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Rice Marketing in Indonesia: Methodology, Results and Implications of a Research Study

4

Rice Marketing in Indonesia: Methodology, Results and Implications of a Research Study

F. Ellis, B. Trotter and P. Magrath

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On the UK side, the sample survey design, analysis and report preparation was made the responsibility of Dr. Frank Ellis of the Overseas Development Group, University of East Anglia. The UK Overseas Development Administration (ODA) provided a Research Officer, Priscilla Magrath, to coordinate the research in Indonesia, and to contribute to the analysis and report writing. Bruce Trotter was contracted as a consultant to undertake the time-series rice price analysis.

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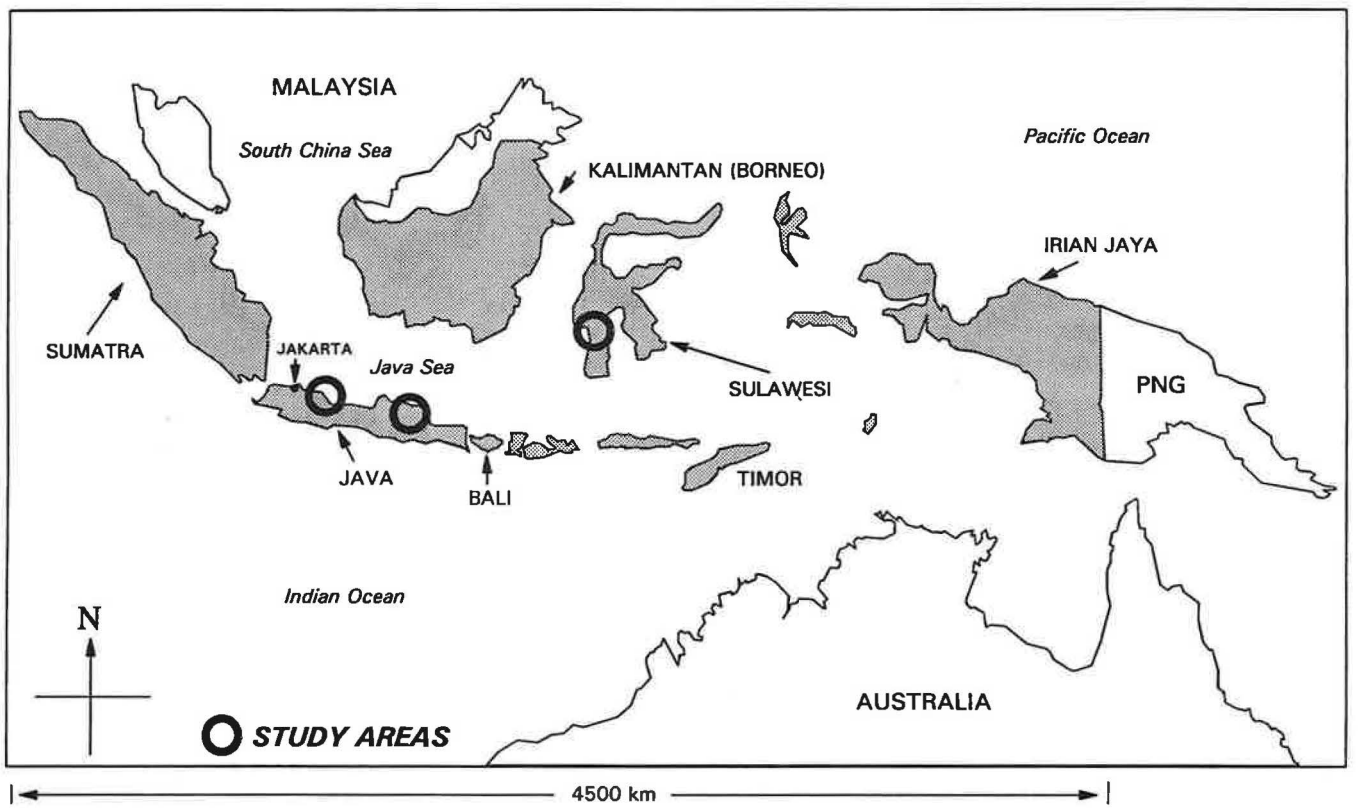
Indonesia: Sample Survey Locations/Rice Marketing Study



Population: 180 million Growth: 1.9% Total rice consumption: 26.5 million tons Consumption per person: 147 kg

Glossary of Indonesian Terms

Indonesian terms	*English equivalent*
bagi hasil	sharecropping (lit. 'divided crop')
bawon	share of harvest paid to harvest labour
beras	milled rice, uncooked
ceblokan	closed harvesting system, in which access to harvest work is restricted to those who have done prior tasks for the cultivator
gabah	paddy or rough rice (after threshing)
jumlah bersih	lit. 'total clean', farm-level total harvest after deduction of labour share and landowner share
jumlah kotor	lit. 'total dirty', farm-level total harvest before deduction of payments in kind to harvest labour or landowner
kabupaten	administrative – district, a sub-division of province
kecamatan	administrative – sub-district
kedokan	an alternative term for '*ceblokan*' as defined above (East Java)
paceklik	the 'lean season' before the first rice harvest, typically Oct-Jan in many parts of Indonesia
palawija	generic term for non-rice food crops such as maize or soybeans, grown as the second crop after rice
penebas	pre-harvest buyer of green rice standing in the field (harvester-trader)
pengijon	pre-harvest buyer who lends money to the cultivator against the green rice standing in the field
rendemen	yield of milled rice from paddy, usually expressed as a percentage
sawah	wet rice field
tebasan	rice harvesting system involving pre-harvest payment and off-farm harvesting gangs (see *penebas* above)

Exchange Rate Note

In the year of undertaking the Rice Marketing Study (1990), the exchange rate of the Indonesian Rupiah against the US $ was as follows:

US $1 = Rp. 1850

SUMMARY

The Indonesia Rice Marketing Study (RMS) was a research programme undertaken in the period 1989-91. The programme consisted of three components: a sample survey of farmers and traders, data based on key informant interviews, and a time-series analysis of rice prices.

The context of the research is a large country which experienced rapid economic growth in the 1980s. The population of Indonesia in 1990 was 180 million people. Rice consumption was 26.5 million tons, implying a consumption level per person of 147 kg/year. Due to increasing income per capita, the share of rice in average household expenditure had declined from over 30% in the early 1970s to under 10% at the start of the 1990s.

The objective of the research was to achieve a more detailed understanding of seasonal rice price formation in Indonesia. This was in the context of the continuing mandate of the public agency responsible for food security, BULOG, to stabilize rice prices for producers and consumers. The research focused on the seasonal behaviour of farmers and traders with respect to rice storage and sales decisions, as well as on the competitiveness and efficiency of the rice marketing system.

The key feature of the sample survey component of the RMS was its starting place with *farmers*, rather than with traders or millers, or with market places such as village markets or city markets. The sample survey method was based on random samples of farmers, in each of three locations, and a system of linked interviews along marketing chains based on the most recent transaction between seller and buyer at time of interview. Three main sample surveys were conducted during 1990, in order to capture events in each of three seasons.

This methodology proved to have a number of points in its favour, especially with respect to obtaining an understanding of the sales, consumption, and storage behaviour of farmers, and discovering the nature of rice marketing chains. In general, the experience with this methodology was positive enough to suggest that it might also be useful for studying food marketing systems in other developing countries.

The sample survey yielded useful information regarding seasonal quantity relationships at farm level, marketing chains, and marketing margins. When combined with evidence from the time-series rice price analysis, the competitiveness of the marketing system was confirmed by a number of alternative indicators.

At the farm level, competitiveness was indicated by the absence of tied transactions and the wide range of choice exhibited by farmers with respect to sales transactions. At the trader level, competitiveness was indicated by the large number of small operators, diversity of channels, absence of tied transactions, narrow margins, and seasonal survival strategies of traders and millers.

Other important findings were the predominantly operational, rather than price, reasons for holding rice by farmers and traders. Farmers hold rice predominantly for family food security reasons. Traders hold rice in order to ensure continuity of mill operation and regularity of rice supply to customers. These reasons suggest that the volume of private interseasonal storage may be relatively insensitive to the level of the seasonal price margin.

The sample survey results permitted the reconstruction of interseasonal storage and carryover behaviour by farmers and traders at the level of the aggregate rice market. The surprising finding was the volume of rice holding across seasons done by farmers and traders. Out of an estimated total interseasonal carryover of 6.6 million tons, farmers were found to be responsible for 2.1 million tons (32%), traders for 3.2 million tons (48%), and procurement by BULOG 1.3 million tons (20%). The existence of these private stocks helps to explain BULOG's ability to stabilize prices on the basis of procuring on average only 6% of domestic output.

The time-series analysis of rice prices had two components: retail price analysis, and producer-consumer margin analysis. The retail price analysis focused on price trends, and on seasonal, locational and varietal dimensions of the rice market.

The time-series price analysis found that (a) the seasonal retail price change was insufficient to provide a positive real return to rice storage at prevailing interest rates, (b) seasonal price changes have been declining slightly over time, (c) the producer-consumer margin likewise has experienced a gradual decline over time, and (d) the Indonesian rice market is highly integrated as measured by spatial price correlations and supported by other indicators of market integration.

It is widely recognized that BULOG is a successful food grain parastatal, especially by comparison with similar agencies operating in other developing countries. Nevertheless BULOG is a large organization, with high overhead costs incurred in maintaining an intervention infrastructure across the geographical spread of Indonesia.

The results of the RMS suggest that BULOG could achieve its price stabilization role at the farm level at considerably lower cost, by more targeted operations with respect to season and location. At the consumer level, the competitiveness of markets and the efficiency of communications across much of Indonesia mean that seasonal peaks in retail prices could be avoided by market injections in a few well chosen locations. The private marketing system has been shown to work well, and this suggests a minimal future role for state action, confined to protecting farmers and consumers from the most severe effects of the continued strong seasonality of rice harvests in Indonesia.

Section 1
Context, Aims and Approach

CONTEXT

This publication reports the methodology, results, and policy conclusions of a research programme undertaken between 1989 and 1991 on the private rice marketing system in Indonesia. The research is called the Rice Marketing Study (RMS). The focus in this section is on the policy context, aims, and methodology of the research. The publication tries, where possible, to relate the details of the Indonesian case-study to wider issues of research into food grain marketing systems in developing countries.

Like many other countries, Indonesia has a parastatal agency responsible for ensuring stable prices for its main food staple, in this case rice. This agency, called the Badan Urusan Logistik (BULOG), operates as a classic buffer-stock authority in the rice market. It purchases rice in the peak harvest season at a floor price to farmers, and it sells rice in order to defend a ceiling retail price for consumers. The historical success of BULOG in achieving both intra-year and inter-year rice price stabilization has been detailed elsewhere (Mears, 1981; Ellis, 1990).

Indonesia has a population of 180 million people, and domestic rice consumption is estimated at roughly 26.5 million tons (1990 figures). (This figure refers to the balance sheet derivation of aggregate rice consumption, based on rice production, stock changes, and deductions for seed, losses and non-food uses.) Average rice consumption/person is therefore around 147 kg/year. Since 1984 this rice consumption has been met almost entirely from domestic supplies, and government policy towards the rice sector has been aimed at maintaining self-sufficiency in line with trend consumption. The issues and prospects of the self-sufficiency strategy are discussed by Damardjati *et al.* (1988), Falcon and Timmer (1991) and Pearson (1991).

BULOG on average procures around 6% of the domestic rice harvest, equivalent to 1.8 million tons. This is used both for price stabilization purposes, and in order to supply rice rations to government employees under a scheme dating from the 1960s called the 'budget group' system. This level of BULOG procurement means that the major proportion of rice trade in Indonesia is conducted through private channels. It also means that in terms of degrees of intervention, BULOG differs considerably from other food grain parastatals found worldwide. Nevertheless, with 3.5 million tons of storage capacity spread across Indonesia, and an annual stock turnover of 1.8 million tons, BULOG is a large organization operating a substantial storage infrastructure with high overhead costs.

Indonesia has enjoyed high rates of economic growth and considerable gains in income per capita over the past fifteen years. One consequence of this is that rice is a declining proportion of average household consumption expenditure, falling from over 30% in the early 1970s to under 10% at the start of the 1990s. (These figures refer to the weighting of rice in the Consumer Price Index for the periods mentioned. The decline in the average proportion does not mean that the rice expenditure share for low income groups has fallen at the same rate.) Indonesia has also experienced a vigorous climate of deregulation since the mid-1980s.

These factors suggest that BULOG, despite the past success of its price stabilization mandate, may confront future pressure to reduce its operations, and its costs to the government budget. In such circumstances, it is important for policymakers, and for BULOG itself, to know more about the mode of operation of the private rice trade which corresponds to 94% of the rice market. The Rice Marketing Study (RMS) was devised with the aim of making a substantial contribution towards improving the knowledge base concerning the private rice marketing system.

AIMS

The central aim of the Rice Marketing Study was to achieve a more detailed understanding of the factors in the private rice marketing system influencing seasonal rice price formation. For the

purposes of research, farmers, as well as traders and millers, were included in the notion of the private marketing system. The research thus encompassed seasonal patterns of behaviour of farmers with respect to rice consumption, sales and stocks, as well as prices, margins, and stockholding behaviour in private marketing channels.

Within this context of an improved understanding of seasonal rice price formation, the aim of the RMS breaks down into the following main concerns:

(a) to define, describe, and quantify the activities of private agents in the rice marketing system, including farmers, *gabah* traders, millers, and rice traders;

(b) to examine the rice storage and sales behaviour of participants in the rice marketing system, including the amount of rice retained by farmers for home consumption;

(c) to examine the formation of margins in private rice marketing channels, including mill recovery rates and the influence of margins on interseasonal private stocks;

(d) to consider the policy implications of the RMS results for the future price stabilization role of BULOG.

Another way of thinking about the aims of the study is to distinguish factors having a direct influence on seasonal price formation (seasonal patterns of output, market supply, stocks, and margins) from factors determining how well the marketing system performs its various functions (structure, competitiveness, and efficiency of marketing channels). The RMS was concerned with both these aspects of the seasonal working of private rice marketing in Indonesia (Ellis, 1992).

METHODOLOGY

The RMS adopted a threefold approach to achieving its aims. The three components were: a sample survey of market participants conducted at seasonal intervals during a calendar year (1990); informal data gathering based on key informant interviews (1990); and time-series analysis of rice prices and margins (1980-90). The research spanned a period of 18 months from October 1989 to March 1991.

The methodology of the formal sample survey is described here, while that of the time-series analysis is covered in Section 4 below. Qualitative and informal data was used in a general way to enhance the interpretation of formal methods of data collection and analysis.

A central feature of the RMS sample survey was that it utilized farmers as a starting point for exploring marketing chains, employing a technique of linked interviews. This contrasts with marketing studies which begin with traders or millers, or with market places such as village markets or city markets. There were several reasons for choosing farmer decision-making as the starting point, and these may be stated as follows:

(a) To measure the major quantity relationships at point of sale by farmers – sales, stocks, consumption – explaining the seasonal flow of rice into the market;

(b) To examine the competitiveness of the marketing system as experienced by farmers;

(c) To distinguish different types of marketing channel between farmers and consumers i.e. the alternative routes and stages by which rice moves from farms to locations of consumption;

(d) A final, more practical, reason was that in Indonesia, as in other countries, it is more feasible to select a representative sample of farmers than to do so for traders. This is because the population of farmers is known and available from village lists of farm households, whereas the population of traders is variable, unknown and unlisted.

The methodology of the RMS sample survey is illustrated by the pyramid concept given in Figure 1. The following are its main features:

(a) Three sample *kabupaten* (districts) were chosen in order to represent:

  (i) a supply area for Jakarta (the district of Karawang, West Java);

  (ii) a rice surplus area with extensive land trading links (the district of Ngawi, East Java); and,

  (iii) a rice surplus area with sea trading links (the district of Sidrap, South Sulawesi).

  These sample survey locations are shown on the map at the beginning of this report.

