1934. Although Dutch policy prior to this time had been to minimize interference in the local economies, the magnitude of the problem, including slumping prices and stagnant production, complicated by the absence of inter-insular trade, compelled them to act. The Dutch pattern of intervention, primarily through trade controls and price manipulation, concentrated on higher levels of the rice marketing chain (i.e., millers and processors rather than farmers), and emphasized consumer rather than producer needs. This set a pattern that is still being followed in Indonesia today.

Official intervention began in 1933 with the formation of a Rice Import Commission to control rice imports through the issuance of licenses, the establishment of a duty on imported rice, and the prohibition of the export of rice. The duty was primarily assessed to fund the instigation of inter-insular rice trade between the rice deficit areas and the rice surplus areas. In 1939, the Stricting Het Voedingsmiddelenfonds (VMF), Indonesia's first food logistics agency, was formed to oversee rice imports, to set ceiling prices, to hold government stocks, and to make procurements to ensure that price levels were maintained. The VMF chose the rice mill as the most appropriate link in the marketing chain, and subsequently all rice mills came under central control. Although the extent of Dutch influence on the rice economy at the time is unknown, they do seem to have been relatively successful at maintaining low rice prices and promoting a pattern of inter-insular rice trade. Perhaps more important was the effect on post-war Indonesian rice policy.

When the Dutch reoccupied Java in 1948, they reestablished the VMF to oversee rice policy. Although the Indonesian government changed the name VMF to Jajasan Bahan Makanan (BAMA) in 1950, they kept its basic functions intact. Under the new Indonesian government, rice began to take on the political importance that it still has today. The government used rice to strengthen its fledgling hold on power by distributing rice rations through BAMA to a large and growing functionary group including the army, police, government bureaucrats, and government plantation workers. A preoccupation with the politically powerful consumer groups at the expense of producers set a pattern of intervention that was to continue until the late 1960s.

As under the VMF, rice mills were required by law to provide BAMA with milled

rice, but low procurement prices left the government with insufficient supplies. Since the government needed increasing amounts of rice to fulfill distribution responsibilities, it was left with inadequate stocks to defend ceiling prices, and urban market prices rose rapidly. In 1952, the government dissolved BAMA and introduced Jajasan Urusan Bahan Makanan (JUBM). The main difference between BAMA and JUBM was that JUBM procured rice from regional purchasing organizations rather than from the rice mills directly, and all rice mills were prohibited from milling rice for private sale.

Initially, JUBM was successful at reducing rice prices and stabilizing import levels, but it quickly became apparent that JUBM's success was largely due to good harvests in 1953 and 1954. In 1955, production dropped, and retail rice prices rose rapidly. The government, expecting another bumper harvest, had curtailed imports so that supplies were grossly insufficient. This scenario was replayed again in 1958 when rice prices almost doubled within the year. Each shortage and leap in prices undermined the confidence of the people in the efficiency of the government, encouraging hoarding and illegal milling of rice.

In retrospect, the problems of JUBM are probably not too surprising. Although the government altered superficial aspects of food logistics board policy, the underpinnings remained intact. Emphasis continued at the consumer or market level, while little or no effort was expended on improving rice production. The government persisted in offering low procurement prices that gave farmers no incentive to sell surplus rice to JUBM or to increase production. Yields stagnated and the government was unable to meet procurement targets. The continuing need for large supplies to distribute to the army and police deprived JUBM of rice needed to support ceiling prices during shortfall years. JUBM was forced to rely on large and growing imports that became increasingly difficult to finance.

Although prices stabilized briefly in 1959, from 1960 until the collapse of Sukarno's government in 1965, inflation sent prices skyrocketing. Struggling with political fragmentation, the government tried to generate support by increasing the amount of rice distributed as rations to functionary groups. To supply these needs, additional procurement was necessary, and the government began obtaining rice by compulsory sales in the rural areas. Rice imports leaped to over 1 million metric tons a year. Even these quantities were insufficient to feed the growing government bureaucracy, and JUBM was left with only small supplies for market control activities. From 1961, the rice market literally fell apart. Retail prices rose from 1,190 rp/mt (1961) to 59,275 rp/mt (1965), and prices from region to region rose independently of one another.

After the 1965 crisis and the 1,000 to 1 reevaluation of the rupiah, Indonesia entered a period of recovery and stabilization. The new government continued to supply government supporters (especially the army) with rice. Although the government maintained price stability in the market place as its primary goal, it began to make efforts to improve supply through programs designed to encourage production increases. It abandoned JUBM, creating a new food logistic agency, Badan Urusan Logistik (BULOG).

BULOG coordinates and manages programs for government intervention in the rice market through a series of sub-agencies or DOLOGS at the kabupaten level. BULOG is not responsible to any other government agencies, but communicates directly with the President's Office. BULOG has a variety of responsibilities including procurement; the maintenance of stocks used for market stabilization purposes, for distribution to functionary groups, and in cases of disaster; imports; and the setting and maintenance of annual floor and ceiling prices for rice. BULOG also maintains some of the warehouse and milling facilities it needs. As discussed

in the statistical section, BULOG collects its own statistics independently of other government organizations for planning purposes.

After the formation of BULOG, the government became increasingly interested in rice self-sufficiency. For the first time fertilizer subsidies were introduced to encourage usage. The idea of a floor price determined by the rumus tani or farmer's formula was introduced in 1968. The rumus tani, still in use today, links the price of urea to a procurement price for rice, and is an attempt to offer farmers an equitable return. The rumus tani formula says $P = \frac{1.5\ FE}{2}$

where P = price of rice/kg.,

F = C.I.F. price of urea fertilizer/kg

E = exchange rate.

1.5 is supposed to represent the distribution cost of fertilizer, while 2 is the approximate conversion of dry stalk paddy to rice. Basically 1 kg. of rice was to be exchanged for 1 kg. of fertilizer. Obviously, regional disparities in the cost of production made this formula simplistic, and initially it was applied only to the major rice growing areas, Java and South Sumatra.

BULOG still remained unable to uniformly support its floor price, and farm prices frequently fell below the minimum. This was due to the lack of suitable storage space under BULOG control, and the fact that most of BULOG's administrative energy was still directed toward price manipulation at the retail level. In spite of logistics problems, rice production still grew rapidly throughout the early and late 1970s. (Rice yields did not grow during 1975-1976 because fertilizer use stagnated.)

BULOG still experiences problems in obtaining an adequate share of the rice crop for its needs, especially in shortfall years when free market prices are

inflated and large imports, more than 2 million metric tons in some years, have been necessary. Especially since the mid 1970s, the total distributed has far exceeded domestic procurement (Table 5). BULOG's inability to adequately defend its floor price can be partially attributed to its continued responsibility toward the functionary groups. In 1969, of the total 1,132 thousand metric tons of rice distributed, 65 percent was given to functionary groups, and the army alone received 48 percent of all rice distributed (Table 5). However, recently, the share of the functionary groups has declined relative to the share allotted to market control, indicating the commitment BULOG has made to maintain stable prices. By 1979, the functionary groups received only 634 thousand metric tons of rice (27 percent), while market control took 2,036 thousand metric tons of rice, or 72 percent of the total distributed.

Currently, BULOG procures between 10 and 15 percent of total production, or about 35 percent of the gross marketed total. Since Indonesia's bumper rice harvest in 1981, BULOG has, for the first time, had no difficulties in meeting its procurement targets. In fact, BULOG's storehouses are bulging and there has been a real danger that it will be unable to defend its floor price. BULOG sets its floor price in February of each year. A standard price is set for all of Indonesia, with slightly different prices for native rices and HYVs. BULOG generally procures the lower quality HYV varieties of rice that do not command a premium on the free market. BULOG buys rice through three primary sources. These are cooperatives (BUUD/KUD), private millers, and very occasionally directly from the producer. Since the government is encouraging farmers to use cooperatives, it pays a slightly higher price to coops. BULOG maintains minimum quality standards for the rice that it buys and adjusts for moisture content.

Rice may be marketed through the free market or sold to the government for

Table 5. Domestic Distribution of Rice ('000' metric tons), 1969/70-1980/81.

		Functionary Group						
Year[a/]	Rice Procured	Civil Bureaucrats	Army	Other[b/]	State Enterprises[c/]	Market Control	Disaster Relief	Total Distributed
1969/70	244	101	543	88	141	204	55	1132
1970/71	531	96	517	92	130	228	45	1108
1971/72	562	84	496	82	105	202	106	1075
1972/73	138	94	457	97	78	768	14	1508
1973/74	268	91	461	108	92	418	30	1200
1974/75	536	95	456	112	95	342	176	1276
1975/76	539	94	462	103	90	559	87	1395
1976/77	410		669[d/]		87	979	84	1819
1977/78	404		611		82	2006	93	2792
1978/79	881		613		106	1032	112	1863
1979/80	431		634		90	2036	59	2819
1980/81[e/]	1650		710		92	1650	31	2483

[a/] BULOG operates on an April to March year.

[b/] Other represents clergymen, teachers and the like.

[c/] Wage supplements to estate workers.

[d/] 1976/77-1979/80: Total for civil bureaucrats, army and other.

[e/] Preliminary .

Sources: 1969/70-1975/76: Indonesia. Badan Urusan Logistik, Statistik Perberasan di Indonesia 1969/70-1975/76 (Jakarta: 1977) and 1976/77-1980/81: BULOG.

procurement purposes. Probably, on average, less than 40 percent of the annual rice crop is marketed.* However, the percent marketed varies from area to area and by type of rice. Surplus areas (for instance, Central and East Java) market a higher percentage of the total crop, and HYVs are more likely to be marketed then local varieties. Of the total marketed, about one third is procured while the bulk moves through free market channels. Farmers generally sell directly to private millers or collectors or market their padi through cooperatives (Figure 2). Although private mills buy the majority of padi (over 90 percent according to Sjarifuddin Baharsjah, Head, Center for Agro-Economic Research, Agency for Agricultural Research and Development, Department of Agriculture, Bogor), cooperatives play an important role in rural areas, not just as marketing agencies, but also as a go-between for farmers and the government. The primary cooperatives--Koperasi Unit Desa (KUD)--are the basic units, while Badan Usaha Unit Desa (BUUD) are quasi units that provide linkages between KUDS and farmers.

As already emphasized, price statistics in Indonesia and Java and Madura are difficult to work with. Although year by year comparisons may not be useful, the statistics do give us a general idea as to long term trends. In the pre-war period, Javanese rice prices rose slowly between 1922 and 1929. 1930 marked the beginning of a declining trend initiated by the world depression. Prices dropped from 241 guilders/mt of rice, to 113 guilders/mt of rice in 1936 and remained unchanged until WW II. Estate wage rates experienced a similar decline, indicating the extremely depressed condition of the farm economy.

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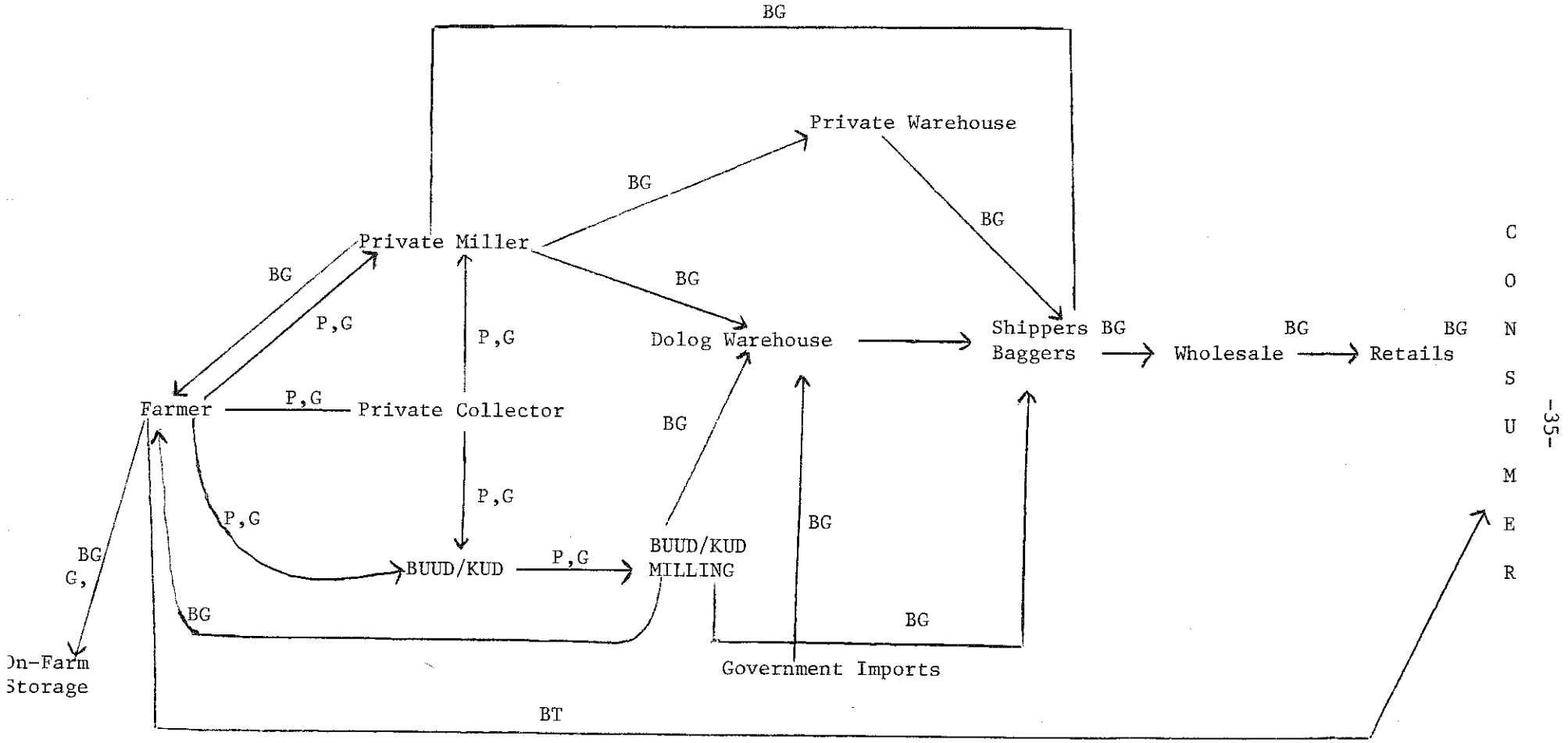
*In 1958, Leon Mears estimated that "somewhat more than 17.5 percent of the crop was marketed," while various surveys conducted during the 1970s report that, on average, between 25 and 50 percent of the total crop is marketed (Mears, The New Rice Economy of Indonesia , 1981, pp. 96-101.