* 3 Provinces
* 3 Kabupaten, 1 each province
* 3 Seasons
* 3 X 100 Farmers, each season
* 3 X 60 Traders, each season
* 3 X 30 Millers, each season
* 9 X Pyramid Sample, total

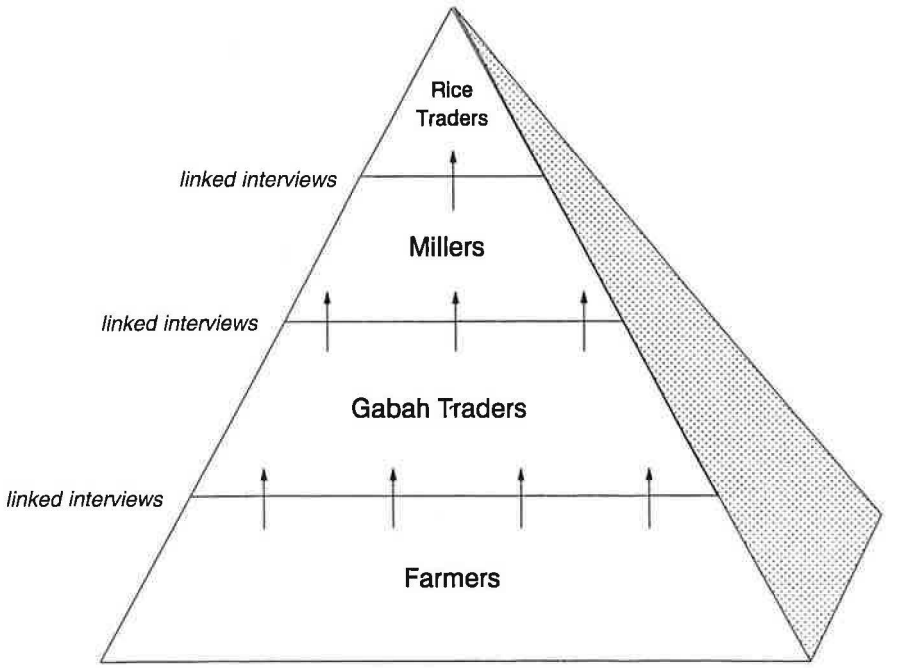


Figure 1 Pyramid Structure of Sample Surveys

(b) For each of these sample survey locations, a linear random sample was taken of ten villages, with the purpose of ensuring a good geographical spread of villages across the sample *kabupaten*.

(c) For each sample village, a random sample of ten farmers was made, giving a total of 100 farmers in each location, or 300 farmers in total.

(d) Traders and millers were interviewed according to a method of linked interviews: each farmer was asked to whom they had made their most recent sale, then each first trader or miller interviewed was asked to whom they had made their most recent sale, then each second trader or miller was asked to whom they had made their most recent sale, and so on (Hayami *et al.*, 1988).

(e) The trader and miller sample was thus non-random, but was designed to elicit information on prices and margins related to the sales transactions of an original random sample of farmers.

(f) The interview structure is pyramid in shape because the sample size declines down the marketing system: some farmers sell to the same trader, some traders sell to the same miller, some sales take place in markets where the identity of the buyer disappears, some chains come to an end close to their origin, while others disappear into long distance trade.

(g) In order to guard against too few observations occurring in successive links in the chain going away from the farmer a minimum sample size was stipulated for traders and millers. This minimum sample size was 60 for traders and 30 for millers in each sample *kabupaten*. Where insufficient observations were obtained from the method of linked interviews, enumerators had to select substitute respondents to fulfil the quota in that category.

(h) The same sample of farmers, and the same method of linked interviews, was undertaken three times, with three-month intervals between each repeat survey, during the calendar year 1990. The aim was to capture the seasonal changes in rice marketing behaviour which occur in the first, second, and third harvest seasons. Another aim was to obtain data on farm household behaviour with respect to the rice market in seasons when the individual household might not be harvesting rice.

This approach to the collection of data on the rice marketing system proved to have several strong points and some weaknesses. The decision to place the major emphasis of the sample survey work on farmers turned out to be a good one. A considerable volume of useful data on farmgate prices, output distribution, sales, stocks, consumption, and purchases was obtained. The farm surveys also yielded much relevant information on qualitative aspects of farmer transactions in the rice market. The linked method of trader interviews provided valuable insights into market structure, the diversity of trading channels, and marketing margins.

However this method was prone to the two potential weaknesses of farmers not knowing the identity of the traders to whom they sold, and the inability of enumerators to follow chains when they became more distant from origin than the boundaries of the *kabupaten*. Another problem with the trader sample, not related to the chain approach, was the great variability of trader types, functions, and technology within the sample. This variability is interesting in itself, but it implies that meaningful statistical averages were sometimes not possible to derive from the data collected in the trader sample.

Overall, the experience with this methodology was positive enough to suggest that it might be worth developing as a more general approach to studying food marketing systems in developing countries, apart from its immediate application to private rice marketing in Indonesia.

Section 2
Sample Survey Results

QUANTITY FLOWS AND STOCKS

This section summarizes the results of the sample surveys undertaken in the rice marketing study, beginning with quantity flows and stocks of *gabah* and *beras* (see the Glossary for these and later terms). The section also covers the topics of marketing chains, costs and margins, and competition in rice marketing channels.

The starting point for an analysis of volume flows and stocks at farm level is the total quantity of *gabah* harvested by the farm household. This quantity is referred to as the 'gross harvest' or *jumlah kotor* because two types of deduction are made before arriving at the quantity over which the household has direct control concerning how much to sell and how much to store. The first deduction is the harvest share paid to harvest labour, and there are several different systems determining the size of this (*bawon, ceblokan*, etc. described below). The second deduction is the landowner share for farmers cultivating either wholly or partly under sharecrop tenure (*bagi hasil*). The 'net harvest' remaining after these deductions have been made is referred to as *jumlah bersih*. The net harvest is available for immediate or deferred market sales, for family consumption, for seed, and for household obligations in kind (for example, inputs are sometimes paid for in kind).

The following paragraphs summarize the results of the sample surveys of farmers with respect to the disaggregated picture of the distribution of the gross harvest. This includes data and discussion on gross and net harvest, harvest share, landowner share, proportion sold, later disposal, home consumption, and storage.

Gross and Net Harvest

Figure 2 summarizes the big picture for the first harvest season across all sample locations. The data set used for this exercise excludes households which had not yet made a market sale at time of interview. For the sample as a whole, the harvest share corresponded to 13% of output, and sharecrop payments to landowners corresponded to 14% of total output. These deductions meant that on average the net harvest under the decision-making control of the farm household was 73% of the gross harvest.

Farmers are observed to sell a majority proportion of the net harvest quantity within a few days of harvest. On average sample farmers sold 68% of the net harvest in this fashion, mostly within five days of the harvest date. The remaining 32% of the net harvest is stored by the household. Of this about one third (i.e. 11% of the net harvest) is required for household consumption, and two thirds (i.e. 21% of the net harvest) is used for later market sales or transfers across seasons. This is referred to as 'Later Decision' in Figure 2.

Comparative data on these various proportions, for the first harvest, are given in Table 1.

Harvest Share

The harvest share varies in different locations according to custom and the system in operation. In the RMS, all observations recorded payment for harvest labour in the form of a crop share or *bawon*. However, *bawon* shares vary according to two main systems: the 'open system', in which as many people can join the harvest as wish to do so; and the 'closed' system, in which the cultivator controls the number of people involved in the harvest. This is typically done by requiring them to have undertaken other tasks, such as hoeing and weeding, in exchange for the right to participate in the harvest. The closed system is known as *ceblokan* in West Java and *kedokan* in East Java. The open system tends to be associated with harvest proportions of 1:9 (a tenth part) or 1:10 (an eleventh part); while the *ceblokan* share is typically in the range of 1:4 (a fifth part) to 1:6 (a seventh part). However it is not always possible to infer the type of harvest system from the share proportion, and many different variations apply in practice.

In the sample locations of the RMS, the *ceblokan* system predominates in Karawang, while open harvests are more prevalent in Ngawi and Sidrap. These differences probably reflect labour market conditions in each location, for example, farmers in Karawang may have experienced a shortage of labour in some periods of the year due to the proximity of the city of Jakarta. In this case the *ceblokan* system provides a means of securing labour for field tasks as well as for harvesting. It has been suggested that variations in these harvesting systems (as well as in the shares) reflect methods by which farmers equalize the marginal product of labour to the going market wage rate (Kikuchi, 1981). Alternatively, they may be associated with attempts to increase the control over labour exercised by the cultivator (Hart, 1986).

Previous research on rice production and marketing in Indonesia has placed emphasis on the rise of another method of organizing harvests, the *tebasan* system (see, for example, Collier *et al.*, 1973; 1974). This is a contract harvesting system, in which the contractor (called a *penebas*) purchases the crop standing in the field, just before harvest, and uses a hired labour gang to undertake the harvest. A result from the RMS of some interest is that not a single instance of *tebasan* harvest was recorded in the surveys for any of the sample locations. This seems surprising given the geographical dispersion of sample villages and locations. It may indicate that the *tebasan* system fluctuates in importance in the Indonesian rice economy, rather than being on the rising trend which is often assumed. Similar fluctuations have also been noted for the *kedokan* system of harvest share (Hart, 1986).

Landowner Share

The landowner share depends in the first instance on the proportion of *sawah* which is cultivated under sharecrop tenancy in different locations. This proportion varied from 35% in Sidrap, to 23% in

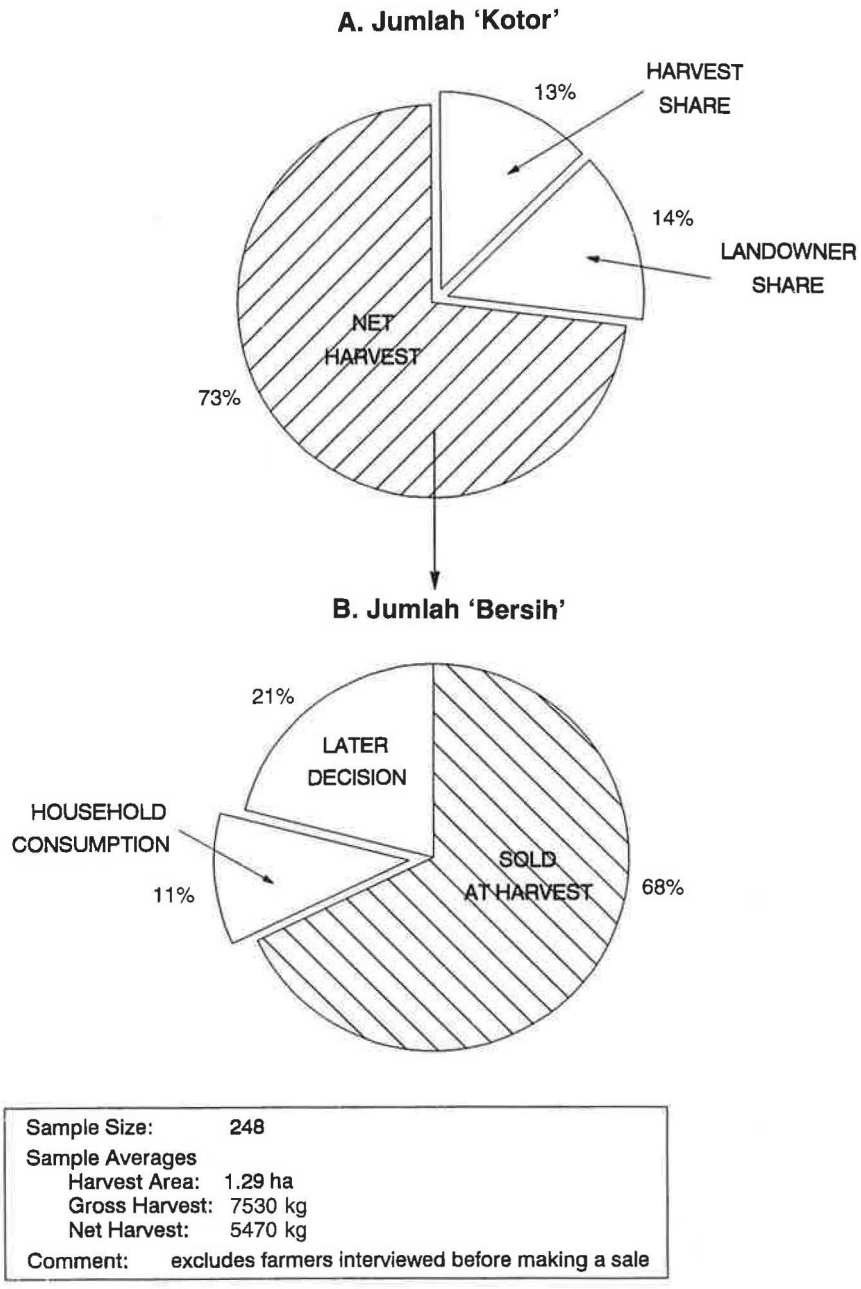


Figure 2 Distribution of Output from First Harvest (All Sample Locations)

Karawang, and 10% in Ngawi, in the RMS sample surveys. The RMS sample displayed tenure proportions overall of 60% owner-cultivator, 25% sharecrop tenant; 10% sharecrop landowner, 4% cash rent, and 1% other access. An interesting summary of land tenure proportions and types in an upland Javanese village can be found in Morooka and Hayami, 1989.

Sharecrop tenancy is a complicated matter to research in Indonesia, and this was not an aim of the RMS. Many farmers own land as well as sharecrop; some farmers sharecrop out their own land while sharecropping in the land of another farmer. Many variations are possible and are found in practice.

The crop ratio paid to the landowner by the tenant is typically 1:1 (half to each) in all locations. Around 90% of the sharecrop farmers in the sample divided the crop according to this ratio. The only other common ratio was 1:2 (one third/two thirds, with the party which supplies the inputs getting the higher share). The division between landowner and tenant takes place *after* the harvest share and

Table 1 Distribution of Output from First Harvest (All Sample Locations)

Volume category	*† Karawang (84) Sample average (kg)	% A	% B	Ngawi (77) Sample average (kg)	% A	% B	Sidrap (87) Sample average (kg)	% A	% B	All locations (248) Sample average (kg)	% A	% B
A. Gross harvest	12 144	100		3 578	100		6 573	100		7 530	100	
Harvest share	1 878	15		361	10		763	12		1 016	13	
Landowner share	1 638	13		293	8		1 135	17		1 044	14	
B. Net harvest	8 628	71	100	2 924	82	100	4 675	71	100	5 470	73	100
Sold	6 243	51	72	1 970	55	67	2 795	43	60	3 707	49	68
Stored	2 386	20	28	954	27	33	1 831	28	39	1 747	23	32
Later decision	1 771	15	21	518	14	18	1 136	17	24	1 160	15	21
Home consumption	615	5	7	436	12	15	695	11	15	587	8	11

Notes: *Number of sample observations in brackets: excludes observations for farmers interviewed before making a sale.
†All data refers to *gabah* GKP.

joint costs have been deducted. Some examples were observed in Sidrap whereby tenants sell the physical *gabah* and pay the landowners in cash.

Sale Proportion

The proportion of the net harvest which is sold within a few days of harvest is a critical component of the overall picture of harvest distribution. Several points can be made from the survey results. *First*, this proportion displays high variation for each location, and within the farmer sample as whole. The coefficient of variation was 40% for the sample as a whole, and most of the sample is divided fairly equally across sales proportions ranging from 30% up to 100%. *Second*, the variability in this proportion is not linked in any systematic way to the level of other farm household variables such as family size, farm size or volume of harvest. This suggests that a great many socio-economic factors related to household income and consumption enter the farmer's decision about the quantity to sell directly from the net harvest. There is growing evidence that, on Java, rice farming is only one of a range of income-generating activities (Preston, 1989).

Despite this high variation, a comparison of the average percentages sold from the net harvest (Table 1 above) reveals that they are neither very far apart, nor ranked implausibly in terms of obvious attributes of the three locations. Being adjacent to the capital city of Jakarta, farmers in Karawang (72% sold) would be expected to display a greater commitment to market exchanges than Ngawi (67% sold), as the middle case, and Sidrap (60% sold), as the most remote of the three locations.

Farmers in all locations tend to make their first, main, sale very soon after harvest. For the first harvest, 40% of farmers made their main sale on the same day as harvest, and 75% within the first five days after harvest. The data given in Table 1 and elsewhere on sales proportions refer to this first main sale, not to the entire amount sold in the end by farmers. Farmers seem to make subsequent sales in small lots in order to cover specific cash needs. They also retain more than they strictly need for family consumption, for food security reasons.

Later Decision

The amount described in Figure 2 and Table 1 as 'later decision' is the quantity stated as stored by the farmer *less* the quantity required for family consumption for a six-month period. The latter quantity is calculated from the daily consumption figures detailed further below, and is used here to provide a working estimate of the decision-making flexibility left open to the farmer after completing the first sale. The 'later decision' proportion averages 21% across all locations, and varies between 18%

(Ngawi) and 24% (Sidrap). The proportion is used both for later sales by farmers and for interseasonal transfers beyond 4–6 months for consumption purposes.

Household Consumption

The rice consumption data for the farm household surveys are summarized in Table 2. Households were asked to state their average daily quantity of rice consumption. There were a few instances of changes to this figure in successive surveys, therefore the first survey is used for the data given here. The figures for personal consumption per day and per year are calculated from household consumption given the number of people in each household.