Fig. 2. IMPORTANT RICE MILLING AND MARKETING CHANNELS IN INDONESIA



P stalk paddy (padi)

G rough rice (gabah)

BG milled rice (beras giling)

BT hand pounded rice (beras tumbuk)

Post-war prices between 1950 and 1965 can be characterized as regionally erratic, but in general climbing very rapidly. The retail price rose from 210 rp/mt in 1954, to 59,275 rp/mt in 1965. This astounding rise in prices can be attributed to the high rate of inflation that Indonesia experienced, especially between 1960 and 1965. After the rupiah devaluation, retail rice prices still continued to rise, although less dramatically, moving from 543 rp/kg in 1966, to 24,700 rp/kg in 1980. However, when the rice price is deflated by the index of nine basic commodities with rice removed, rice prices in fact have remained constant or declined slightly. (See Douglas Hedley, "Rice Buffer Stocks for Indonesia: A First Approximation," paper prepared for IFPRI, IFDC, IRRI Workshop on Rice Policy in Southeast Asian Countries, Los Banos, Philippines, May 1979, pp. 10-11.) If deflated rice prices for the 1970s are compared with deflated prices for non-farm goods, it is clear that rice prices have been falling relative to non-farm goods. This indicates a possible shift in income-earning power from rural to urban areas in spite of the significant rice production gains made in the 1970s.

Until 1981, Indonesia was the world's largest single importer of rice, accounting for about one third of all rice traded. All rice imports are carried out by BULOG in consultation with the President's Palace. BULOG fixes imports year-by-year based on the previous year's harvest and the predicted shortfall in procurement needs. Indonesia's principal suppliers are Thailand, Hong Kong (China), the U.S. and Burma.

In the pre-war period, rice imports to Java and Madura averaged a gross amount of about 270,000 metric tons of rice each year until the 1930s, while rice exports gradually declined until they were made illegal in 1933. In

this period, Java exported high quality rice and imported poor or medium quality rice in exchange. During the 1930s, rice imports decreased under the effects of the Depression to only 23,000 metric tons in 1938. After the war, imports rapidly rose to about 500,000 metric tons per year, surpassing 1 million metric tons during the early 1960s and the period of hyperinflation. Following the fall of Sukarno, imports were held at a minimum level because of serious economic difficulties and a lack of foreign exchange, but swiftly surpassed 1 million metric tons as oil sales increased foreign exchange earnings and BULOG had the ability to support its floor and ceiling prices. By 1980, rice imports had risen beyond 2 million metric tons. After record harvests in the 1980/81 and 1981/82 seasons, BULOG procured unusually large amounts of rice. Currently, government godowns are filled to capacity. Rice imports were reduced to only 543,000 metric tons in 1981 and will likely be below 250,000 metric tons in 1982, the lowest level since the 1950s. Although it is unlikely the weather will be as cooperative as it has been the past two years, government schemes to increase rice production and the firm commitment to support floor prices means that in the future BULOG will probably be able to procure enough rice to meet its needs, and that Indonesia will finally approach its long-time goal of rice self sufficiency.

Consumption

Rice is the single most important food source for all income groups in Indonesia, accounting for over half of all calories consumed. Although other grains (primarily corn in the rural areas and imported wheat flour in the urban areas) and cassava are also regionally consumed, the preferred food grain of all Indonesians is rice.

In the pre-war period, domestic per capita availability in Java remained

essentially stagnant at about 88 kg/person/yr as production increases barely kept ahead of population growth. The post-war period found availability at approximately the same level of 88 kg/person. Consumption also remained essentially constant, decreasing from 93 kg/person in 1954 (94 kg. estimated availability) to 89 kg/person in 1961 (80 kg. estimated availability) (calculated by Leon Mears, "Food Grain Consumption Trends and Their Effects on Food Grain Marketing in Indonesia," mimeo, 1962, p. 1). Imports accounted for a relatively small portion of total consumption, although the percentage rose rapidly in the 1960s. Mears estimates that 14 kg. of rice annually were supplied by imports. In this period, rice accounted for slightly over half of all carbohydrate consumption. The bulk was supplied by corn, sweet potatoes and cassava. Corn, sweet potatoes and cassava were especially important food sources in rural areas.

In 1968, rice availability began to increase. It rose from 98 kg/capita in 1968, to 121 kg/capita in 1979, or a yearly growth rate of almost 2 percent. In 1978, BPS estimated that rice consumption was 123 kg/person, while total caloric intake had risen from about 2,000 kcal at the beginning of the 1970s, to 2,367 kcal in 1978. Part of the reason that rice consumption has risen rapidly, especially in urban areas, is that rice prices have been declining, both in a real sense and vis-a-vis non-food prices. Corn, cassava and sweet potato consumption has declined about 3 percent per year, and non-food prices have actually been rising steadily. Average urban rice consumption has improved markedly, but at the expense of overall rural consumption. Farmers must purchase non-food items at higher prices, while receiving less for rice sales. Thus, it is likely that income differentials between urban and rural areas are currently increasing.

Country Sources of Basic Data

Historically, Java and Madura have been the seat of political and administrative power in the Indonesian islands. In the pre-WWII period, the Dutch collection of statistics was largely limited to these islands. The post-WWII Indonesian government did not begin the serious collection of statistics until 1950, so that there is a substantial gap in the 1940s between Dutch and Indonesian sources.

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*This book is a gold mine of information on the rice economy of Indonesia--highly recommended.

Glossary of Selected Indonesian Terms

1. Stalk paddy (padi) - includes the unmilled rice grains with the stalk or straw attached. The Indonesian term for stalk paddy is padi, the common Western term for unmilled rice.
2. Gabah - general term for unmilled or rough rice.
3. Beras - general term for milled rice.
4. Kering - dry; Padi kering is dry stalk paddy.
5. Basah - wet; Padi Basah is wet stalk paddy.
6. Lurah - village headman
7. Sawah - land on which rice is grown that is puddled and flooded, often irrigated, but also includes rain-fed area. Sawah is frequently translated as "irrigated area," but this is not strictly accurate.
8. Petani - general term for farmer.
9. Ladang - dryland cultivation including upland and shifting cultivation (brief periods of cultivation with long periods of fallow, characteristic of hillside areas). Currently, there are about 4 million hectares of ladang land.
10. Perkerangan - household garden land. Most farmers maintain small garden plots that are intensively cultivated to fruits, vegetables, and staples such as soybeans, peanuts and taro. Much of the produce of the small plots is marketed and contributes an important share to most farmers' incomes.
11. Kecamatan - sub-district
12. Kabupaten - district
13. Desa - village
14. Gudang - warehouse
15. Harga - price

Acronyms

BPS - Biro Pusat Statistik or CBS: Central Bureau of Statistics

BULOG - Badan Urusan Logistik (Food Logistics Board)

BIMAS - Bimbingan Masal (Mass Guidance)

DPTP - Ditjen Pertanian Tanaman Pangan (Directorate General of Foodcrops, Ministry of Agriculture)

INMAS - Intensifikasi Masal (Mass Intensification)

INSUS - Intensifikasi Khusus (Special Intensification)

In older publications, Dutch names or Dutch spelling for Indonesian place names are sometimes used. For example: Batavia = Djakarta = Jakarta.

Important Rice Conversion Factors

Prior to WWII unit of money = guilder

After WWII unit of money = rupiah

Mid-1965 rupiah devalued so that 1 new rupiah = 1,000 old rupiah. In 1978, the rupiah was devalued by 33.6 percent against the U.S. dollar to stimulate domestic manufacturing and increase export competitiveness.

Historical

1 centenaar = 100 kg. = 1 quintal

1 picul of rice = 0.6176 mt rice

1 picul of rice = 100 kati rice

Current

1 litre rice = .8 kg. rice

1 gangtang rice = 8.58 litres = .00686 mt. rice

1 mt. rice = 145.69 gantang

Padi kering to Beras - 52% (before 1960 50% used)

Padi Basah to Padi Kering - 75-80%

Gabah to Gabah Kering - 85%

Gabah Kering to Beras - 68%

Note: Conversion factors are subject to change depending on the organization, area, etc.

INDONESIA

Data for Indonesia are presented in two tables rather than one--Java and Madura and Indonesia. The reason is that historical time series prior to World War II are available only for Java and Madura. Not until Indonesia became a nation was data reported for both Java and the Outer Islands, and, as our discussion will illustrate, it has taken considerable time to develop reliable national estimates.