The sample as a whole gives a mean annual rice consumption level of 145 kg/person. This is similar to the national annual per capita consumption estimate for 1990 obtained by the balance sheet method which is 147 kg. Note that there are significant differences in mean annual consumption per person between sample locations, with Karawang (176 kg) displaying higher rice consumption than Sidrap (140 kg) and Ngawi (120 kg).

The rice consumption data were used to calculate the quantity of *gabah* required to satisfy household consumption needs over a six-month period. It is this figure which is used in Table 1 and Figure 2 to represent the share of the net harvest retained for home consumption. The conversion rates used for making this and other conversions between *gabah* and rice are the mill recovery rates stated by farmers themselves as representing the expected outturn from having *gabah* milled for home consumption.

Table 2 Rice Consumption in the Farm Household Surveys

Rice consumption	Units	Karawang	Ngawi	Sidrap	All locations
Sample size*	No.	97	97	95	289
Home consumption (total family)	kg/day	1.88	1.51	2.02	1.80
Household size	No.	4.0	4.4	5.3	4.6
Consumption/person	kg/day	0.48	0.33	0.38	0.40
Annual consumption/person	kg/year	176	120	140	145

Note: * Excludes three outliers in each location. All data in this table are the sample means for the number of observations indicated.

Storage

Farmers were asked how much rice and *gabah* they had in store at time of interview, as well as questions about the location of stocks, maximum stock capacity, and the length of time over which they intended to keep stocks. The results obtained from this set of questions can be summarized as follows:

(a) In most cases farmers keep their stocks in the form of *gabah* rather than *beras*. Household consumption requirements of *beras* are met by taking small quantities of *gabah* (perhaps seven to ten days worth of rice consumption) to the mill on a regular basis.

(b) Farmers keep their stocks mainly in the home. About 95% of all sample farmers kept their stocks at home. Space for storage does not appear to act as a constraint on the quantity which is stored at home. In most cases, farmers' stated maximum capacity to store was much higher than the actual amount stored. In the first survey, for example, farmers on average held 1.6 tons of *gabah* in store soon after harvest, but the average stated maximum storage capacity (excluding outliers) was 4.5 tons.

Table 3 Average Storage Quantities of Sample Farmers (kg *Gabah*)

Survey no.	Karawang kg	obs*	Ngawi kg	obs*	Sidrap kg	obs*	Total kg	obs*
Survey 1	**2628**	**96**	**776**	**78**	**1282**	**95**	**1616**	**269**
Survey 2	**2242**	**90**	**944**	**92**	**965**	**90**	**1380**	**272**
Survey 3	**1670**	**83**	**587**	**66**	**1247**	**91**	**1212**	**240**

Note: *obs = number of observations used in calculating mean storage quantities.

(c) Farmers tend to hold back from the market quantities of *gabah* several times in excess of household consumption needs. On average, first survey farmers kept back 1.6 tons (Table 3). This was nearly three times the quantity needed to feed the household for six months (0.6 tons). Another way of stating the same result is that stocks immediately after harvest were enough to provide cover for nearly 18 months' household consumption.

(d) However, as shown in Table 3, there were significant differences between locations in the level of post-harvest stocks. These correspond in part to differences in the level of average total output per household (Table 1 above). The seasonal dimensions shown in Table 3 are discussed further below.

(e) Farmers were asked in several different ways how long their stocks would last in relation to their level of consumption. While these questions seem to have caused a bit of confusion for both enumerators and respondents, the results (Table 4) clearly indicate that farmers intend their stocks to run down by the time of the next harvest. The results for Sidrap are especially revealing. When asked immediately after the first harvest when stocks would run out, farmers replied on average 6.2 months; in the non-harvest season they replied 4.9 months; and after the third harvest they replied 5.1 months. These figures are closely related to the actual intervals between interview dates and the next harvest in each case.

Table 4 Average Stated Storage Interval of Sample Farmers (Months until Stock Depleted)

Survey no.	Karawang months	obs*	Ngawi months	obs*	Sidrap months	obs*
Survey 1	4.5	77	3.2	88	6.2	99
Survey 2	4.8	78	3.9	90	4.9	94
Survey 3	4.9	26	3.4	42	5.1	86
All surveys	4.7	181	3.5	220	5.4	279

Note: * obs = number of observations used in calculating mean months stated stock duration.

Note that the figures given for average storage levels in Table 3 do not exactly match the figures given for *gabah* unsold earlier in Table 1. The reason for this is that the sample differs between these two tables. Table 3 is based on all farmers who provided valid answers to questions about quantities of rice and *gabah* in store. Table 1, on the other hand, is based on those farmers who had made their main sale at time of interview, and the amount unsold is calculated by subtraction of the quantity sold from the net harvest. It is not surprising that there should be minor differences in magnitude between these two different ways at looking at flows and stocks.

Seasonal Comparisons

The RMS sample surveys were conducted at roughly three-month intervals between the first harvest (late March/early April) and the beginning of the *paceklik* season (Sept/Oct). There is some variation

within each sample location, since enumerators tried to interview farmers after harvest, if they were harvesting in that period.

The pattern of results varies from season to season. In the first survey, all sample farmers had harvested rice, and thus the most complete set of data is available on rice flows and stocks. In the second survey, about 60 farmers in Karawang harvested rice, 75 farmers in Ngawi, and almost none in Sidrap. In the third survey, 30 farmers in Karawang harvested rice, 40 farmers in Ngawi, and 85 in Sidrap.

There were many questions which could be answered by all farmers in every season e.g. questions on recent *gabah* sales, and on quantities in store. However the interpretation of these questions is quite different according to whether or not farmers have just harvested. In order to make valid seasonal comparisons of behaviour such as sales or storage, the same farmers must be used in the data set for each successive season. For this reason, the average seasonal storage data given in Table 3 makes an inaccurate guide to seasonal storage behaviour since the samples contain widely varying numbers of farmers who have harvested *gabah* in each season.

Two aspects of the seasonal behaviour of farmers are of special interest in the RMS context. The first is the proportion of output which they market from different seasonal harvests. The second is the stock levels which they maintain across the seasons. These are examined using selected sub-groups of sample farmers. One sub-group consists of 43 farmers in Karawang (Group A) who harvested in the first and second harvest seasons. Another sub-group consists of 27 farmers in Karawang (Group B) who harvested in the first and third harvest seasons. The final sub-group consists of 56 farmers in Sidrap (Group C) who harvested in the first and third harvest seasons.

The sales and related behaviour of these three groups is summarized in Table 5. The first sub-group of Karawang farmers (Group A) obtained a low net harvest in the second survey. It is believed that this may have been due to insect damage. Whether this has a bearing on the results is not known. The main result is that the proportion of output sold fell from 73% to 54% between the first and second seasons. The absolute quantity not sold was more or less the same as the first harvest.

The second sub-group of Karawang farmers (Group B) also obtained a lower average harvest in the third season than in the first season. The proportion of output sold immediately after harvest fell from 70% to 55%, very similar to the outcome for the first sub-group (Group A).

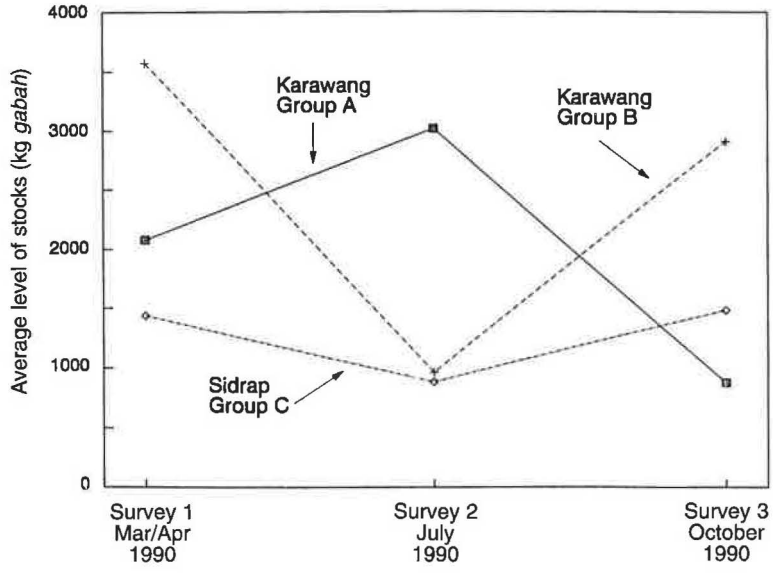


Figure 3 Seasonal Changes in Average Storage per Household (Selected Sub-samples)

The group of Sidrap farmers (Group C) obtained a lower harvest in the third season than in the first season. Their average proportion sold declined only from 64% to 56%, which given the statistical variability underlying these figures implies no significant change between these seasons.

The seasonal storage behaviour of these three groups is summarized in Table 6 and Figure 3. The first group (Group A) adds to stocks in the second season, and by the time the third season comes round stocks have depleted broadly in line with expected consumption requirements over the subsequent *paceklik* season, allowing for a risk margin of extra food security. The second group (Group B) experience declining stocks through the middle of the year due to consumption and sales, then builds up stocks just before *paceklik*. The third group (Group C) also experiences declining stocks through the middle of the year, which are then replenished to their former level in the third season harvest. Statistically, the results for Groups A and C are better than those for Group B, which is a relatively small sub-sample containing wide variability in farmer size characteristics.

Taken in conjunction with earlier evidence on farmers' intended stock depletion rates (Table 4), these results lead to the following conclusions about the seasonal marketing and stocking behaviour of Indonesian rice farmers:

(a) Stocks play a dual role for farmers. One role is as a holding operation for sales which are intended between one harvest and the next. The other role is household food security, which includes the basic consumption needs of the household within and between seasons plus a risk margin to allow for possible delays or failures in the next harvest.

Table 5 Seasonal Changes in the Distribution of Net Harvest

Volume category	Units	Karawang Group A Survey 1	Survey 2	Karawang Group B Survey 1	Survey 3	Sidrap Group C Survey 1	Survey 3
Observations	No.	43	43	27	27	56	56
Net harvest	kg	9313	5495	6702	4983	5154	3470
Sold	kg	6771	2975	4685	2730	3279	1937
	%	72.7%	54.1%	69.9%	54.8%	63.6%	55.8%
Not sold	kg	2542	2520	2017	2253	1875	1533
	%	27.3%	45.9%	30.1%	45.2%	36.4%	44.2%
Later decision	kg	1979	1937	1428	1636	1191	876
	%	21.2%	35.3%	21.3%	32.8%	23.1%	25.2%
Home consumption	kg	563	583	589	617	684	657
	%	6.0%	10.6%	8.8%	12.4%	13.3%	18.9%

Table 6 Seasonal Storage Patterns of Selected Groups of Farmers: Average kg in Store at each Survey

Survey no. Sample obs.	Karawang Group A 43	Karawang Group B 27	Sidrap Group C 56
Survey 1	2077	3570	1438
Survey 2	3019	965	885
Survey 3	878	2911	1484

(b) These roles are intertwined. Farmers hold back a high enough proportion of the harvest to cover between two and three times normal consumption. As the period between harvests progresses they gradually sell the amount which is surplus to household consumption requirements.

(c) Farmers do not carry over stocks at the next harvest unless there are good food security reasons for doing so. There is some carry over at the second harvest for farmers who need to store enough rice to last until the first harvest season the following year (stocks are increased as in the Karawang, Group A, example above).

(d) The timing of harvests, and the periods between harvests, are such that farmers may be observed to sell immediately (main sale) a smaller proportion of their net harvest in the second or third harvest season than in the first harvest season. However, the way this occurs is highly variable according to local circumstances, and does not lead to generalizations about the pattern of this decline. Nor does the decline in the immediate sale proportion necessarily mean that the eventual total sale proportion declines over the seasons.

(e) Availability of storage space does not seem to be a constraint on the storage behaviour of most farmers. It would appear that most farmers' houses can contain up to four tons or more of grain stored in sacks, whereas after harvest farmers tend to keep between one and three tons.

Farmer Purchases of Rice

The foregoing discussion demonstrates that it is rare for farmers to buy rice, unless they are switching between home and purchased rice for special consumption reasons. When asked the details of their rice purchase behaviour, about 75% of all farmers in the sample stated that they never bought rice. This proportion varies slightly between locations and across seasons, but clearly rice purchase by farmers is not a major feature of the aggregate rice market. The data obtained from the few households that answered questions on rice purchases were of poor quality, and did not yield useful insights into this aspect of farmer behaviour.

MARKETING CHAINS

Overview of Private Rice Marketing

Rice marketing in Indonesia is carried out by a large number of small operators, working mainly outside the context of formal market places. *Kecamatan* and *kabupaten* markets provide important collection and retail points for some marketing channels but the majority of traders and millers operate through networks of relationships with other traders, linking the paddy producer to the rice consumer.

These networks ensure not only the smooth flow of rice but also that of working capital. In the competitive environment of the Indonesian rice market individual success is largely determined by the nature and extent of such contacts, and by the ability to command regular sources of credit. Even then a high degree of flexibility in mode of operation is required. Seasonal changes in margins encourage traders to seek new marketing channels, to switch from trading unmilled to milled rice, or to close down or trade in other commodities, until margins improve.

Description of Trader Types

There are a number of ways in which traders might be categorized, the most obvious, perhaps, being scale of operation and function performed. In the analysis of the sample survey data the focus has been on function, although in some cases there is a degree of correlation between function and scale.

Four broad categories have been defined based on the types of transactions which were being carried out at the time of respondent interviews: gabah-gabah traders defined as those who buy and sell unmilled rice; gabah-beras traders who buy *gabah*, rent mill facilities and sell the milled rice; millers, as those who own a mill; and beras-beras traders, who buy and sell *beras*.

These categories have proved useful for certain types of analysis but it must be remembered that the variation in mode of operation within each category can be substantial and that individuals may

cross the boundaries of several categories at one time (selling both *gabah* and *beras*), or may switch categories from one season to the next.

Gabah-gabah traders (G-Gs)
The main function performed by gabah-gabah traders is to transport *gabah* from the field or farm household to the mill. Some also undertake sun-drying of the *gabah*. These functions may also be performed by the farmer. A proportion of 38% of marketing chains followed in the sample survey included one or more *gabah* traders, while in the remaining 62% farmers sold directly to a gabah-beras trader, miller or KUD (Kooperasi Unit Desa, State-sponsored farmer co-operatives), or even rented mill facilities and sold *beras* to a *beras* trader.

Gabah-beras traders (G-Bs)
Gabah-beras traders buy *gabah* from the field or farmers' home, rent mill facilities at a local mill and sell the milled *beras*. They thus form an alternative link in the marketing chain to the miller. All chains in the sample survey included either a gabah-beras trader, or a miller, or KUD. As with gabah-gabah traders, gabah-beras traders are often small operators and indeed G-G traders may switch to become G-B traders at times when sales of *gabah* are unprofitable. G-B traders are rarely found in Sidrap but are common in Karawang and Ngawi. In Karawang 23% of all traders were G-Bs, and 29% were millers; while in Ngawi 36% were G-B traders and only 19% were millers (see Table 7).

Millers
For the purposes of the survey a miller was defined as anyone who owns a mill, but it is useful to distinguish different types of miller according to their role in the rice market.

Two key roles may be performed by millers in the marketing chain. A miller may buy *gabah*, mill it and sell *beras*, or she or he may provide mill facilities for others to mill their *gabah*. In many cases both activities occur at the same site. However, some mills are specifically oriented towards mill rent for local farmers' home consumption (common in Ngawi), others focus on providing a base for the trading activities of G-B traders (Ngawi and Karawang), while a third group concentrate on trading in their own right, with mill rent an insignificant source of income (most mills in Sidrap fall into this category).

Beras-beras traders (B-Bs)
The functions performed by those who trade beras may include (a) transport from mill to wholesale or retail outlets, (b) bulking up and short term storage at the wholesale level and (c) packaging for retail sales.

The mode of operation of *beras* traders depends on the type of retail market for which the *beras* is destined and on its location in relation to the mill. The local population often buy directly from the

Table 7 Number of Trader Respondents by Type*

	Karawang		Ngawi		Sidrap		All locations	
Trader type	No	%	No	%	No	%	No	%
Gabah – gabah	64	*25*	49	*32*	22	*12*	135	*23*
Gabah – beras	59	*23*	55	*36*	15	*8*	129	*22*
Miller†	73	*29*	29	*19*	122	*65*	224	*38*
Beras beras	59	*23*	18	*12*	29	*15*	106	*18*
All types	255	*100*	151	*100*	188	*100*	594	*100*

Data source: RMS sample survey, traders, survey A.

Notes: * Includes substitutes traders as well as those entering chains.
† Miller includes KUD – Miller.

mill for home consumption, in which case no B-B trader is involved in the marketing chain. At the next level, village B-B traders buy from farmers, G-B traders, or millers for retail sales in village or *kecamatan* markets.