Java and Madura I Year	Cultivated Area '000' ha.	Rice Production '000' mt. (milled)	Rice Area '000' ha. (Harvested)	Rice Yield mt./ha. (milled)	Total Area Irrigated '000' ha.	Rice Imports '000' mt. (milled)	Rice Exports '000' mt. (milled)	Population '000' Persons	Farm Harvest Price Guilders/mt.
	1	2	3	4	5	6	7	8	9
1900									
1901									
1902									
1903									
1904									
1905									
1906									
1907									
1908									
1909									
1910									
1911									
1912									
1913									
1914									
1915									
1916	5637[C]		3034						
1917	5944		3160						
1918	6477		3273						
1919	6618		3433					34977	308[D]
1920	6851	3067	3223	.95				36487	
1921	6929	2705	2923	.93		273		37034	205
1922	6967	3302	3309	1.00		312		37589	183
1923	6995	3304	3304	1.00		209	27	38153	202
1924	7091	3431	3382	1.01		243	38	38726	196
1925	7155	3259	3295	.99		267	28	39306	205
1926	7334	3507	3395	1.03		312	40	39896	186
1927	7465	3606	3543	1.02		104	12	40495	184
1928	7566	3623	3526	1.03	883[F]	293	9	41102	194
1929	7603	3516	3423	1.03	815	346		41718	187
1930	7646	4450	3559	1.25	883	314		42344	132
1931	7658	3648	3513	1.04	934	287		42979	100
1932	7685	3862	3690	1.05	944	212		43624	79
1933	7703	3917	3778	1.04	988	179		44279	76
1934	7726	3685	3731	.99	993	140	--	44942	78
1935	7753	3993	3783	1.06	1054	118	--	45617	71
1936	7799	4152	3873	1.07	1155	9	--	46301	81
1937	7850	4102[H]	3867	1.06	1176	9	--	46996	85
1938	7871	4349	3960	1.10	1204	23	--	47700	80
1939	7900	4348	4028	1.08	1234	34	--		

INDONESIA

Data for Indonesia are presented in two tables rather than one--Java and Madura and Indonesia. The reason is that historical time series prior to World War II are available only for Java and Madura. Not until Indonesia became a nation was data reported for both Java and the Outer Islands, and, as our discussion will illustrate, it has taken considerable time to develop reliable national estimates.

Java and Madura I Year	Cultivated Area '000' ha.	Rice Production '000' mt. (milled)	Rice Area '000' ha. (Harvested)	Rice Yield mt./ha. (milled)	Total Area Irrigated '000' ha.	Rice Imports '000' mt. (milled)	Rice Exports '000' mt. (milled)	Population '000'Persons	Farm Harvest Price Guilders/mt.
	1	2	3	4	5	6	7	8	9
1900									
1901									
1902									
1903									
1904									
1905									
1906									
1907									
1908									
1909									
1910									
1911									
1912									
1913									
1914									
1915									
1916	5637[C]		3034						
1917	5944		3160						
1918	6477		3273						
1919	6618		3433						
1920	6851	3067	3223	.95				34977	308[D]
1921	6929	2705	2923	.93		273		36487	
1922	6967	3302	3309	1.00		312		37034	205
1923	6995	3304	3304	1.00		209	27	37589	183
1924	7091	3431	3382	1.01		243	38	38153	202
1925	7155	3259	3295	.99		267	28	38726	196
1926	7334	3507	3395	1.03		312	40	39306	205
1927	7465	3606	3543	1.02		104	12	39896	186
1928	7566	3623	3526	1.03	883[F]	293	9	40495	184
1929	7603	3516	3423	1.03	815	346		41102	194
1930	7646	4450	3559	1.25	883	314		41718	187
1931	7658	3648	3513	1.04	934	287		42344	132
1932	7685	3862	3690	1.05	944	212		42979	100
1933	7703	3917	3778	1.04	988	179		43624	79
1934	7726	3685	3731	.99	993	140	--	44279	76
1935	7753	3993	3783	1.06	1054	118	--	44942	78
1936	7799	4152	3873	1.07	1155	9	--	45617	71
1937	7850	4102[R]	3867	1.06	1176	9	--	46301	81
1938	7871	4349	3960	1.10	1204	23	--	46996	85
1939	7900	4348	4028	1.08	1234	34	--	47700	80

Java and Madura I	Procurement Price	Wholesale Price guilder/mt. (milled average)	Retail Price guilder/mt. (milled) (main market Jakarta)	Farm Wage guilder/day	Domestic Apparent Per Capita Availability--kg/capita/yr (milled)	Main Rice Crop Area '000' ha Sawah (Harvested)	Main Rice Crop Production '000' mt. Sawah Milled	Main Rice Crop Yield mt./ha Sawah Milled
	10	11	12	13	14	15	16	17
1900	--							
1901	--							
1902	--							
1903	--							
1904	--							
1905	--							
1906	--							
1907	--							
1908	--							
1909	--							
1910	--							
1911	--							
1912	--	95[A]	146[B]					
1914	--							
1915	--					2643	3023	1.14
1916	--					2762	3180	1.15
1917	--					2880	3222	1.12
1918	--					2979	3507	1.18
1919	--					2766	2949	1.07
1920	--		284		88	2619	2653	1.01
1921	--			.56[E]	74	2961	3238	1.09
1922	--	132	262	.52	89	2948	3223	1.09
1923	--	129	233	.46	88	2995	3338	1.11
1924	--	156	265	.45	90	2910	3150	1.08
1925	--	149	229	.48	84	2949	3353	1.14
1926	--	158	245	.45	89	3056	3430	1.12
1927	--	141	256	.45	90	3052	3305	1.08
1928	--	141	254	.46	89	2987	3264	1.09
1929	--	141	249[G]	.46	86	3123	3497	1.12
1930	--	120	241	.46	107	3073	3371	1.10
1931	--	76	189	.44	86	3263	3580	1.10
1932	--	65	136	.38	90	3324	3644	1.10
1933	--	50	114	.33	90	3338	3444	1.03
1934	--	47	111	.28	83	3396	3757	1.11
1935	--	56	115	.26	89	3475	3888	1.12
1936	--	58	113	.23	91	3476	3872[H]	1.11
1937	--	70	113	.24	89	3571	4090	1.15
1938	--	66	114	.27	93	3653	4116	1.13
1939	--	67	113	.27	91			

Java and Madura II	Cultivated Area '000' ha.	Rice Production '000' mt. (milled)	Rice Area '000' ha. (Harvested)	Rice Yield mt./ha. (milled)	Rice Area Irrigated '000' ha.	Rice Imports '000' mt. (milled)	Rice Exports '000' mt. (milled)	Population '000'Persons	Farm Harvest Price 10 rp./mt. (Paddy)
	1	2	3	4	5	6	7	8	9
1940	7928	4664	4089	1.14	1311	12	---	48416	83
1941	7961	4677	4100	1.14			---	48200	
1942		3932	4026	.98			---	48900	
1943		3836	4132	.93			---	49300	
1944		3305	3572	.93			---	49300	
1945		2741	3118	.88			---	48800	
1946		2668	3260	.82			---	48300	
1947		n.a.	n.a.	n.a.			---	48300	
1948		n.a.	n.a.	n.a.			---	48300	
1949		n.a.	n.a.	n.a.		167	---	48800	89 J
1950	8140	3721	3615	1.03		167	---	50456	93
1951	8166	3908	3787	1.03		264	---	51430	205
1952	8158	4159	3884	1.07		383	---	52437	238
1953	8150	4431	4017	1.10		186	---	53480	210
1954	8220	4817	4157	1.16		117	---	54560	210
1955	8339	4583	4189	1.09		17	---	55679	263
1956	8280	4756	4300	1.11		440	---	56837	313
1957	8331	4740	4311	1.10		319	---	58037	340
1958	8372	4963	4389	1.13		N	---	59280	524
1959	8392	5054	4329	1.17			---	60567	551
1960	8395	5057	4320	1.17			---	61901 O	696
1961	8374	4803	3992	1.20			---	63226	1190
1962	8377	5145	4087	1.26			---	64357	3371
1963	8424	4443	3647	1.22	1641 P		---	65534	7436
1964	8099	4375	3655	1.20			---	66757	17183
1965		4975	4034	1.23			---	68028	59275 QR
1966		5203	4117	1.26			---	69345	263
1967		4976 T	4021	1.24			---	70708	782
1968		7074	4264	1.66			---	72118	2111
1969		7504	4294	1.75			---	73575	1810
1970		7886 W	4302	1.83			---	75079	2163
1971		8439	4416	1.91			---	76629	2063
1972		8106	4332	1.87			---	78356	2533
1973	6332 X	8864 Y	4567	1.94			---	80077	3766
1974		9438	4730	2.00			---	81801	4233
1975		9330	4653	2.01			---	83534	5055
1976		9562	4466 aa	2.14	2390		---	85289	8147
1977		9334	4378	2.13			---	87076	8413
1978		10607	4750	2.23	2454 bb		---		8021
1979		10680	4630	2.31			---		10297
1980		12610 dd	4780 dd	2.63 dd			---	91270 ee	11342
1981		13500 dd	4860 dd	2.78 dd					11975

Java and Madura II	Procurement Price 10 rp./mt. (paddy)	Wholesale Price 10 rp./mt.(milled) (main market Jakarta)	Retail Price 10 rp./mt. (milled average)	Farm Wage Rate rp./day	Domestic Apparent Per Capita Availability--kg/capita/yr (milled)	Main Rice Crop Area '000' ha Sawah (Harvested)	Main Rice Crop Production '000' mt. Sawah Milled	Main Rice Crop Yield mt./ha Sawah Milled
	10	11	12	13	14	15	16	17
1940	---	89	114	.27	96	3724	4408	1.18
1941					97	3743	4403	1.18
1942					80			
1943					78			
1944					67			
1945					56			
1946					55			
1947								
1948		87[I]	77[K]					
1949		184	83					
1950		103	85		74	3388	3588	1.06
1951		228	201		76	3586	3806	1.06
1952	75[L]	267	231		79	3662	4041	1.10
1953	75	228	211		83	3768	4284	1.14
1954	70	245	219		88	3897	4617	1.18
1955	80	284	271	7.4[M]	82	3925	4434	1.13
1956	90	344	327	9.0	84	4076	4629	1.14
1957	100	441	398	9.2	82	4069	4596	1.13
1958	142	773	598	11.5	84	4124	4803	1.16
1959	175	723	601	13.2	83	4056	4881	1.20
1960	200	775	747		82	4006	4836	1.21
1961	250	1327	1194		76	3668	4545	1.24
1962	700	4619	3568		80	3703	4784	1.29
1963	2200	8007	7547		68	3301	4193	1.27
1964		21450	17602		66	3295	4111	1.25
1965		74117[Q]	59650[Q]		73	3658	4713	1.29
1966	Q	671	520	9.3[S]	75	3682	4877	1.32
1967		2046	1489	27.2	70	3636	4677[T]	1.29
1968		4762[V]	4101	54.8	98	3857	6767	1.75
1969	2090[U]	3680	3809	73.3	102	3947	7241	1.83
1970	2090	4476	4460	100.9	105	3959	7616[W]	1.92
1971	2090	4194	4577		110	3947	8151	2.07
1972	2090	4912	5039	124.6	103	4006	7829	1.95
1973	2798	7662	8944	164.5	111	4235	8565[Y]	2.02
1974	4180	7837	9399	208.6	115	4446	9194	2.07
1975	5850	9701	11135	254.8	112	4388	9087	2.07
1976	6850	11927	13322	248.0	112	4217	9331	2.21
1977	7100	12710	14828	360.0	107	4133[aa]	9094	2.20[cc]
1978	7500	15746	14177	433.0		4467[cc]	10340[cc]	2.31[cc]
1979	9000	19637	17662	500.0				
1980	10500	22182[ff]						
1981	12000	23773[ff]						

Footnotes for Java & Madura

A/ 1913-1940: Wholesale price is an unweighted average market price for imported Rangoon rice at Batavia, Semarang and Sourabaya markets. Since the wholesale price recorded here is for imported rice, it is not comparable to the farm harvest price series that is for native rice.

B/ 1913-1929: Average retail rice price is for No. 1 Bulu rice at Batavia market only.

C/ 1916-1964: Cultivated area refers to total irrigated and non-irrigated farm and estate area. By the early 1960s, approximately 60 percent of the total surface area of Java and Madura was under cultivation.

D/ 1920-1940: Farm harvest price is an average price for No. 1 husked rice (beras) in native markets on Java and Madura. See footnote J for additional information.

E/ 1921-1940: Farm wage rate is for males working in sugar fields on estates.

F/ 1928-1940: Irrigated area refers to all cultivated area technically irrigated. This includes irrigated area for all crops, although rice undoubtedly dominates. Technically irrigated area refers only to government operated irrigated land and does not include area irrigated under village schemes.

G/ 1930-1940: Average retail rice price is for Tjiandjur rice at Batavia market only.

H/ 1938-1973: Dry stalk paddy (padi) converted to milled rice (beras) at 52 percent. Series provided by BPS.

I/ 1948-1968: Wholesale rice price is for "Bulu" and is an average domestic price for Jakarta markets.

J/ 1949-1965: Farm harvest price is the rural market price for milled No. 1 Bulu rice. Farm harvest prices are similar to or larger than average retail rice prices because the farm harvest data really represents a retail price for rice in rural markets and are for top quality rice.

K/ 1949-1979: Average retail price is for common or cheap rice and is an unweighted average of four markets: Jakarta, Bandung, Semarang, and Jogjakarta.

L/ 1952-1963: Procurement price is for padi Cere No. 2 for Central Java. (Prior to 1960 rice was only procured in three Javanese provinces except for small amounts purchased in S. Sulawesi [1952, 1954] and Sumatera [1959]. Mark Pitt, "Economic Policy and Agricultural Development in Indonesia," Ph.D. thesis, University of California, 1977, p. 24.) Cere No. 2 is a lower quality rice and commands a low free market price as compared to other types such as No. 1 Bulu.

M/ 1955-1959: Farm wage rate is for rubber (heava) estates on Java and includes the gross money wage (gaji) and the value (harga) of payments in kind for both male and female workers. The rate is for all workers on rubber estates including administrative personnel. The rate is calculated by averaging the number of permanent workers in the months March, June, September, and December, and dividing the average by the total annual wage bill.

N/ 1958-1981: The Indonesian government as a whole imports rice. See Indonesia Table, Rice imports (6).

O/ 1961-1971: Interpolated based on results of population censuses in 1961 (62,993,000 people Oct.) and 1971 (76,031,000 people, Sept.), and further adjusted based on 1971-1981 population projections. 1972-1977: Taken from population projection of Indonesia by age, sex and region made by BPS for 1971-1981. (Disaggregated estimates available only until 1977.)

P/ 1963: Total area irrigated for all crops.

Q/ 1966-1981: Starting in 1966 prices are given in new rupiah. One new rupiah equals 1,000 old rupiah.

R/ 1966-1981: Farm harvest price is an average farm-gate price for the 4 kabupaten of Java for gabah kering (dry paddy). 1966-1975 is for Bulu No. 1, and 1976-1981 are for the months of October or September.