Some *beras* enters large wholesale/retail markets at *kabupaten* or provincial towns. Wholesale and retail markets in Indonesia are generally combined with the same traders selling both wholesale and retail, with price differences ranging from Rp 0–25. (An exception is the Cipinang Wholesale market in Jakarta, the destination of much of the *beras* traded from Karawang.) Such *beras* seems to be often sold by the miller directly to a wholesaler at the market, so that it is the miller who undertakes the transport. Wholesalers themselves generally do not transport. Their function is to provide a post for bulking up and packaging, for sale both to other wholesalers and to retail customers.

Typology of Marketing Chains

The method of linked interviews used in the sample survey proved successful in generating a large amount of interesting information on marketing chains. However caution is required in the interpretation of the results. A total of 604 marketing chains were followed from 300 sample farmers over the study period. These give an impression of the relative importance of different types of marketing chains, and of different destination markets for each research location. They do not, however, indicate the relative volume flows along different trading channels. Chains were followed according to the 'most recent sale' of farmers and traders. For farmers this coincided with their main sale from the recent harvest, in most cases. For traders, however, there are many sales transactions across different marketing channels, and a single transaction says nothing about the quantitative importance of each type of channel for that trader.

One of the most striking findings of the study was the marked contrast in the marketing channels from farmer to retailer in the three research locations. These differences are related to the flows of *gabah* and *beras* within and beyond each *kabupaten*, which are in turn determined by seasonal patterns of supply and demand.

Thus, whereas in Sidrap a very high proportion of sample chains ended at the DOLOG, in Karawang and Ngawi the majority ended on the open market. (BULOG has a provincial depot (DOLOG) in all 27 provinces of Indonesia, and these operate the local infrastructure of rice storage godowns.) In the case of Karawang some 35% ended at the Cipinang Wholesale market in Jakarta, and a further 15% in other *kabupaten*. Many of the chains from Ngawi were not followed to their end since farmers and traders often did not know the identity of the trader who had purchased from them. However, it is clear from enumerators' and other reports that much of the paddy from Ngawi leaves the *kabupaten* as *gabah* to be milled in Jombang, Kediri and elsewhere in East and Central Java, before being sold into Surabaya or to DOLOG warehouses.

Another significant finding was the lack of convergence in marketing chains. Few cases were found of more than three or four chains passing through the same trader at any point in the marketing chain. This lack of convergence confirms the general impression of competition between a large number of small operators.

Figure 4 gives a diagrammatic representation of the marketing chains followed over the study period in the three research locations. The underlying data are summarized in Table 8. As the following descriptions indicate, differences in the destination markets are reflected in differences in the types of trader which predominate and in their mode of operation.

Sidrap

At the first main survey in Sidrap 96% of the 91 marketing chains followed, ended at local DOLOG warehouses. This contrasts with 12% in the case of Karawang and 2% in the case of Ngawi (although in those areas unfinished chains may in fact have ended at the DOLOG had they been followed). The

first survey fell within the main procurement season and in all areas the percentage falls at subsequent surveys, but in the case of Sidrap the percentage for all three surveys remains high, at 78%.

The predominant marketing chain (70% of chains) at the first main survey in Sidrap was:

FARMER → MILLER and/or KUD → DOLOG

In the remaining 30% of cases G-G traders acted as intermediaries between farmer and DOLOG. Only three G-B traders entered chains and no B-B traders were included.

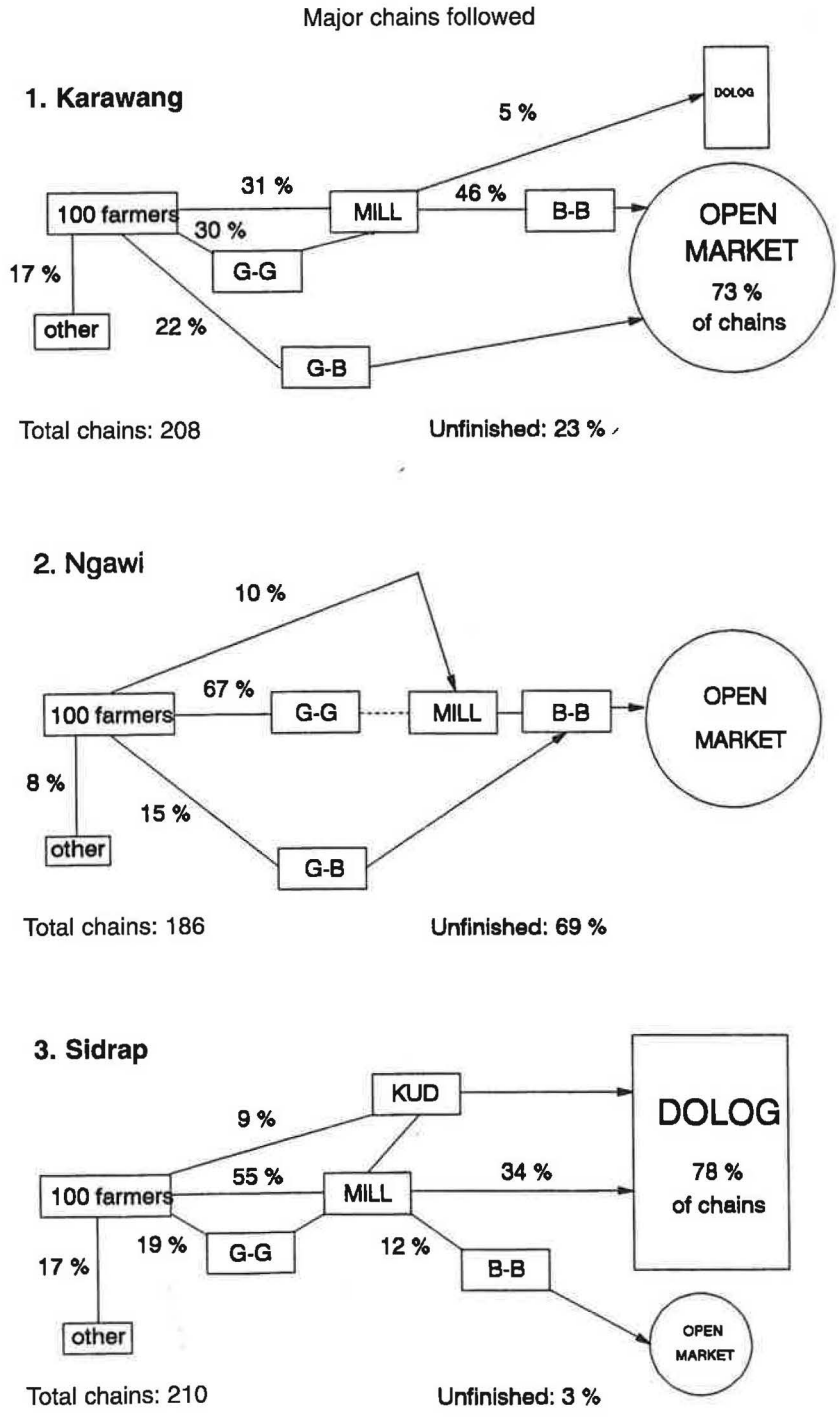


Figure 4 Marketing Chains from Sample Farmers

Table 8 Marketing Chains

(a) Ends of marketing chains followed in sample survey (all surveys)

Location	Karawang	Ngawi	Sidrap	All locations
Number of chains	208	186	210	604
Number no sale	92	114	92	298
Total farmer interviews	300	300	302	902
Chain ends	%	%	%	%
Unfinished	23	76	3	30
DOLOG	5	2	78	29
Open market	73	22	19	41
Total*	100	100	100	100
Location chain end†				
within *kabupaten*	24	4	12	14
within province	15	37	5	18
provincial urban centre‡	35	4	2	14
Total	74	46	19	46

Notes: *Figures do not always add up to 100 due to rounding up.
†Location chain end: includes unfinished chains where location was specified. In this case it may not be the final location. Sales to Dolog have been excluded.
‡Provincial urban centre: Karawang – Cipinang Wholesale Market, Jakarta; Ngawi – Surabaya; Sidrap – Ujung Pandang.
Rice ending here may enter inter-island trade (esp. Surabaya and Ujung Pandang).

(b) First link from farmer in marketing chains followed in sample survey (all surveys)

Location	Karawang	Ngawi	Sidrap	All locations
Number of chains	208	186	210	604
Number no sale	92	114	92	298
Total farmer interviews	300	300	302	902
Farmer first link	%	%	%	%
Gabah – gabah trader	30	67	19	38
Gabah – beras trader	22	15	0	12
Miller	31	10	55	33
KUD	0	1	9	3
Beras trader	6	1	8	5
Retail*	2	0	7	3
Unknown	9	8	1	6
Total†	100	100	100	100

Notes: *Retail: farmer sold directly in local market or to neighbour.
†Figures do not always add up to 100 due to rounding up.

The second main survey fell between the two harvests. Some farmers sold small amounts of milled rice into local retail markets. In 12 cases (25%) farmers sold directly into local markets while 40% of chains at the second survey involved a B-B trader.

The third survey coincided with the second harvest, which, in contrast to the situation on Java, is comparable in size with the first harvest. The usual pattern at this time of year is for rice from Sidrap to enter the open market. In 1990, however, margins remained unattractive (both due to relatively stable prices and a constraint on availability of bank credit). Sales to DOLOG continued until November 1990 and 81% of chains followed at the third survey ended at DOLOG warehouses.

It is perhaps not surprising, given the strong role of DOLOG in the rice market, that KUDs play a greater role in Sidrap than in the other research *kabupaten*. A proportion of 36% of sample marketing

chains from Sidrap included a KUD, and 9% of chains (19 cases) involved sales from a farmer direct to KUD. This compares with two KUDs entering chains in Ngawi and none in Karawang. However, 8% of traders interviewed in Karawang and 3% of those interviewed in Ngawi said they sometimes sold to KUD, although their 'most recent sale' had been elsewhere.

Ngawi

In the case of Ngawi 69% of all chains followed were unfinished, so that the final destination of the rice is unknown. In many cases the respondent was aware of the location of the buyer – often in Jombang, Kediri or other *kabupaten*. In this case the location is entered at Table 8a even though rice may have been sold on to Surabaya or DOLOG.

The proportion of unfinished chains falls from 73% at the first survey to 71% at the second survey and 53% at the third. This may reflect the fall in sales beyond the *kabupaten* as market supply falls and *gabah* prices rise.

The number of chains including a G-G trader is higher in Ngawi than in the other two *kabupaten*, reflecting the situation where much of the *gabah* is milled outside the district. Of chains followed at the three surveys, 67% included at least one G-G trader, and 17% included two.

For the same reason and in marked contrast with Sidrap, marketing chains followed in Ngawi include very few millers. Only one miller entered a chain at the first survey, eight at the second and four at the third. Where enumerators were able to follow a chain as far as the site of milling this function was more often performed by a G-B trader. Most mills in Ngawi are small and are geared towards mill rent for local farmers and traders.

Since so many chains were not followed chain ends have to be inferred from other information. Thus the predominant chain for paddy grown in Ngawi appears to be:

FARMER → GABAH-GABAH TRADER → MILLER → BERAS-BERAS TRADER

with the miller and *beras* trader located outside the *kabupaten*.

Karawang

The predominant marketing chains in Karawang were:

FARMER → MILLER → BERAS-BERAS TRADER	28%
FARMER → GABAH-BERAS TRADER → BERAS-BERAS TRADER	22%
FARMER → GABAH-TRADER → MILLER → BERAS-BERAS TRADER	13%

Marketing chains recorded in Karawang did not vary greatly in comparisons across the seasons. Most of the chains ended on the open market, and sales to DOLOG occurred only at the first survey, when 10 chains entered DOLOG warehouses. The proportion of unfinished chains is 29% at the first survey and falls slightly at each successive survey, giving a percentage of 23% for all three surveys.

Taking all three surveys together, 24% ended within the *kabupaten*, many at the wholesale market in Karawang, the Pasar Johar (PJK); 35% of chains entered the Pasar Induk Cipinang (CIP), Jakarta and 15% ended in other *kabupaten*.

Mode of Operation of Traders

The destination market for rice from a particular area affects not only the type of trader found but also their mode of operation. In particular, there is a marked contrast between the mode of operation of traders and millers in a market dominated by DOLOG procurement and that in markets dominated by sales on the open market.

Thus, millers in Sidrap have adopted a mode of operation geared towards sales to the DOLOG. Quality requirements are clearly specified, the sale price is fixed for the year and demand is, in theory, unlimited. Furthermore, in Sidrap an unofficial private market 'floor price' for gabah into-mill is established by mutual agreement between millers, DOLOG and local government officials (in 1990 this was set at Rp 225–230). This means that margins are stable and predictable, and the role of market information is reduced.

Margins from farm to DOLOG are small, leaving little room for intermediary G-G or B-B traders, and indeed it was said that anyone not owning mill and/or transport facilities could not survive in the rice market in Sidrap.

These characteristics of the market make for a very standardized mode of operation in Sidrap. By contrast, the mode of operation of traders and millers in Karawang and Ngawi, where open market sales predominate, shows great diversity. The greater variation in quality requirements, prices and margins demands a high degree of flexibility. A number of cases were found of individuals operating as G-G traders at the first survey and G-B traders at a later survey due to a drop in margins as *gabah* prices rose. In Ngawi G-G and G-B traders often trade secondary crops such as maize and soybean, switching from crop to crop in response to changes in margins.

In this environment the role of market information is crucial. Where trade occurs over a long distance small local traders are at a disadvantage in terms of access to price information in destination markets. They frequently prefer to sell to a single buyer rather than having to bargain at each sale on the basis of inadequate information. At the first survey, 50% of traders interviewed in Ngawi and 24% of those interviewed in Karawang said that they regularly sold to the same buyer.

COSTS AND MARGINS

In the previous section the functions of different types of trader were described and their relative importance in sample marketing chains in each location was discussed. It is interesting to note that in spite of the variation in mode of operation, average gross margins, as calculated from survey data, did not vary greatly between locations.

Gross margins were calculated using respondent current sale and purchase prices for the date of interview, and their quoted *rendemen* from *gabah* to *beras*. 'Net' margins were calculated by subtracting transport, drying and milling costs from the gross margin. Tables 9a and 9b give a summary of results for the first survey. Table 9a shows that gross margins vary according to the function performed by the trader in the marketing chains, and that the same type of trader earned similar margins across all three locations at the time of the first main survey.

As might be expected, *gabah* traders, whose main function is to transport *gabah* to the site of milling, earn the smallest margins. Gross margins were on average Rp 8.3/kg, and net margins were Rp 3.3/kg *gabah*. Gabah-beras traders and millers both earn margins of Rp 30-35/kg *beras*, of which roughly two thirds account for transport, drying and milling costs, while the remainder is the net margin. Income from the sale of by-products is not included. Millers can earn an additional Rp 8–15/kg *beras* milled on the sale of bran, and, in cases where high quality *beras* is produced, an additional Rp 10/kg from the sale of small brokens. The beras-beras traders in the sample gave average gross margins of Rp 18.7, but the sample size was rather small due to the high proportion of unfinished chains in Ngawi and the small number of *beras* traders entering chains in Sidrap.

Margins earned are highly sensitive to the *rendemen* from *gabah* to *beras*, which in turn depends on the quality of *gabah* and of the milled output. Sample survey data showed a wide degree of variation both in sale prices and milling *rendemen*. Supplementary field investigations offered a similar picture.

Table 9 Costs and Net Margins

(a) Average gross margins by type of trader, Survey 1

Transaction	Unit	Karawang Margin*	*n*	Ngawi Margin	*n*	Sidrap Margin	*n*	All locations Margin	*n*
Gabah – gabah	Rp/kg *gabah*	8.2	(27)	9.3	(13)	7.5	(11)	8.3	(41)
Gabah – beras	Rp/kg *beras*	31.5	(25)	32.4	(17)	–	–	31.9	(42)
Miller	Rp/kg *beras*	25.3	(17)	43.3	(9)	33.9	(37)	32.9	(63)
Beras – beras	Rp/kg *beras*	21.5	(10)	13.0	(5)	–	–	18.7	(15)

Source: RMS sample survey, traders, survey 1. **Notes:** * Gross margins: current sale price – current buy price; For gabah – beras traders and millers, *gabah* buy price converted to *beras* equivalent using quoted *rendemen*.

(b) Gross margins, costs and net margins, Survey 1

		All locations			
Transaction	Unit	Gross margin	Costs*	Net margin	*n*
Gabah – gabah	Rp/kg *gabah*	8.3	5.0	3.3	(41)
Gabah – beras	Rp/kg *beras*	31.9	20.7	11.2	(42)
Miller	Rp/kg *beras*	32.9	21.3	13.9	(63)
Beras – beras	Rp/kg *beras*	18.7	7.5	11.2	(15)

Source: RMS sample survey, traders, survey 1. **Notes:** * Costs: G – G and B – B = transport; G – B and M = transport, dry and mill.

example, five millers interviewed on the same day in Karawang quoted *rendemen* ranging from 55% to 62% for wet *gabah* of similar quality. The *beras* sale prices for the same millers also varied widely according to the quality of the *beras*, and the margins, net of variable costs, ranged from Rp 5–15/kg *beras*.