S/ 1966-1979: Farm wage rate is the average wage rate for all types of estate agriculture on Java. It includes the gross money wage (gaji) and the value (harga) of payments in kind for both male and female workers. The rate is an unweighted average for all workers including administrative personnel. Thus, the included wage rates are not strictly representative of a general laborer wage rate. The rate is calculated by averaging the number of permanent workers in the months March, June, September and December, and dividing the average by the total annual wage bill. Although this wage rate is not representative of the wage rates for paddy laborers, it should give a general idea of the trends in agricultural wage rates.

T/ 1968-1979: In 1970, BPS began to use a new method for estimating per hectare yields of padi sawah for Java and Madura. Previously, crop cutting

sample plots of 1500 sq. meters had been carried out to both determine official yields and to set land taxes based on the average yield. BPS suspected that this practice engendered possible biases because of the opportunities for underestimation. In 1970, they began to make independent crop cuttings to determine yields and subsequently adjusted production figures to 1968. In 1971, BPS began to use net area rather than gross area of harvested sawah. BPS has not factored this change into its recalculation of production figures, so that production and area figures for 1971 and afterwards are not comparable with pre-1971 figures. For a more detailed explanation of BPS methodology and an attempt to adjust BPS series back to 1960 see: Alfian Lains, "Regional Concentration of Rice Production in Indonesia," Ph.D. thesis, University of the Philippines, 1978.

U/ 1969-1981: Procurement prices are for cooperative (KUD) sales of HYV rice (HYV varieties of rice are commonly sold to BULOG. Traditional varieties are more likely to be sold on the free market) and are in April-March fiscal years.

V/ 1969-1981: Wholesale price is for farm crops in Jakarta markets. 1978-1981 prices are for Saigon Bandung rice.

W/ 1971-1979: Bunded area excluded from area of harvested sawah from 1971 onwards.

X/ 1973: Cultivated area figure refers to the total area of all farms and estates on Java and Madura. This number is derived from the 1973 Agricultural Census, and includes the DKI Jakarta, West Java, Central Java, Yogyakarta and East Java.

Y/ 1974-1979: Dry unhusked paddy (gabah) converted to milled rice (beras) at 68 percent.

Z/ 1976: Irrigated area figure is for rice area including technical, semi-technical, simple/village irrigation and tidal/swamp land.

aa/ 1977-1981: Definition of sawah area changed to include bunded paddy area.

bb/ 1978: Irrigated area figure refers to total wetland area planted to paddy and irrigated using man-made means. This includes area under technical, semi-technical, and village/simple systems. Figure refers to total surface area and does not count double cropped area twice.

cc/ 1979: Preliminary.

dd/ 1980, 1981; preliminary.

ee/ 1980: Unadjusted results of 1980 population census not including East Timor.

ff/ 1981: Average of January-September only.

Sources of Data for Java and Madura

1. Cultivated Area

1916-1927: Nederlandsch-Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement van Economische Zaken, Statistisch Jarroverzicht van Nederlandsch-Indië (Batavia: Landsdrukkerij).

1928-1973: Nederlandsch Indië. Departement van Economische Zaken, Centraal Kantoor voor de Statistiek, Statistisch Zakboekje voor Nederlandsch Indië (Batavia: 1934-1938). Name changed to Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

2. Rice Production

1920-1937: Mears, Leon, Rice Marketing in the Republic of Indonesia (Djakarta: Djakarta School of Economics, University of Indonesia, 1961).

1938-1978: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

1979-1981: Mears, Leon, The New Rice Economy of Indonesia (Yogyakarta: Gadjah Mada University Press, 1981).

3. Rice Area

1916-1919: Nederlandsch-Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement von Economische Zaken, Statistisch Jarroverzicht van Nederlandsch-Indië (Batavia: Landsdrukkerij).

1920-1949: Mears, Leon, Rice Marketing in the Republic of Indonesia (Djakarta: Djakarta School of Economics, University of Indonesia, 1961).

1950-1978: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

1979-1981: Mears, Leon, The New Rice Economy of Indonesia (Yogyakarta: Gadjah Mada University Press, 1981).

4. Yield

1980-1981: Rice yields calculated by dividing rice production (3) by rice area (2).

5. Rice Area Irrigated

1928-1940: Nederlandsch-Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement van Economische Zaken, Statistisch Jarroverzicht van Nederlandsch Indië (Batavia: Landsdrukkerij).

1963: 1963 Agricultural Census Final Report.

1976: Nyberg, Albert and Dibyo Prabowo, "Status and Performance of Irrigation as of 1976 and the Prospects to 1990 and 2000," prepared for IFPRI/IRRI/IFDC Rice Policy Project in Southeast Asian Countries Workshop, Los Banos, Philippines, May 22-25, 1979, pp. 53-54.

1978: Indonesia: Biro Pusat Statistik, Statistical Pocketbook of Indonesia (1979/1980: Jakarta).

6. Rice Imports

1921-1956: Mears, Leon, Rice Marketing in the Republic of Indonesia (Djakarta: Djakarta School of Economics, University of Indonesia, 1961).

7. Rice Exports

1923-1928: Nederlandsch-Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement van Economische Zaken, Statistich Jarroverzicht van Nederlandsch-Indië (Batavia: Landsdrukkerij).

8. Population

1920-1950: Mears, Leon, Rice Marketing in the Republic of Indonesia (Djakarta: Djakarta School of Economics, University of Indonesia, 1961).

1951-1977: Indonesia, Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

1980: Indonesia. Biro Pusat Statistik, Indikator Ekonomi (Jakarta, 1981).

9. Farm Harvest Price

1920-1940: Nederlandsch-Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement van Economische Zaken, Statistich Jarroverzicht van Nederlandsch-Indië (Batavia: Landsdrukkerij).

1949-1965: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

1966-1981: Indonesia. Biro Pusat Statistik, Indikator Ekonomi (Jakarta: 1970-1981).

10. Procurement

No procurement prior to World War II.

1952-1963: Pitt, Mark, "Economic Policy and Agricultural Development in Indonesia," Ph.D. thesis, University of California, 1977, p. 21. Original data from BULOG.

1969-1981: Indonesia. Badan Urusan Logistik.

11. Main Market-Jakarta-Wholesale Rice Price

1913-1940: Nederlandsch-Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement van Economische Zaken, Statistisch Jarroverzicht van Nederlandsch Indië (Batavia: Landsdrukkerij).

1949-1981: Indonesia. Biro Pusat Statistik, Indikator Ekonomi (Jakarta: 1970-1981).

12. Average Retail Rice Price

1913-1939. Nederlandsch-Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement van Economische Zaken, Statistisch Zakboekje voor Nederlandsch Indië (Batavia: 1934-1938).

1949-1957: Mears, Leon, Rice Marketing in the Republic of Indonesia (Djakarta: Djakarta School of Economics, University of Indonesia, 1961).

1958-1979: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

13. Farm Wage Rate

1921-1940: Nederlandsch-Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement van Economische Zaken, Statistisch Jarroverzicht van Nederlandsch-Indië (Batavia: Landsdrukkerij).

1955-1959: Indonesia. Biro Pusat Statistik, Rata-Rata Upah Buruh Perkebunan (Jakarta).

1966-1979: Indonesia. Biro Pusat Statistik, Statistik Upah Karyawan Perkebunan (Jakarta).

14. Domestic Per Capita Apparent Rice Availability

Domestic availability calculated by dividing rice production (2) by population (8) on an annual basis.

15. Main Rice Crop Area (Sawah)

1916-1919: Nederlandsch-Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement van Economische Zaken, Statistisch Jarroverzicht van Nederlandsch Indië (Batavia: Landsdrukkerij).