COMPETITION IN RICE MARKETING CHANNELS

The results presented so far on the working of the private rice marketing system give some indication of the degree of competition prevalent in marketing channels: choice and flexibility of sales; diversity of participants at different levels in the system; the competition between them for supplies; and the small margins within which individual traders are often observed to operate.

An important debate in the literature on food marketing in developing countries concerns the choice and flexibility of transactions between buyers and sellers of food grains. This applies especially to farmer sales to traders, but also concerns transactions between traders at different points in the marketing chain (Crow, 1989). The basic issue is to distinguish *free* from *tied* transactions, where tied transactions imply some degree of coercion in the relationship between buyer and seller, for example, due to debt obligations. Food marketing in the Indian sub-continent is often associated with tied transactions, and this has been called 'forced commerce' (Bhaduri, 1986).

Farmers in the RMS surveys were asked questions designed to discover the relative freedom of their sales decisions. Very little evidence was found to suggest that farmgate sale transactions are tied in the majority of cases:

(a) Very few observations were recorded of *gabah* being used to repay debts to moneylenders or shopkeepers;

(b) The majority of farmers (about 60%) did not undertake repeat transactions with the same trader;

(c) The remaining farmers did not report 'obligation' as a significant reason for selling regularly to the same trader;

(d) Sales according to the *pengijon* or *penebas* systems are sometimes associated with debt obligation, but no such sales were recorded in the RMS sample surveys.

The diversity of traders in the rice marketing system has already been described. The system is characterized by the large number of small operators, with small differences of scope or function determining their ability to secure a livelihood from trading.

Millers are observed to compete actively for supplies. Although there are networks between traders (using devices such as agents and regular customers) these are not binding. They are more to do with ensuring a regular turnover of supplies and lowering transaction risks by personal knowledge than to do with creating monopoly situations. The lack of convergence between chains, noted earlier, is another indication of lack of concentration in the system. The surveys found no evidence of barriers to entry into rice marketing at the various different levels of the system.

A related indicator of competition is the low margin within which traders operate. There are flows which are viable only in particular seasons of the year (e.g., only in the main harvest); there are traders who cease operating after the main season; many traders adopt complicated strategies in order to remain viable over the cycle of seasons, e.g., switching from *gabah* trading to *beras* trading, or cross-subsidizing between profitable and unprofitable activities.

In short, the RMS sample surveys provide a large quantity of evidence demonstrating a high degree of competitiveness in the private rice marketing system in Indonesia.

SUMMARY

The sample surveys conducted during 1990 for the Rice Marketing Study yielded a considerable amount of useful information for interpreting the Indonesian rice market. The key discoveries may be summarized briefly as follows:

(a) the immediate sale by farmers of around 68% of first season net harvest;

(b) farmer storage related to ensuring farm household food security across the seasons, with little reliance on rice purchases from the market;

(c) rice consumption in farm households at around 145 kg per person per year;

(d) predominance of *bawon* systems of harvest organization, and absence of *tebasan* sales from sample surveys;

(e) competitiveness of private rice marketing channels as evidenced by large number of small operators, diversity of channels, absence of tied transactions, narrow margins, and survival strategies of traders and millers.

Section 3
Interpretation of the Aggregate Rice Market

AIMS AND ASSUMPTIONS

The purpose of this section is to consider the implications of the results of the RMS sample survey for the seasonal behaviour of the aggregate rice market. The two dimensions which are examined are (a) seasonal characteristics of the rice market as a whole, (b) interseasonal rice flows and transfers in the market.

The starting point of the aggregate analysis is to consider the seasonal pattern of rice production, and its relationship to farm household consumption, marketed surplus and non-farm consumption. For this purpose, it is necessary to make some simplifying assumptions which are set out in the following list (see also Table 10). These assumptions are made in order to facilitate the derivation of some preliminary conclusions about the seasonal working of the rice market from sample survey results. They can be relaxed or modified for other purposes, if required, without changing the substantive findings that are set out in this paper.

(a) The aggregate rice market is in balance. Production is sufficient to cover normal consumption; procurement is equal to distribution over the calendar year.

(b) This self-sufficiency level of production is 29.8 million tons *beras*, giving a net output available for consumption of 26.5 million tons. This follows an established procedure in Indonesia of making an 11% reduction due to seed, losses, and rice used for animal feed. Thus 26.5 million tons = 29.8 million tons X 0.89 (Indonesia, 1989a). See also page X. The figure 26.5 million tons is close to the estimated balance sheet consumption figure for 1990.

(c) Consumption stays at the same level each month and consists of two components. First, there is the consumption of rice farm households, and this is called 'farm' consumption. Second, there is the consumption of non-rice farm households and all non-farm households, and this is called 'non-farm' consumption.

(d) The total population of Indonesia is 179.3 million people (mid-year 1990 estimate). This comprises a total of 39.4 million households, of which an estimated 11.8 million (30%) are rice farming households. Average household size is taken as 4.6 persons for both farm (see RMS results) and non-farm households (1990 population census).

(e) Rice consumption per capita is taken as the same for both rice farm households and non-rice households. The level of rice consumption per capita is 147.8 kg/year calculated by the simple division of net output (26.5 million tons) by the mid-year population (179.3 million people). Note that per capita rice consumption is much lower than this (135.4 kg per year) according to 1990 household income and expenditure data.

Given these assumptions, the total consumption of 26.5 million tons divides between 7.9 million tons (30%) for rice farmers, and 18.6 million tons (70%) for all others. On a constant monthly basis, the consumption of rice farmers is 662 500 tons per month, and non-farm consumption is 1 545 800 tons per month.

Table 10 Assumptions and Baseline Data (Reference Year: 1990)

Category	Unit	Data
Gross rice production	'000 tons	29 775
Net rice production	'000 tons	26 500
Rice consumption	'000 tons	26 500
Total population	millions	179.3
Total households		39.4
Rice households	million H/H	11.8
Non-rice households	million H/H	27.6
Annual consumption		
Rice households	'000 tons	7 950
Non-rice households*	'000 tons	18 550
Per capita	kg/person	147.8
Monthly consumption		
Rice households	'000 tons	662.5
Non-rice households	'000 tons	1 545.8

Source: Balance sheet calculations, RMS results.

Note: * This is also what is commonly called 'marketed surplus'.

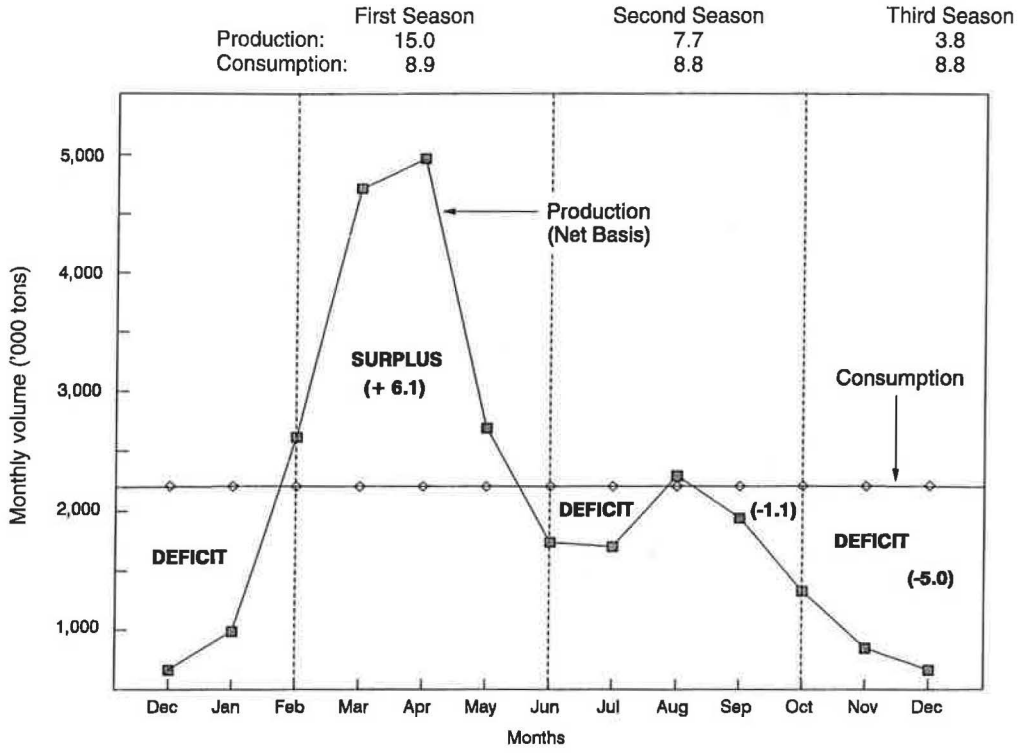


Figure 5 Seasonal Balance of the Rice Market
Sources: – assumed annual net production 26.5 million tons
– pattern based on monthly area harvested average 1986–89

Note that at an aggregate annual level, *marketed surplus* is the same as non-farm consumption under the conditions so far specified. Marketed surplus is normally defined as total output less the quantity retained by farmers for their own consumption. Thus in Indonesia the marketed surplus in rice is roughly 70% of total output. However it is the seasonal rather than aggregate size of the marketed surplus which is important for BULOG operations.

SEASONAL RICE MARKET

The central seasonal feature of the rice market in Indonesia is the uneven level of production compared to the continuous needs of consumption. This is depicted in Figure 5 using monthly rice market data which is provided in the Appendix. The production pattern displayed in Figure 5 is the average pattern experienced for four years in the late 1980s. It is derived from the monthly percentage of total area harvested (Indonesia, 1989b; 1989c), averaged for the four years 1986–89, and applied to the net production figure of 26.5 million tons. Some points arising are as follows:

(a) Seasonal rice output remains very uneven, notwithstanding the advances made in irrigation and multiple cropping over the past two decades. There is 57% of rice production occurring from Feb–May, 29% from June–Sept, and 14% from Oct–Jan.

(b) The outcome of this pattern of production is that the rice market is in seasonal surplus for just four months in each year, which is the period from February to May. There is one other month, August, when output is at or just above the steady-state consumption level. In all other months, the rice market is in seasonal deficit.

(c) When the rice market is in annual balance, the surpluses of surplus months must cancel out the deficits of deficit months. In Figure 5, the total surplus (which equals the total deficit) is 6.1 million tons. This is equivalent to 23% of annual production.

In other words almost a quarter of total rice output must be carried over from the surplus season (Feb–May) to deficit seasons, in order to avoid a large seasonal imbalance between supply and demand, and consequent high levels of price instability. It is the roles played by different actors – farmers, traders, BULOG – in achieving this seasonal carryover which is the key to understanding more fully the influence of BULOG on the rice market.

The seasonal imbalance of the rice market is further illustrated in Figures 6a and 6b. Figure 6a uses monthly data in order to highlight the relationship between the *constant* levels of farm and non-farm consumption, on the one hand, and the major switch between surplus and deficit seasons of the year, on the other hand. Figure 6b uses four-monthly data to emphasize the same point.

This four-monthly data divides the year into the three seasons of Feb–May, June–Sept, and Oct–Jan. This division seems to be the most useful one for examining seasonal effects in the aggregate rice market.

The peak of BULOG procurement occurs with a lag of roughly one month compared to the period of maximum surplus in production. This lag represents the time taken for sale, transport, drying and milling. In recent years (five-year average 1986–90) 84% of BULOG procurement has occurred from Mar–June, 14% from July–Oct, and 2% from Nov–Feb (see Appendix). In the subsequent analysis of seasonal balances and transfers this pattern of procurement is moved back by one month, so that the peak four-month procurement period lines up with the peak four-month production period.

The seasonal pattern of BULOG procurement is illustrated in Figures 7a and 7b. The top figure shows the average pattern and volume of procurement in recent years (average 1986–90). Average domestic procurement has been 1.6 million tons in this period. The bottom figure shows the percentage pattern of procurement superimposed on the percentage pattern of production. This illustrates the lag between the peak harvest period and peak procurement period referred to in the previous paragraph.

SEASONAL FLOWS AND INTERSEASONAL TRANSFERS

The RMS results demonstrate that farmers and traders, as well as BULOG, play major roles in the interseasonal carryover of rice. Table 11 and Figure 8 between them provide data which reconstruct the typical pattern of flows and interseasonal carryovers in the rice market. This 'model' is based in part on the results obtained from the RMS sample surveys, in part on aggregate rice market data, and in part on the simplifying assumptions set out earlier.

The intention is *not* to pretend that this is an accurate and definitive accounting of the seasonal rice market. Rather it is to demonstrate certain important orders of magnitude in the role of different participants, and in the functions they perform. The figures are given in millions of tons, and they represent approximations to the seasonal processes at work in the aggregate rice market.

The top section of Table 11 summarizes the seasonal picture of surplus and deficit already described. A surplus of 6.1 million tons must be carried over from the peak season to the deficit seasons in order to keep the market in balance. The rest of the table explains how this task is performed, by looking first at farmer behaviour, second at trader behaviour, and third at the role of BULOG. The data for interseasonal transfers can also be followed diagrammatically in Figure 8.

Farmers and others involved in rice production (landowners and harvest labour) sell 10.2 million tons in the first harvest, or 68% of the quantity harvested (a figure derived from RMS sample survey results). Of the remaining 4.8 million tons, 2.7 million tons are used for farm household consumption, and 2.1 million tons are carried over to the next two seasons (1.3 million tons to the second season and 0.8 million tons across to the third season).

The second and third season farmer figures are derived by keeping farm household consumption in balance overall. This is based on the RMS finding that the majority of rice farmers do not usually

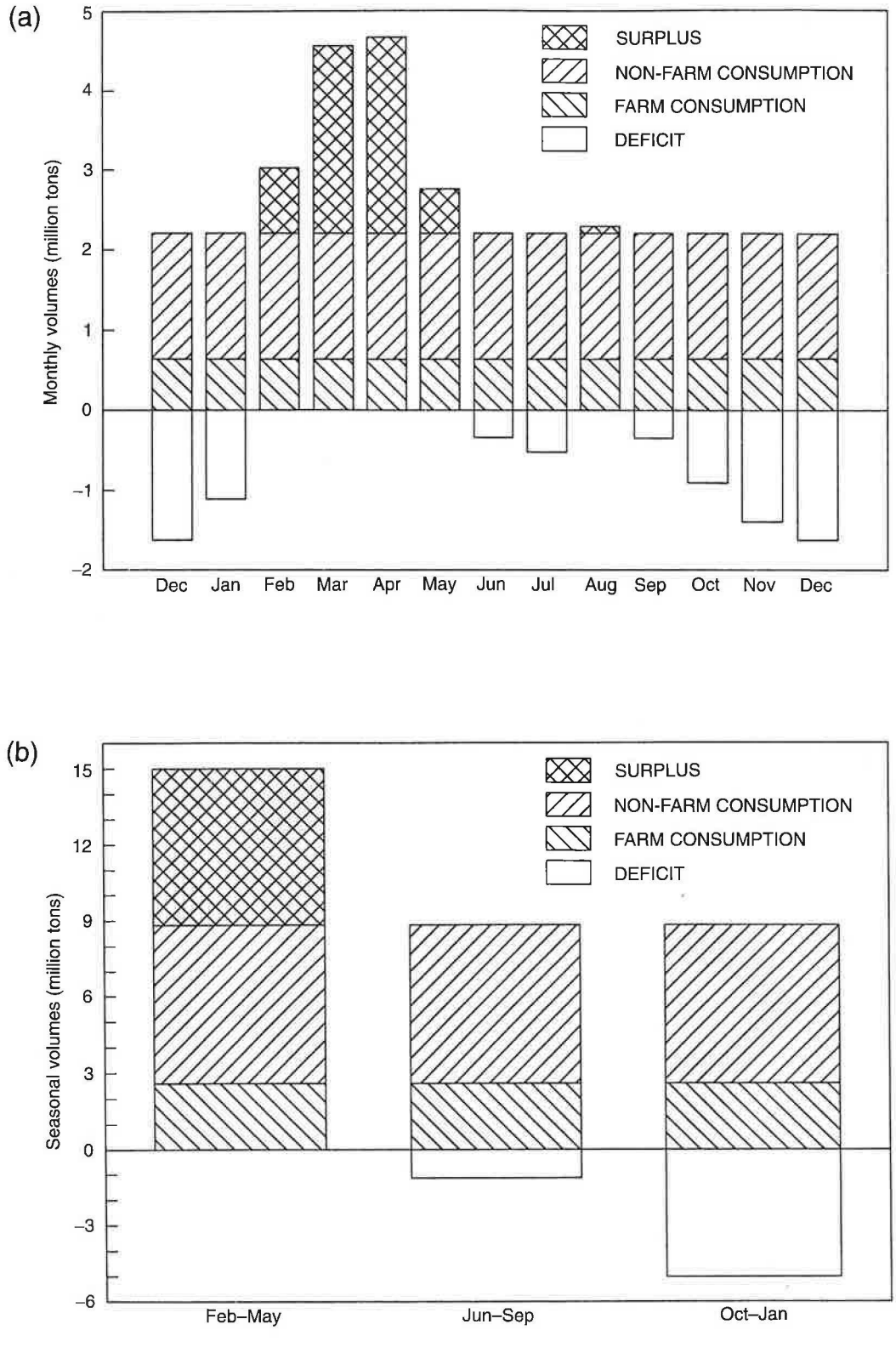


Figure 6 (a) Monthly Balance of Rice Market; (b) Seasonal Balance of Rice Market (4-monthly)

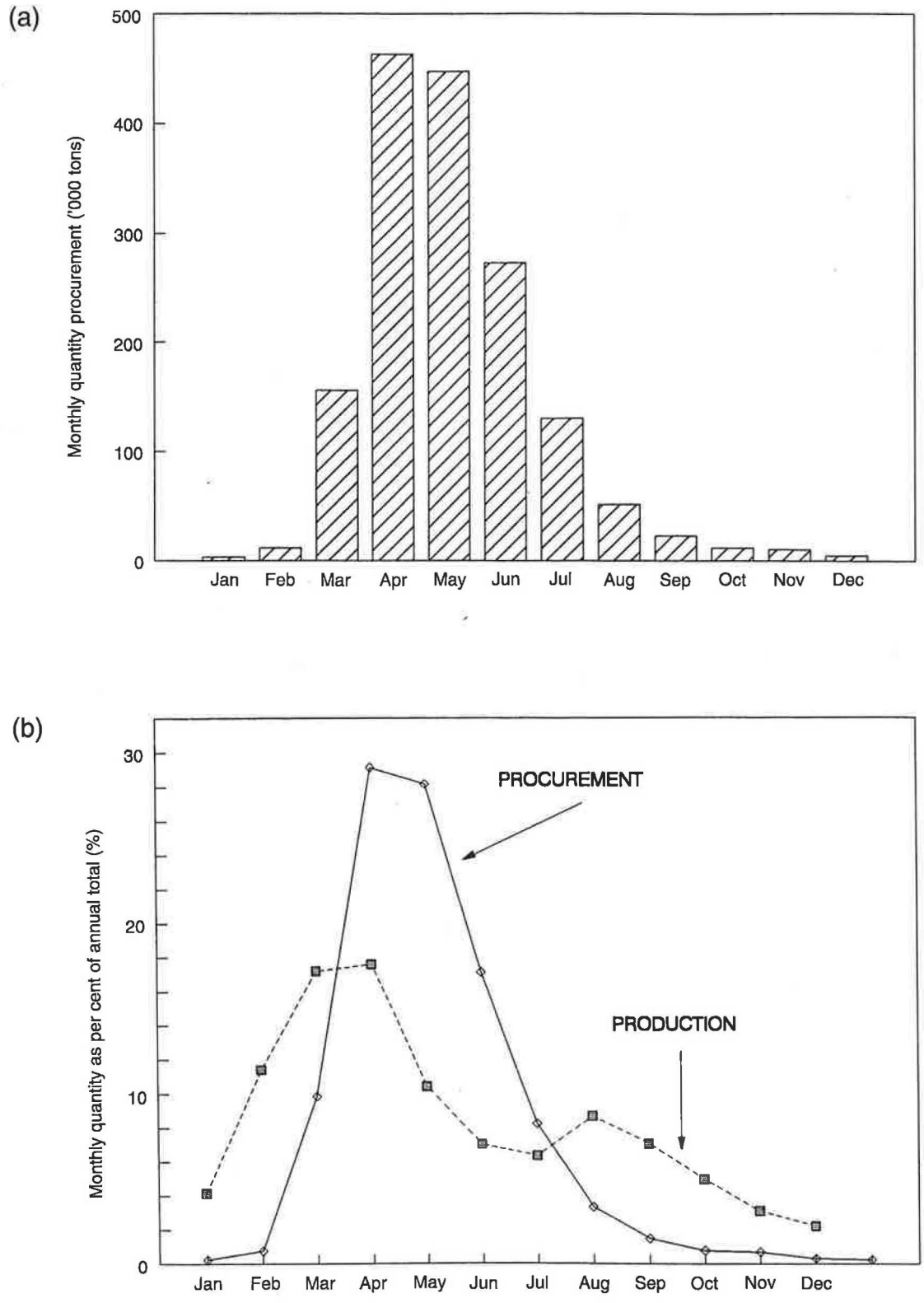


Figure 7 (a) Monthly Pattern of BULOG Procurement; (b) Comparison Procurement and Production (Average 1986–90)

Table 11 Model of Seasonal Carryovers in a Balanced Rice Market (Based on 1990 Aggregate Consumption)

	Rice volumes	First season (million tons) Feb-May	Second season (million tons) June-Sept	Third season (million tons) Oct-Jan	Total year (million tons) Feb-Jan
A1	Production	16.9	8.6	4.3	29.8
A2	Net output (A1 x 0.89)	15.0	7.7	3.8	26.5
B	Consumption	8.9	8.8	8.8	26.5
C	(Deficit)/surplus	6.1	(1.1)	(5.0)	0.0
D1	Farmer sold	10.2	5.2	3.2	18.6
D2	Farmer unsold	4.8	2.5	0.6	7.9
D3	Farm consumption	2.7	2.6	2.6	7.9
D3a	ex-this season	2.7	1.3	0.6	4.6
D3b	ex-last season	0.0	1.3	2.0	3.3
D4	Farmer carryover*	1.3	1.2	0.0	2.5
	(D2-D3a)	0.8	---------->		
E1	Non-farm consumption	6.2	6.2	6.2	18.6
F1	less budget groups	0.5	0.5	0.5	1.5
E2	Net consumption	5.7	5.7	5.7	17.1
E2a	ex-this season	5.7	2.5	3.2	11.4
E2b	ex-last season	0.0	3.2	2.5	5.7
E3	Trader carryover (D1-E2A—F2)	3.2	2.5	0.0	5.7
F2	BULOG carryover (Procurement)	1.3 (Mar-June)	0.2 (July-Oct)	0.0 (Nov-Feb)	1.5

Source: BPS, BULOG, and RMS results.

Note: * Farmer carryover from the first season is 2.1 million tons, of which 1.3 million tons goes to second season consumption, and 0.8 million tons to third season consumption.

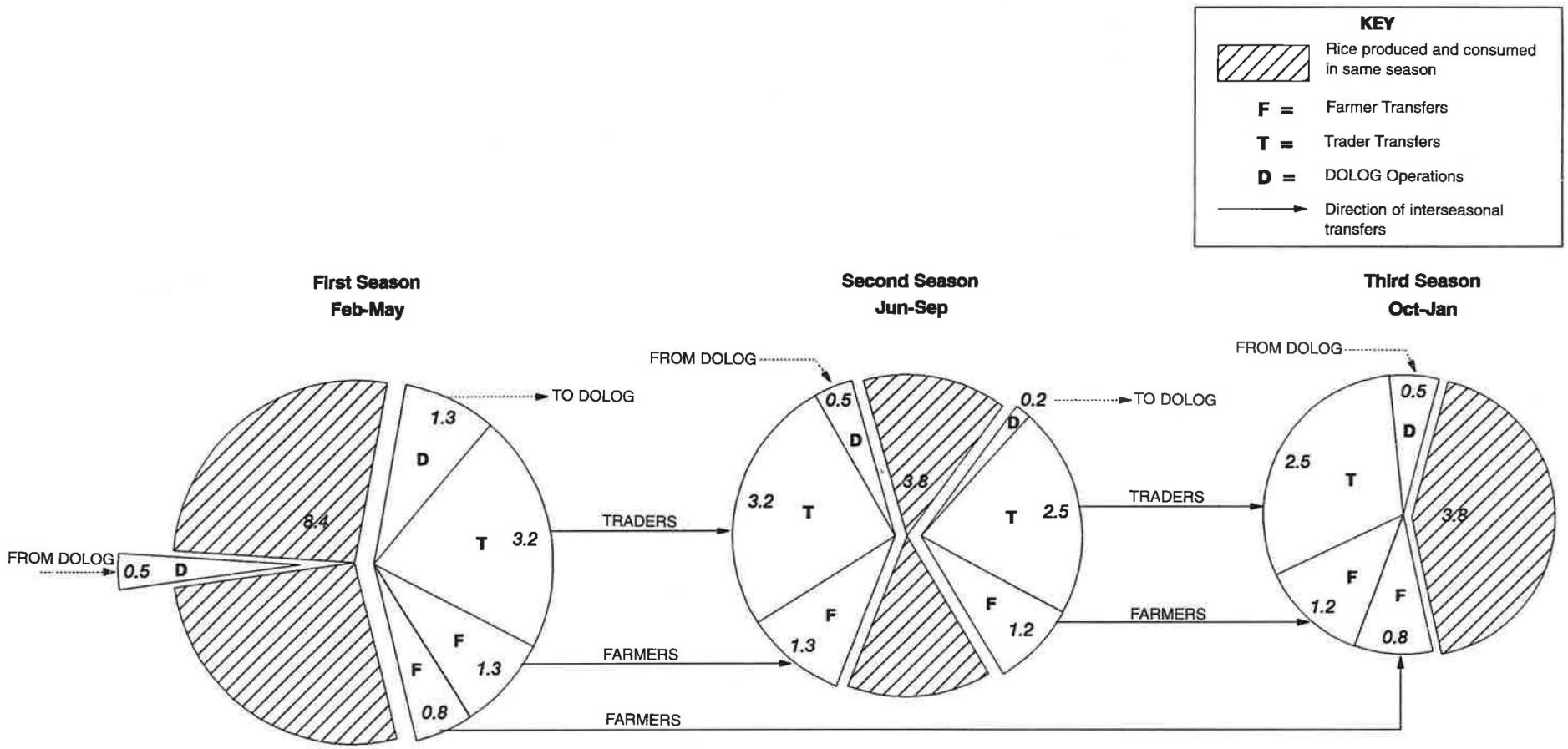
purchase rice over the annual cycle. The simplifying assumption is made that farmers who harvest in the second and third season consume rice from their own harvests in these seasons.

In the second season only half the total number of rice households have a harvest (a figure based on the area decline from first to second season), therefore only half of seasonal consumption for all rice farmers is met directly from the harvest (1.3 million tons). The other half (1.3 million tons) is met from the previous season's carryover. In the third season only a quarter of the total number of rice households have a harvest, therefore roughly a quarter of seasonal farm consumption is met directly from the harvest (0.6 million tons). The remaining amount is met from first season (0.8 million tons) and second season (1.2 million tons) carryovers. The quantities sold by farmers in the second and third seasons are determined by these latter calculations and are 5.2 and 3.2 million tons.

Non-farm consumption requirements in each four-month period are 6.2 million tons. However, the private system does not need to fulfil all of this quantity due to the operation of the budget group system by BULOG. In Table 11, budget group distributions are entered as 0.5 million tons in each four-month period. This understates recent average levels of total distribution by BULOG whose annual budget group obligations amount to 1.8 million tons. However, this inaccuracy on the distribution side makes negligible difference here. The purpose at this stage is to examine a balanced market for which budget group distribution is set equal to an assumed level of procurement at 1.5 million tons for the year. The net consumption to be met from private market deliveries is therefore 5.7 million tons per four-monthly period, or 17.1 million tons for the year.

In the first season farmers sell 10.2 million tons, non-farm consumption is 5.7 million tons and BULOG procures 1.3 million tons. Therefore, by deduction, carryover by private traders from the first season to the second season is 3.2 million tons.

In the second season farmers sell 5.2 million tons. Of this 2.5 million tons are required for non-farm consumption and 0.2 million tons are procured by BULOG. Private traders therefore carry forward 2.7 million tons to the third season.



Note: TO DOLOG refers to procurement for 4-month periods one month later than the seasons specified for production (see text for explanation)

Figure 8 Model of Interseasonal Transfers in the Rice Market (Figures in Million Tons)

In the third season farmers sell 3.2 million tons. All this is used for non-farm consumption, which is also covered by supplies carried forward by private traders from the previous season. It is assumed that there is no private carryover from the third season to the first season the following year, for the reason that prices fall as soon as the new season gets under way. However, even if there was some such carryover, the orders of magnitude of interseasonal transfers so far described are unlikely to be greatly affected.

This model contains an accounting framework for ensuring that carryovers from one season to another coincide with the surplus or deficit position in each season. The accounting of rice transfers across seasons is shown in Table 12. Quantities carried forward from one season to the following season(s) are regarded as positive since they represent surpluses in the season in which they originate. Quantities consumed in the current season out of transfers from previous seasons are regarded as negative since they represent deficits in the season in which they are consumed. The balance between positive and negative transfers gives the net surplus or deficit position in each four-month period.

This exercise reveals the significance of private agents (farmers and traders) in the interseasonal transfer of rice in Indonesia. In Table 12, farmers and private traders are responsible for 80% of the gross transfer of 6.6 million tons from the first season to the second season. They are responsible for an even larger proportion (95%) of the gross transfer of 3.9 million tons from the second season to the third season.

The interseasonal transfers by farmers and by private traders are not closely related to the 'incentive to store' reason for interseasonal storage which is the usual approach by economists to stockholding. Replies to certain questions in the RMS suggest that the main motive of farmer storage is to ensure family consumption needs across the cycle of the seasons. Farmers often carry over more than is strictly required for family consumption, in order to give themselves a risk margin against unforeseen events.

Traders also store *gabah* and rice mainly for operational purposes (such as the continuity of *gabah* supply into mills, and the regular supply of rice to customers) rather than for reasons related to the seasonal price margin. Operational convenience has long been recognized as an important motive for crop storage, such that some level of interseasonal stockholding occurs even when the real rate of return to such storage is negative (Brennan, 1958). Time-series evidence (next section) suggests that competition between traders has actually been causing the seasonal price margin to decline in real terms during the 1980s. Moreover, the cost of borrowed funds, at an annual nominal rate of around 36% in 1990–91, is in excess of the gross return given by the seasonal margin, resulting in a negative real incentive to hold stocks for price reasons. The interseasonal transfers made by traders, as shown in Tables 11 and 12, therefore represent operational lags of rice in process, rather than the existence of potential profits from interseasonal stock holding *per se*.

Table 12 Patterns of Transfers Across the Seasons

Carryovers	Season 1 (million tons rice)	Season 2 (million tons rice)	Season 3 (million tons rice)
A *Carried forward*	*6.6*	*3.9*	*0.0*
by farmers	2.1	1.2	0.0
by traders	3.2	2.5	0.0
by BULOG (Procurement)	1.3	0.2	0.0
B *From previous*	*(0.5)*	*(5.0)*	*(5.0)*
by farmers	0.0	(1.3)	(2.0)
by traders	0.0	(3.2)	(2.5)
by BULOG (budget groups)	(0.5)	(0.5)	(0.5)
C *Net surplus/(deficit)* (A minus B)	*6.1*	*(1.1)*	*(5.0)*

Source: Table 11.

Section 4
Time-Series Rice Price Analysis

OBJECTIVES AND DATA SOURCES

The rice price analysis consists of two main components. The *first* is an analysis of retail rice prices, and the *second* is an analysis of producer-consumer margins. The objective of the time-series price analysis was to obtain a proper understanding of the seasonal, locational and variety dimensions of short, medium and long run rice price trends. Additional specific concerns were the representativeness for statistical purposes of the Medium Price of rice, as opposed to prices by variety, and the effect of BULOG on rice price trends and relationships. (The 'Medium Price' of rice is a retail price time-series constructed by BULOG for each province in Indonesia, and for the country as a whole, on the basis of the majority variety being consumed in different locations at each point in time.)

The data used for the retail price analysis were from two main sources: (a) the Medium Price series for provinces by month from BULOG, and (b) monthly retail prices by variety and by province from the Biro Pusat Statistik (BPS). These two data sets originate from the same source as far as data collection is concerned, which is a joint weekly survey of retail prices carried out at the provincial level. BPS also undertakes regular consumer surveys by province to derive varietal weights for the computation of a weighted mean rice price for use in the Consumer Price Index. BULOG's Medium Price can be viewed as the price of the modal variety i.e. the price of the variety most often chosen by consumers. From the BPS survey data, Indonesian rice consumers appear to enjoy a large degree of varietal diversity and flexibility. Consequently the variety actually used in the BULOG Medium Price series is not constant over time or location. This can lead to discontinuities in the series as can be seen in Figure 11.