16. Main Rice Crop Area (Sawah)

1920-1941: Mears, Leon, Rice Marketing in the Republic of Indonesia (Djakarta: Djakarta School of Economics, University of Indonesia, 1961).

1950-1979: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

17. Main Rice Crop Production (Sawah)

1916-1937: Nederlandsch-Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement van Economische Zaken, Statistisch Jarroverzicht van Nederlandsch-Indië (Batavia: Landsdrukkerij).

1938-1979: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

18. Main Rice Crop Yield (Sawah)

1916-1979: Main rice crop yield calculated by dividing main crop production (16) by main crop area (15) on an annual basis.

Indonesia	Arable Land and Permanent Crops '000' ha. A/	Rice Production '000' mt. (milled)	Rice Area '000' ha. (Harvested)	Rice Yield mt./ha. (milled)	Rice Area Irrigated '000' ha.	Rice Imports '000' mt. (milled)	Rice Exports '000' mt. (milled)	Population Year End '000' Persons	Farm Harvest Price 10 rp/mt. (Paddy)
	1	2	3	4	5	6	7	8	9
1938						334	43		
1939						278	42		
1940			3781			109	76	70476	
1941						82			
1942									
1943									
1944									
1945									
1946									
1947									
1948									
1949						333	--		
1950		6017[D]	5700	1.06		334	--	77207	
1951		6224	5815	1.07		529	--	78741	
1952		6642	6114	1.09		766	--	80329	
1953		7313	6465	1.13		372	--	81973	
1954		7832	6613	1.18		261	--	83676	
1955		7505	6570	1.14		127	--	85440	
1956		7602	6702	1.13		763[G]	--	87267	
1957		7632	6798	1.12		572	--	89160	
1958		7979	6990	1.14		707	--	91122	
1959		8294	7153	1.16		608	--	93153[H]	
1960		8767	7285	1.20		962	--	100655	
1961		8268	6857	1.21		684	--	102900	
1962		8898	7283	1.22		536	--	105242	
1963		7944	6731	1.18	2347[I]	487	--	107627	
1964	16900	8420	6980	1.21		1785	--	110055	
1965	17000	8877	7327	1.21		787	--	112269	
1966	17400	9339	7691	1.21		281	--	114176	263[J/K]
1967	17500	9047[M]	7516	1.20		57	--	116115	782
1968	17900	11670	7614	1.53		486	--	118123	2111
1969	18000	12250	7667	1.60		238	--	120286	1810
1970	18100	13140	8135[P]	1.62		324	--	122671	2163
1971	18100	13724	8324	1.65		120	--	125353	2063
1972	18150[Q]	13183	7898	1.67		335	--	128175	2533
1973	18500	14607[R]	7942	1.84		1863	--	131020	3766
1974	18500	15276	8509	1.80		1132	--	133824	4233
1975	18600	15185	8495	1.79		693	--	136578[T]	5055
1976	19418	15845	9369[U]	1.69	3713[S]	1302	--	139349	8147
1977	17200	15876	8360	1.90		1973	--	142187	8413
1978		17525	8929	1.96	3820[V]	1842	--	145095	8021
1979		17872[X]	8850[X]	2.03[X]		1922	--	148085[Y]	10297
1980		20246[X]	9020[X]	2.25[X]		2012	--	151168	11342
1981		21670[X]	9300[X]	2.33[X]		Z	--	154339	11975

Indonesia	Procurement Price 10 rp./mt. (milled)	Wholesale Price 10 rp./mt.(milled) (main market Jakarta)	Retail Price 10 rp./mt. (milled) (Average)	Farm Wage Rate rp./day	Domestic Apparent Per Capita Availability--kg/capita/yr (milled)	Main Rice Crop Area '000' ha Sawah (Harvested)	Main Rice Crop Production '000' mt. Sawah	Main Rice Crop Yield mt./ha Sawah
	10	11	12	13	14	15	16	17
1938	--	66B	114C					
1939	--	67	113					
1940	--	89	114					
1941	--							
1942	--							
1943	--							
1944	--							
1945	--							
1946								
1947								
1948		87						
1949		184	89					
1950		103	93		78	4781	5421[D]	1.13
1951		228	205		79	4946	5712	1.15
1952	75[E]	267	238		83	5090	6014	1.18
1953	75	228	210		89	5380	6580	1.22
1954	70	245	210		94	5469	6938	1.27
1955	80	284	263	8.7[F]	88	5517	6752	1.22
1956	90	344	313	10.2	87	5701	6920	1.21
1957	100	441	340	10.9	86	5748	6886	1.20
1958	142	773	524	13.4	88	5914	7218	1.22
1959	175	723	551	16.2	89	5936	7399	1.25
1960	200	775	696		87	5975	7736	1.29
1961	250	1327	1190		80	5584	7246	1.30
1962	700	4619	3371		85	5836	7725	1.32
1963	2200	8007	7436		74	5329	6909	1.30
1964		21450	17183		77	5484	7275	1.33
1965		74117[J]	59275[J]		79	5875	7783	1.32
1966		671	543	10.7[L]	82	6011	8069	1.34
1967		2046[N]	1549	32.0	78	5995	7958[M]	1.33
1968		4762	3986	69.9	98	6364	10442	1.64
1969	3700[O]	3680	3688	94.9	94	6544	11167	1.71
1970	3700	4476	4255	124.8	107	6679[P]	12037	1.80
1971	3700	4194	4081		109	6893	12640	1.83
1972	3700	4912	5000	146.8	103	6602	12169	1.84
1973	4875	7662	7651	205.9	111	7064	13469[R]	1.91
1974	6850	7837	8173	252.1	114	7340	14316	1.95
1975	9700	9701	9835	306.9	111	7334	14178	1.93
1976	10800	11927	14196	346.6	114	7229[U]	14859	2.06
1977	11000	12710	15219	417.3	112	7202	14829	2.06
1978	11950	15746	16600	502.5	121	7698[W]	16437[W]	2.14[W]
1979	14900	19637	21100	587.4	121	7661	16818	2.20
1980	17500	22182[aa]	24700[bb]		134		19067[X]	
1981	19500	23773	27100					

Footnotes for Indonesia

A/ BPS does not release cultivated area statistics on an annual basis, although an estimate for the total area of farms and estates is computed decennially as part of the agricultural census. (For the most recent estimate see Footnote Q, 1973.) Harvested area statistics for most important food crops are regularly released each year.

B/ 1938-1967: Wholesale rice price is for "Bulu" and is an average domestic price for Jakarta markets.

C/ 1938-1981: Retail price is for No. 1 milled (Bulu) rice. Bulu is the best quality and hence highest priced domestic rice. Data are taken from the BPS "Retail price of 12 food articles in rural markets of Java and Madura" series, and represent an average market price for the islands of Java and Madura only.

D/ 1950-1973: Dry stalk paddy (padi) converted to milled rice (beras) at 52 percent. Series provided by BPS.

E/ 1952-1963: Procurement price is for padi Cere No. 2 for Central Java. (Prior to 1960 rice was only procured in three Javanese provinces except for small amounts purchased in S. Sulawesi [1952, 1954] and Sumatera [1959]. Mark Pitt, "Economic Policy and Agricultural Development in Indonesia," Ph.D. thesis, University of California, 1977, p. 24.) Cere No. 2 is lower quality than Bulu.

F/ 1955-1959: Farm wage rate is for rubber (heava) estates, and includes the gross money wage (gaji) and the value (harga) of payments in kind for both male and female workers. The rate is for all workers on rubber estates including administrative personnel. The rate is calculated by averaging the number of

permanent workers in the months March, June, September and December, and dividing the average by the total annual wage bill.

G/ 1957-1979: Includes rice and glutinous rice imports.