Price series by variety are discontinuous, with some varietal prices disappearing and reappearing, or data not being available for the whole study period. Variety definition is usually broad and occasionally unclear. The retail price analysis focused on varieties that are important in the consumption mix and for which there are sufficient data to utilize. The locations for study necessarily had to be restricted. All of the Javanese provinces were included plus the following off-Java locations:

Medan, North Sumatra
Pontianak, West Kalimantan
Ujung Pandang, South Sulawesi
Jayapura, Irian Jaya.

The objective of the producer-consumer price margin analysis was to analyse the size, trend and seasonality of producer-*urban* consumer and producer-*rural* consumer margins. There had been little previous work done on this aspect of the rice market in Indonesia.

The producer price series used for price margin analysis was supplied by BPS from its Farmer Terms of Trade data collection exercise, and was the price received by farmers for sales of dry *gabah*. Price series with base years of 1976 and 1983 were chained to provide a single series from 1980 to 1990. For comparison with consumer *beras* prices, the series were converted from dry *gabah* to *beras* using the current official conversion rate of 0.65.

Two consumer price series were used; the price paid by farmers for *beras* from the BPS Farmer Terms of Trade series, and the BPS/BULOG provincial capital retail price series. These two series permit analysis of producer-consumer margins for both urban and rural consumers.

RETAIL PRICE SEASONAL ANALYSIS 1980–90

Overview of the Medium Price Data

Figure 9 depicts the price trend of the Medium Retail Price for Indonesia, in nominal and real (constant 1977) Rp/kg terms. A similar analysis was made of all the provincial varietal and Medium Price data and the preliminary points made here reflect these time-series investigations. There are several points to highlight:

(a) In real terms, Indonesian retail rice prices, as measured by the Medium Price, increased approximately 24% from 1980 to 1990 (seasonal trough to seasonal trough).

(b) There is evidence of strong seasonal and cyclical components with *real* prices rising for three years (1981–83), falling for two (1984–85), rising again for three (1986–88) and falling again for two (1989–90).

(c) The provincial level data suggest that underlying the Indonesian average there is quite wide variation in the strength of seasonality, Semarang displaying particularly strong seasonality, and Jayapura displaying particularly weak seasonality.

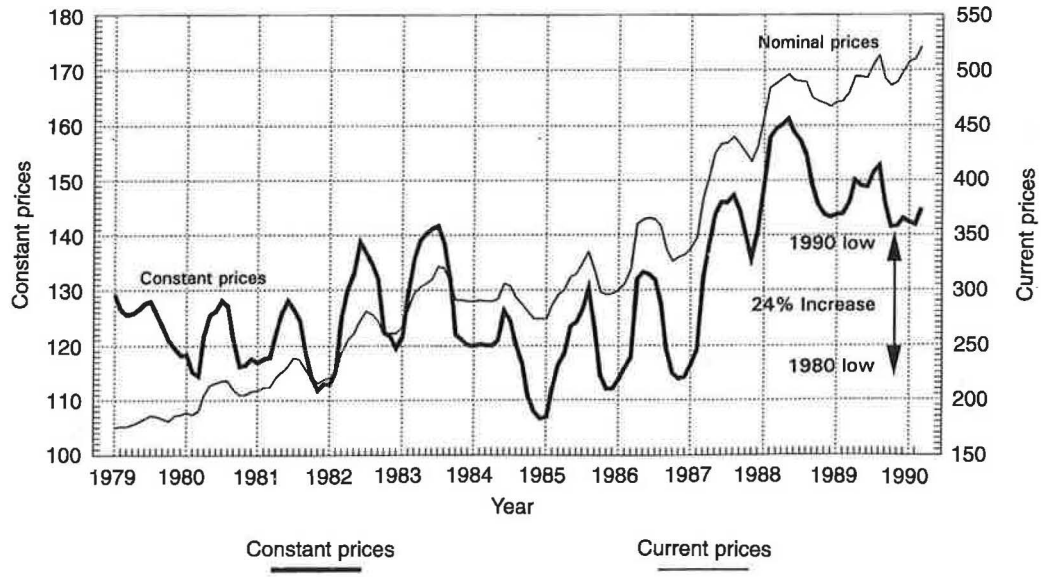
(d) *Real* price trends tend to be less correlated geographically in the 1987–90 period than earlier in the decade.

(e) BULOG calculates a simple average Medium Price for Indonesia which is not population weighted. This overestimates both nominal and real price increases, and underestimates the seasonal and cyclical components of the price series.

Seasonal Analysis Methodology

Seasonal price analysis is used for several different purposes including that of assessing the efficiency of markets. In a competitive market the seasonal price increase should reflect the cost of storage. The analysis undertaken for this report decomposed the price series into four component parts according to a classical multiplicative price model:

$$Price_i = Trend_i \times Cyclical_i \times Seasonal_i \times Random_i$$



Deflator: Indonesian CPI (excluding rice)
Grid lines are July

Figure 9 Indonesia: Trend in the Medium Price of Rice 1980–90 (Rp/kg Nominal and Real Terms)

The price in month $_i$ is equal to the trend component times the cyclical component, times the seasonal component, times the random component. The analysis focused on the seasonal component but the trend and cyclical components were derived as well. The seasonal component is represented by a Grand Seasonal Index (GSI) for each calendar month (Goetz and Weber, 1986). The average value of the GSI for all calendar months is set equal to 100. Seasonality can then be measured as any single month's deviation from this average value of 100.

East Java Seasonal Analysis Results

The East Java data are presented here as an example of the analysis. East Java is the second largest provincial rice producer but the most important surplus province, accounting for some 55% of BULOG's procurement.

The East Java Medium Price exhibits a real price increase from 1980 to 1990 of 30% (seasonal low to seasonal low). Essentially all this increase occurred in the 1986–89 period. The same cyclical nature of the trend occurs with this price series as with the all-Indonesia Medium Price shown in Figure 9: declining 1983–1986, increasing 1986–1989, and subsequently levelling off 1989–90.

Figure 10 plots the Grand Seasonal Index for the Medium Price in Surabaya, the provincial capital of East Java. The Grand Seasonal Index can be tested for the existence, strength, variability and trend of seasonality. For the Surabaya Medium Price there is a statistically significant classical pattern with the seasonal high in January being 11% higher than the seasonal low in July.

The analysis showed some statistically significant trends in the GSI Index. The seasonal index level of the peak price month of January has been declining over time at an average rate of 0.7 index units per year. In other words the seasonal peak is dropping, and seasonality is becoming less pronounced over time. The months of February and March also displayed significant negative trends in their index levels, of –0.4 and –0.3 units per year respectively, implying a faster drop to the seasonal low in July. The increased use of shorter growing season varieties which leads to earlier harvesting may account for these observed changes.

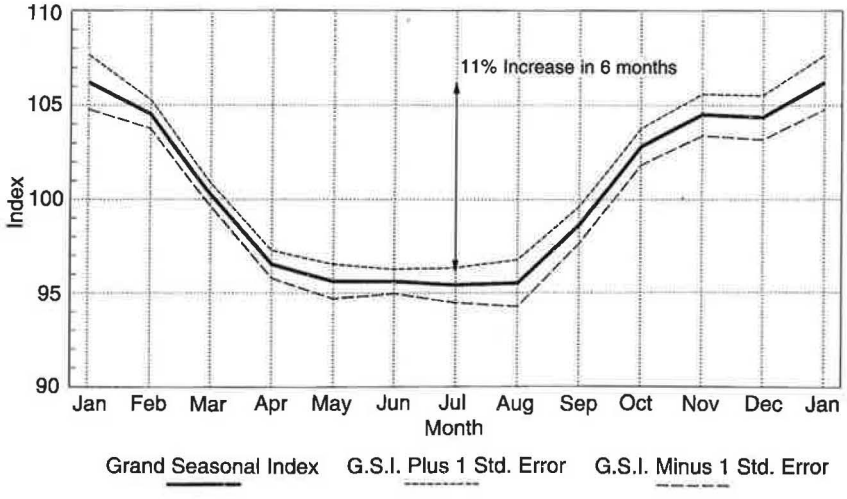


Figure 10 Grand Seasonal Index (Surabaya, Medium Retail Price)

Varietal Effect on East Java Seasonal Results

The foregoing analysis was based on the Surabaya Medium Price. It is important to know if the conclusions are altered if variety prices are used instead. Figure 11 shows the price trends in real terms of various rice varieties. One interesting observation from Figure 11 is that the Surabaya Medium Price was based upon the variety class IR II until 1988, at which time it was switched to IR I. The impact of that switch was to raise artificially the Medium Price series and to over-emphasize the price increase that was occurring. There are also other anomalies. For example, the January 1984 Medium Price spike is not found in the varietal series and is likely an error in the series. Conversely, the December 1984 IR II price spike is mirrored in neither the other varieties nor the Medium Price. In general terms however the variety price trends are reflected adequately by the Medium Price. It is worth noting here that after 1988 there is evidence of widening price differences between varieties. This is in addition to the increasing price divergence between locations in this period already mentioned.

As captured by GSI analysis, the seasonal price pattern was statistically similar between different varieties in East Java. This means that the Medium Price adequately represents the seasonal pattern for all varieties.

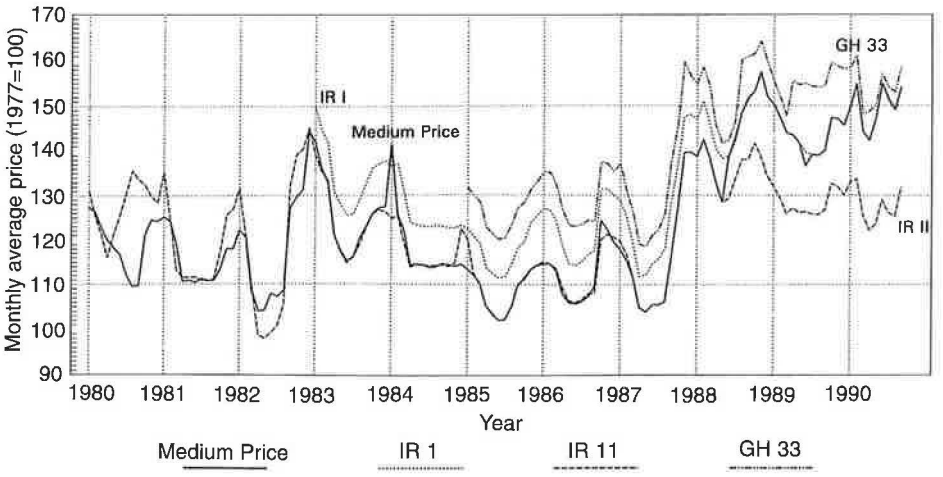
Indonesian Seasonal Analysis Results

It is necessary to discuss how representative the East Java results are for Indonesia as a whole. Table 13 provides data comparing the seasonal analysis results by location. The locations are separated into Java and off-Java because the high/low months can be different, representing different harvest patterns, and because the degree of seasonality is different.

It turns out that the East Java results are broadly representative of seasonal price patterns on Java. The seasonal low month would at first appear to range from April to July on Java, but if one consults the underlying data the seasonal patterns are very similar across Javanese provinces. There are however two unrepresentative features of East Java:

(a) The degree of price seasonality is generally higher elsewhere in Java (lower 'lows' and higher 'highs'); and

(b) The implied real return on seasonal storage (percentage increase per month in the Grand Seasonal Index) is higher elsewhere in Java.



Deflator: Indonesia CIP (excluding rice)
BPS Weights (1989): IR64: 31%, Bengawan: 20%, GH33: 17%, IR36: 8%
Grid lines are January

Figure 11 Retail Prices by Variety in Constant Terms (Surabaya)

Table 13 Comparison of Grand Seasonal Index Characteristics (Medium Price)

	GSI High	High month	GSI Low	Low month	Hi-low range	Percentage increase	Percentage increase per month*
Java							
Jakarta	106.0	Dec	95.6	July	10.4	10.9	1.4
Bandung	107.6	Dec	91.4	June	16.2	17.7	3.0
Semarang	109.2	Jan	91.3	May	17.9	19.6	2.5
Yogyakarta	107.5	Dec	92.7	Apr	14.8	16.0	2.0
Surabaya	106.1	Jan	95.3	July	10.8	11.3	1.9
Off-Java							
Medan	104.2	Feb	97.5	June	6.7	6.9	1.4
Pontianak	103	Nov	96.7	Apr	6.3	6.5	0.9
Ujung Pandang	104.5	Jan	96.3	July	8.2	8.5	1.4
Jayapura	101.1	Apr	98.5	Dec	2.6	2.6	0.7
Indonesia							
Indonesia	102.8	Jan	97.1	June	5.7	5.9	0.8
Indonesia (Wtd.)	105.3	Jan	94.9	June	10.4	11.0	1.6

Note: *Production weighted averages are as follows; Java = 2.5%/month, Off-Java = 1.3%/month, Indonesia = 2.2%/month.

Off-Java locations exhibit several differences relative to Java:

(a) The degree of seasonality is lower, especially so for the provincial capital of Irian Jaya, Jayapura, which displays no statistically significant seasonal pattern. (This is explained by the fact that the province of Irian Jaya is not a major rice producing and consuming area, and the Medium Price for most months tracks the fixed price at which the local branch of BULOG (the DOLOG) releases rice out of public store.)

(b) The implied real return on seasonal storage is lower, averaging 1.3% versus 2.5% per month for Java.

The average percentage increase from seasonal low to high given in the last column of Table 13 is low by comparison to other studies which have been undertaken in Indonesia using similar analysis. Goldman (1974) found a range of real seasonal price increases between 5.0 to 6.2% per month for Javanese rice prices in the 1950s and 1960s. Timmer (1987) cites real seasonal price increases for maize in Indonesia of over 8% per month. The results reported here of seasonal rice price rises of 2.5% on Java, and 2.2% for Indonesia, are consistent both with a competitive market and with good performance by BULOG in stabilising seasonal price swings. They are low enough to doubt the profitability of private storage as a separate market operation. However, as already discussed in Section 3, negative net returns to storage are not only possible but quite rational in a competitive market. This is because storage is partly undertaken for operational convenience, its logic deriving from the extra returns or lower costs obtained from maintaining a steady flow of rice onto the market (Brennan, 1958).

Extending this comparative analysis to examine additional aspects of price seasonality, the following results have general applicability for Indonesia, with one or two exceptions in the special case of the capital city, Jakarta:

(a) The seasonal peaks are generally declining;

(b) The descent from the seasonal peak to the seasonal low is quicker;

(c) The seasonal lows are generally rising; and

(d) The rally from the seasonal low to the seasonal peak is faster.

Seasonality is thus becoming less pronounced. Diagrammatically, as displayed in Figure 10, the Grand Seasonal Index curve is becoming less smooth, more V-shaped, and exhibits a lower high and a higher low.

Jakarta would appear to exhibit the same tendency of faster price declines and increases (a more V-shape curve), but also displays no change in the level of the peak and a deepening, rather than a shallowing, of the trough. Seasonality thus appears to be becoming slightly more pronounced in Jakarta.

RETAIL PRICE LOCATION ANALYSIS 1980–90

The location analysis undertaken involved the derivation of bivariate correlation coefficients for deflated, seasonally adjusted prices in the different locations. Bivariate correlation coefficients provide a scale free measure of association ranging from –1, for perfectly negatively correlated variables, to +1 for perfectly positively correlated ones. Zero is the expected result for statistically independent variables. The percentage of price variation associated with the other market is the square of the correlation coefficient. Following other work (Jones, 1974), a correlation coefficient level of +0.8 was taken as the minimum value to represent strong price association (>64%of price variation associated with the other market). The range of +0.6 to +0.8 was classified as moderate price association (36 to 64% of price variation associated with the other market). Below +0.6 was considered weak association. The seasonality and trend of correlations were also examined.

Correlation coefficients are used as measures of market integration. However, highly positive coefficients can result for reasons other than market integration, for example, from government price controls or linkage through a third market. Moreover, low positive coefficients do not necessarily imply lack of integration. Some markets may be linked only during parts of the season or in bumper crop years. Correlation coefficients can therefore give both false positive and false negative results.

The results of the correlation analysis are summarized in Table 14. The first part of that table provides a matrix of the correlation coefficients for provincial Medium Prices. Prices were deflated and seasonally adjusted before conducting the correlation exercise. Strong correlations (+.80 or higher) are in bold. Moderately strong correlations (+.60 to +.80) are shaded. The matrix suggests a number of things:

(a) Java locations, with the exception of Yogyakarta, show strong price correlations with each other (the Yogyakarta anomaly is explained later);

(b) The off-Java locations of Pontianak and Ujung Pandang show strong price correlation with Java;

(c) The off-Java locations show only moderate price correlation amongst themselves;

(d) Jayapura shows weak correlation with all locations (see (a) page 35);

(e) Yogyakarta shows only weak to moderate correlation with all locations.