H/ 1960: USDA estimates are used 1960-1981. USDA estimates are considerably larger than official Indonesia figures, but probably more realistically assess population growth. 1960-1975 population estimates exclude E. Timor (annexed in 1976). An adjusted 1970 census figure for E. Timor estimates the total population as 642,000 persons.

I/ 1963: Total area irrigated for all crops.

J/ 1966-1981: Starting in 1966 prices are given in new rupiah: one new rupiah equals 1,000 old rupiah.

K/ 1966-1981: Farm harvest price is an average farm-gate price for the four kabupaten of Java for gabah kering (dry paddy). 1966-1975 is for Bulu No. 1, and 1976-1981 are for the months of October or September.

L/ 1966-1979: Farm wage rate is the average wage rate for all types of estate agriculture. It includes the gross money wage (gaji) and the value (harga) of payments in kind for both male and female workers. The rate is an unweighted average for all workers including administrative personnel. Thus, the included wage rates are not strictly representative of a general laborer wage rate. The rate is calculated by averaging the number of permanent workers in the months March, June, September and December, and dividing the average by the total annual wage bill. Although this wage rate is not representative of the wage rates for paddy laborers, it should give a general idea of the trends in agricultural wage rates.

M/ 1968-1980: In 1970, BPS began to use a new method for estimating per hectare yields of padi sawah for Java and Madura. Previously crop cutting on sample plots of 1500 sq. meters had been carried out to both determine official yields and to set land taxes based on average yields. BPS suspected that this practice engendered possible biases because of the opportunities for underestimation. In 1970, they began to make independent crop cuttings to determine yields, and subsequently adjusted production figures back to 1968. In 1971, BPS began to use net area rather than gross area of harvested sawah. BPS has not factored this change into its recalculation of production figures, so that production and area figures for 1971 and afterwards are not comparable with pre-1971 figures. For a more detailed explanation of BPS methodology and an attempt to adjust BPS series back to 1960 see: Alfian Lains, "Regional Concentration of Rice Production in Indonesia," Ph.D. thesis, University of the Philippines, 1978. Leon Mears also provides a table in which rice production is adjusted back to 1960 (The New Rice Economy of Indonesia, 1981, p. 488).

N/ 1968-1981: Wholesale rice price is for farm crops in Jakarta markets. 1978-1981 prices are for Saigon Bandung rice.

O/ 1969-1981: Procurement prices are for cooperative (KUD) sales of HYV rice (HYV varieties of rice are commonly sold to BULOG. Traditional varieties are more likely to be sold on the free market), and are in April-March fiscal years.

P/ 1971-1979: Bunded area excluded from area of harvested sawah from 1971 onwards.

Q/ 1973: During the 1973 Census of Agriculture BPS found that the total area of farms and estates was 16,394,000 ha.--a much lower figure than the FAO estimate for 1973.

R/ 1974-1980: Dry unhusked paddy (gabah) converted to milled rice (beras) at 68 percent. Series provided by BPS.

S/ 1976: Irrigated area figure is for rice area (see footnote V) including technical, semi-technical, simple/village and tidal swamp land irrigation systems.

T/ 1976: 1976-1981 population estimates for Indonesia are projected based on the midyear 1975 adjusted population census figure and on assumed trends in fertility and mortality since 1975. The population of E. Timor is included.

U/ 1977-1981: Definition of sawah area changed to include bunded paddy area.

V/ 1978: Irrigated area figure refers to total wetland area planted to paddy and irrigated using man-made means. This includes area under technical, semi-technical and village/simple systems. Figure refers to total surface area and does not count double cropped area twice.

W/ 1979: Preliminary.

X/ 1980-1981: Preliminary.

Y/ 1980: Unadjusted result of Oct. 31, 1980 population census--excluding East Timor--is 147,490,000.

Z/ 1981: After a bumper rice harvest in 1981 rice exports were practically nil for the calendar year 1981.

aa/ 1981: Average of January-September only.

bb/ 1981: Average of January-August only.

Sources of Data for Indonesia

NOTE: For the pre-World War II period see Java and Madura table.

1. Arable Land

   1964-1977: Food and Agriculture Organization of the United Nations, FAO Production Yearbook (Rome).

2. Rice Production

   1950-1979: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

   1980: Indonesia. Biro Pusat Statistik, Indikator Ekonomi (Jakarta, 1981).

   1981: Mears, Leon, The New Rice Economy of Indonesia (Yogyakarta: Gadjah Mada University Press, 1981).

3. Rice Area

   1950-1979: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

   1980-1981: Mears, Leon, The New Rice Economy of Indonesia (Yogyakarta: Gadjah Mada University Press, 1981).

4. Rice Yield

   Calculated on the basis of reported production (2) and area (3).

5. Rice Area Irrigated

   1963: 1963 Agricultural Census Final Report.

   1976: Nyberg, Albert and Dibyo Prabowo, "Status and Performance of Irrigation in Indonesia as of 1978 and the Prospects to 1990 and 2000," prepared for the IFPRI/IRRI/IFDC Rice Policy Project for Southeast Asian Countries workshop, Los Banos, Philippines, May 22-25, 1979, pp. 53-54.

   1978: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (1979/1980: Jakarta).

6. Rice Imports

1938-1956: Mears, Leon, Rice Marketing in the Republic of Indonesia (Djakarta: Djakarta School of Economics, University of Indonesia, 1961).

1957-1979: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

1980: Indonesia. Biro Pusat Statistik, Indikator Ekonomi (Jakarta: 1981).

7. Rice Exports

1938-1940: Nederlandsch Indië. Samengesteld door het Centraal Kantoor voor de Statistiek van het Departement van Economische Zaken, Statistisch Jarroverzicht van Nederlandsch-Indië (Batavia: Landsdrukkerij).

8. Population

1940-1959: Indonesia: Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta: 1940).

1960-1969: U.S. Dept. of Commerce, Bureau of the Census, International Population Dynamics 1950-79 (Washington, D.C.: 1979), 1SP-WP-79(A).

1970-1981: U.S. Dept. of Commerce, Bureau of the Census, Demographic Estimates for Countries with a Population of 10 Million or More: 1981 (Washington, D.C.: 1981), 1SP-WP-81.

9. Farm Harvest Price

1966-1981: Indonesia. Biro Pusat Statistik, Indikator Ekonomi (Jakarta: 1970-1981).

10. Procurement

1952-1963: Pitt, Mark, "Economic Policy and Agricultural Development in Indonesia," Ph.D. thesis, University of California, 1977, p. 21, original source BULOG.

1969-1981: Indonesia. Badan Urusan Logistik.

11. Main Market-Jakarta-Wholesale Rice Price

1938-1967: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

1968-1979: Indonesia. Biro Pusat Statistik, Indikator Ekonomi (Jakarta: 1970-1981).

12. Average Retail Rice Price

1938-1981: Indonesia. Biro Pusat Statistik, Indikator Ekonomi (Jakarta: 1970-1981).

13. Farm Wage Rate

1955-1959: Indonesia. Biro Pusat Statistik, Rata-Rata Upah Buruh Perkebunan (Jakarta).

1966-1979: Indonesia. Biro Pusat Statistik, Statistik Upah Karyawan Perkebunan (Jakarta).

14. Domestic Apparent Per Capita Rice Availability

1950-1979: Domestic availability calculated by dividing rice production (2) by population (8) on an annual basis.

15. Main Rice Crop Area (Sawah)

1950-1979: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

16. Main Rice Crop Production (Sawah)

1950-1979: Indonesia. Biro Pusat Statistik, Statistical Pocketbook of Indonesia (Jakarta).

1980: Indonesia. Biro Pusat Statistik, Indikator Ekonomi (Jakarta: 1981).

17. Main Rice Crop Yield

1950-1979: Main rice crop yields calculated by dividing main crop production (16) by main crop area (15) on an annual basis.

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