The results, with the exception of Jayapura and Yogyakarta, are consistent with a hypothesis of a high degree of integration in the Indonesian rice market. The Java locations are the most highly integrated. The off-Java locations are more integrated with Java than between themselves.

Price correlations display significant seasonality for most pairs of observations. Correlation is typically strongest between April and November, peaking in August. However, the lower level of correlation in the December-March period may partly be due to the limitations of using monthly data. Weekly data would be more useful for this period when particularly sharp price rises and declines are experienced. If BULOG's own actions were creating the conditions for strong price correlations then we would expect correlations to be strongest when BULOG is most active: the harvest period of March to May and the price peaks of December to February. The results do not correspond to that expectation.

Table 14b illustrates, using correlations between Jakarta and other cities by way of example, the importance of first eliminating inflation from price time-series as it is a source of 'false positive' results. The last column of Table 14b reproduces the Jakarta bivariate correlations from 14a. Other columns display the coefficients which occur (i) with no adjustment and no account of inflation, (ii) with seasonal adjustment but no account of inflation, and (iii) with real prices but no seasonal adjustment. Seasonal adjustment is shown to make little difference to the correlation results, but correlations are always substantially higher before inflation has been removed from price trends.

Table 14 Correlation Analysis of Rice Prices by Location 1980-90

(a) Correlation coefficients for seasonally adjusted, deflated Medium Prices

	Jakarta	Medan	Bandung	Semarang	Yogyakarta	Surabaya	Pontianak	Ujung Pandang	Jayapura
Jakarta	1	**0.86**	**0.89**	**0.94**	0.56	**0.86**	0.79	**0.86**	0.61
Medan		1	**0.89**	0.78	0.56	**0.81**	0.77	**0.80**	0.59
Bandung			1	**0.90**	0.64	**0.86**	**0.82**	**0.80**	0.56
Semarang				1	0.66	**0.88**	**0.81**	**0.85**	0.33
Yogyakarta					1	0.60	0.60	0.61	0.52
Surabaya						1	**0.82**	**0.88**	0.55
Pontianak							1	0.77	0.50
Ujung Pandang								1	0.47
Jayapura									1

(b) Adjusted and unadjusted price correlations for Jakarta (Medium Price)

	Nominal prices	Seasonally adjusted	Deflated prices	Seasonally adjusted and deflated
Medan	**0.98**	**0.98**	**0.86**	**0.86**
Bandung	**0.98**	**0.98**	**0.89**	**0.89**
Semarang	**0.98**	**0.99**	**0.80**	**0.84**
Yogyakarta			0.59	0.56
Surabaya	**0.98**	**0.98**	**0.87**	**0.86**
Pontianak	**0.98**	**0.98**	0.79	0.79
Ujung Pandang	**0.99**	**0.99**	**0.86**	**0.86**
Jayapura	**0.94**	**0.95**	0.57	0.61

(c) Effects of variety on Jakarta correlation coefficients (seasonally adjusted and deflated)

	Medium Price	IR	Cisadane
Bandung	**0.89**	**0.90**	0.63
Semarang	**0.84**	**0.91**	**0.95**
Yogyakarta	0.56	**0.92**	**0.96**
Surabaya	**0.86**	**0.91**	
Ujung Pandang	**0.86**	**0.90**	**0.91**

Table 14c depicts the effect of variety on the correlation coefficients for Jakarta. In all but one case the use of named varieties, instead of the Medium Price, increased the correlation coefficients. Given the pattern shown earlier in Figure 11 this is what we would expect. For instance the correlation of Semarang with Jakarta is increased from +.84 to +.95 if the variety Cisadane I is used instead of the Medium Price of rice.

In this context of variety correlations, the data for Yogyakarta is especially interesting, since it reverses the previous conclusion of weak correlation between Yogyakarta and other locations. This also explains the anomalous result found earlier concerning Yogyakarta, prices for which are in fact strongly correlated with other Java locations. The evidence suggests that for Yogyakarta, in contrast to other locations, the Medium Price is an unusually poor indicator of rice price trends.

Although the Medium Price generally tends to underestimate the level of correlation, this effect is large enough only in the case of Yogyakarta to lead to a reclassification from moderate to strong correlation.

The data were examined to determine if there was any trend in the correlation coefficients during the decade. There is little suggestion of a sustained trend. However focusing solely on the varietal data, which is of higher quality than the Medium Price data, there is some evidence of a decline in levels of correlation after 1987.

PRODUCER-CONSUMER GROSS MARGIN ANALYSIS 1980–90

East Java Results

Again the East Java data is explained in detail as it is the most important province and because it shows the most pronounced and easily understood trends. Figure 12 shows the trend of producer-urban consumer gross margins for East Java. An estimate of miller benefits from rice bran and brewers grains has been added to the margins following work by Tabor (1989). Without this adjustment gross margins become negative in 1987. The reader is cautioned that these margins, though adjusted, are gross, with no deductions for any costs e.g. transport. As such they do not represent the level of trader profit margins or necessarily the trend in trader profit margins. Given the data quality and assumptions in the analysis, one should concentrate on the trend, rather than the absolute level, of the margins.

East Java exhibits a pronounced and consistent decreasing trend in both nominal and deflated margins over the whole period. By late 1987 both nominal and real margins had declined to very low, and likely unsustainable, levels. The data does not permit determination of the causes of this trend; whether it is due to a decrease in transport costs, marketing costs, or trader profit margins. However, the decline in real margins is a product of the two separate trends of declining real retail prices, and rising real producer prices. The relative importance of these two effects can be seen in Figure 13.

Farmers have been beneficiaries of this trend. The corollary of the declining trend in margins is an increasing trend in the producers' share of the urban retail price. For East Java this rose from a low of 61% in 1980 to an unsustainable peak of over 96% in 1987.

The analysis also examined the trend of the price farmers in East Java paid for rice minus the price they received for *gabah*. This can be thought of as a producer-rural consumer gross margin, whereas the results just discussed refer to the producer-urban consumer gross margin. Interestingly the rural gross margin was found to display a similar pattern, with margins decreasing over the period 1980 to 1986, again to very low levels, and widening out again in the 1986–89 period.

The producer-urban consumer gross margin was further analysed for seasonality. Since the sample survey results of the RMS suggest that farmers sold roughly 70% of the main harvest within five days after harvest, it is important to know the seasonal relationship, as well as the trend, of margins. Figure 14 shows this seasonal trend for East Java. It depicts the seasonality in terms of a Grand Seasonal Index as was done previously for retail prices. Margins show significant and marked seasonality. One can see just how marked that seasonality is by comparing Figure 14 (the GSI for margins) to Figure 10 (the GSI for retail prices). Retail price highs were only 11% above the lows, whereas the margin highs were 49% above their lows. The widest margins occur during the main harvest season when farmers are selling the majority of the marketed surplus.

Comparative Producer-Rural Consumer Gross Margins

Other Javanese provinces are compared to East Java in Table 15. Essentially there has been a convergence of producer-rural consumer gross margins in real terms (constant 1977 Rp/kg) across Java over the decade. With East Java rural margins starting the decade double those of virtually every other province, that convergence has come about largely from declining East Java margins. This can be seen in the last three columns to the right in Table 15, comparing the levels and trends in margins between provinces. The convergence of rural margins across Java supports the view that the Javanese rice market now has the ability to absorb efficiently East Java's marketable surplus. Possibly at the start of the decade this surplus could only be absorbed if wider marketing margins existed.

Comparative Producer-Urban Consumer Gross Margins

Only in West Java did producer-urban consumer gross margins not decline over the decade. As can be seen in the first column of Table 15, the decline of real margins is most evident in East Java. (The

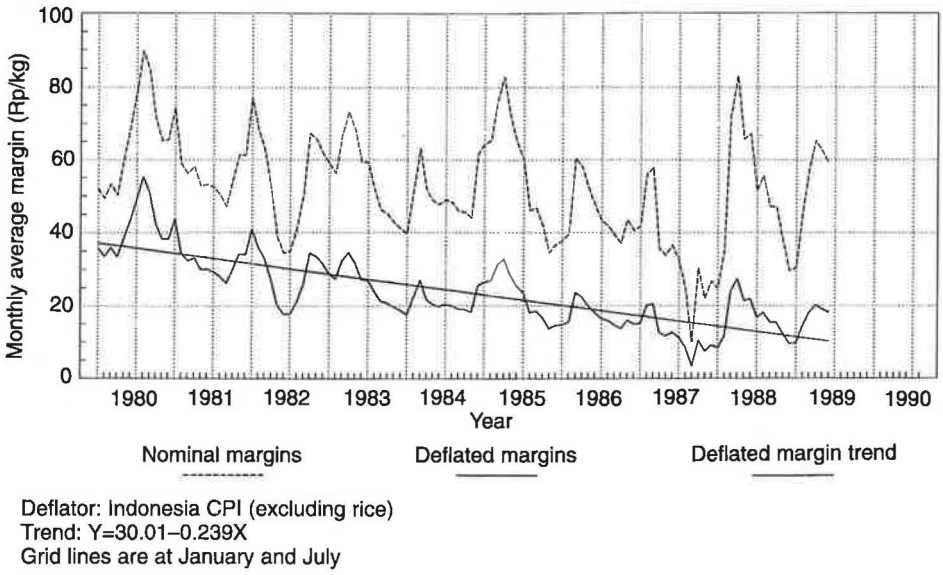


Figure 12 Producer-Consumer Gross Margin (East Java: Surabaya-Urban)

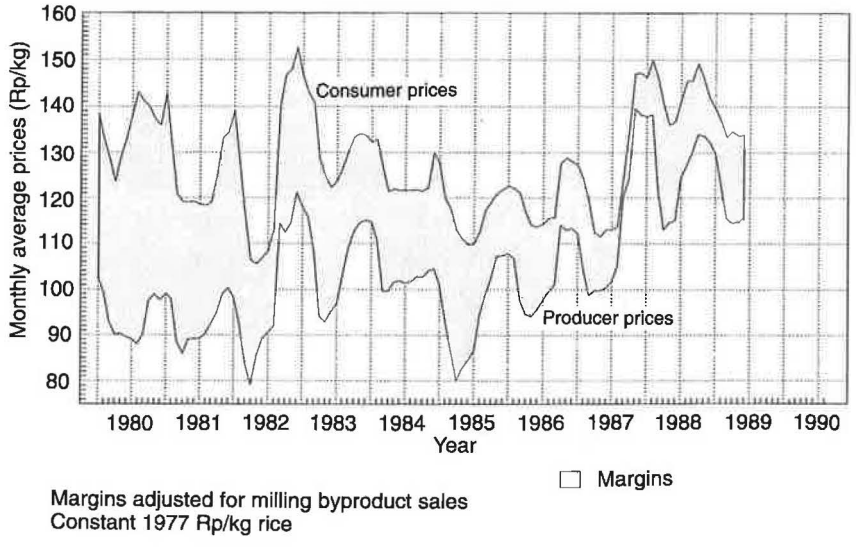


Figure 13 Real Producer-Consumer Margins (East Java: Surabaya-Urban)

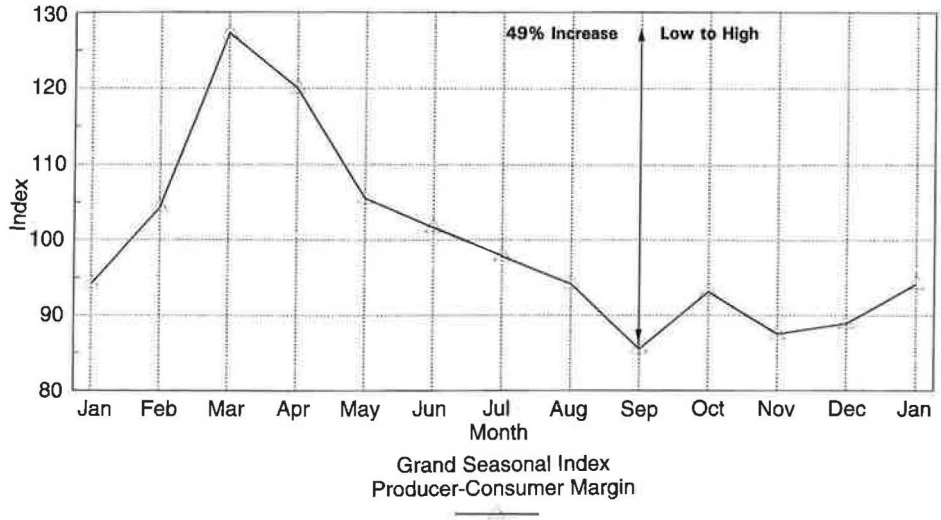


Figure 14 Seasonality of Producer-Consumer Gross Margin (East Java: Urban Margin)

trends in producer-urban consumer and producer-rural consumer margins are not strictly comparable. The former used data for the period 1982–90, the latter from 1980–90. Since the 1980–82 period was one of high margins, particularly in East Java, the longer time period of the producer-rural consumer series produces a larger negative trend value.) The decline of real margins is possibly because margins there started higher than in other provinces. However the increase in urban margins for West Java is interesting, since rural margins in West Java declined over the same period. This suggests that West Java transport costs, urban marketing costs or urban trader margins have increased in real terms over this period.

Producer Share of Urban Consumer Prices

This same situation is mirrored in the producer share of the urban retail price. Only in West Java does it not show an increasing trend. In the other Javanese provinces the share increased until roughly 1986/87 after which it levelled off. This upward trend was strongest and most consistent in East Java. In West Java the producer share showed an increasing trend only up until 1983/84, after which the decrease already discussed occurred.

Table 15 Producer-Consumer Gross Real Margins, Java

	Producer-urban gross real margins						Producer-rural gross real margins		
	Trend	Producer share		Grand Seasonal Index			Trend	1980 level	1989 level
	(Rp/kg/month)	High (%)	Low (%)	High	Low	Change (%)	(Rp/kg/month)	(Rp/kg)	(Rp/kg)
East Java	–0.19	97	61	127 Mar	85	49	–0.29	52	23
Yogyakarta	–0.06	96	74	116 May	85 Dec	36	–0.05	18	13
Central Java	–0.05	90	71	115 Oct	94 Mar	23	0.03	28	25
West Java*	0.06	88	66	113 Mar	86 Dec	31	–0.02	31	27

All prices in constant 1977 Rp/kg rice.

Note: * Bandung used as the urban consumer market.

Seasonality of Margins

In all provinces seasonality is statistically significant and marked. East Java shows the strongest seasonality, displaying the figure already cited of 49% between the highest and lowest seasonal margin. This presumably is indicative of the larger marketable surplus to be absorbed by the market in East Java.

The high producer share of urban consumer prices shown in the second column of Table 15 needs to be tempered by the knowledge of the strong seasonality of margins. Average producer shares would be lower because farm sales are heavily biased to the periods of widest producer-consumer margins.

SUMMARY

This section has been concerned with the analysis of time-series price trends and producer-consumer margins, including seasonal, locational and varietal dimensions. The period covered is 1980 to 1990. The main findings of interest may be summarized briefly as follows:

(a) Indonesian retail prices rose in real terms over the period by approximately 24%;

(b) This price trend contains a strong cyclical component with prices rising in 1981–83, falling in 1984–85, rising in 1986–88 and falling in 1989–90;

(c) With respect to seasonality, on average the seasonal high price in January is 11% above the seasonal low price in July (East Java);

(d) There appears to be a gradual tendency for this seasonal price change to become less pronounced everywhere except Jakarta;

(e) The unweighted Indonesian Medium Price series used by BULOG overestimates both nominal and real price increases compared to a population weighted Medium Price series;

(f) For most locations, the Medium Price provides an accurate enough representation of price trends compared to the use of variety prices for the same purposes;

(g) The Indonesian rice market is generally found to be highly integrated, especially on Java;

(h) East Java displays a gradual decline in the producer-consumer margin over time, with margins elsewhere either declining or remaining static;

(i) Jakarta is an exception to this tendency, with some indication of a widening producer-consumer margin;

(j) A corollary of declining margins is that the producer share of the retail price rises over time, a tendency which is especially evident in East Java.

Section 5
Policy Conclusions

COMPETITION IN MARKETING CHANNELS

The time-series rice price analysis set out in the preceding section tends to reinforce the sample survey finding of a high degree of competition in rice marketing channels in Indonesia. The diverse evidence in this area is summarized, for convenience, in Figure 15 below.

Market competitiveness is indicated at the farm level by the wide choice of sales options confronting farmers, and by the absence of tied transactions, such as those often associated with debt obligations. In marketing channels, competitiveness is indicated by the large number of small operators, the diversity of channels, the lack of convergence of chains found in the sample surveys, the small margins within which traders and millers operate, and the survival behaviour of traders in terms of seasonal shifts in specialization and activity.

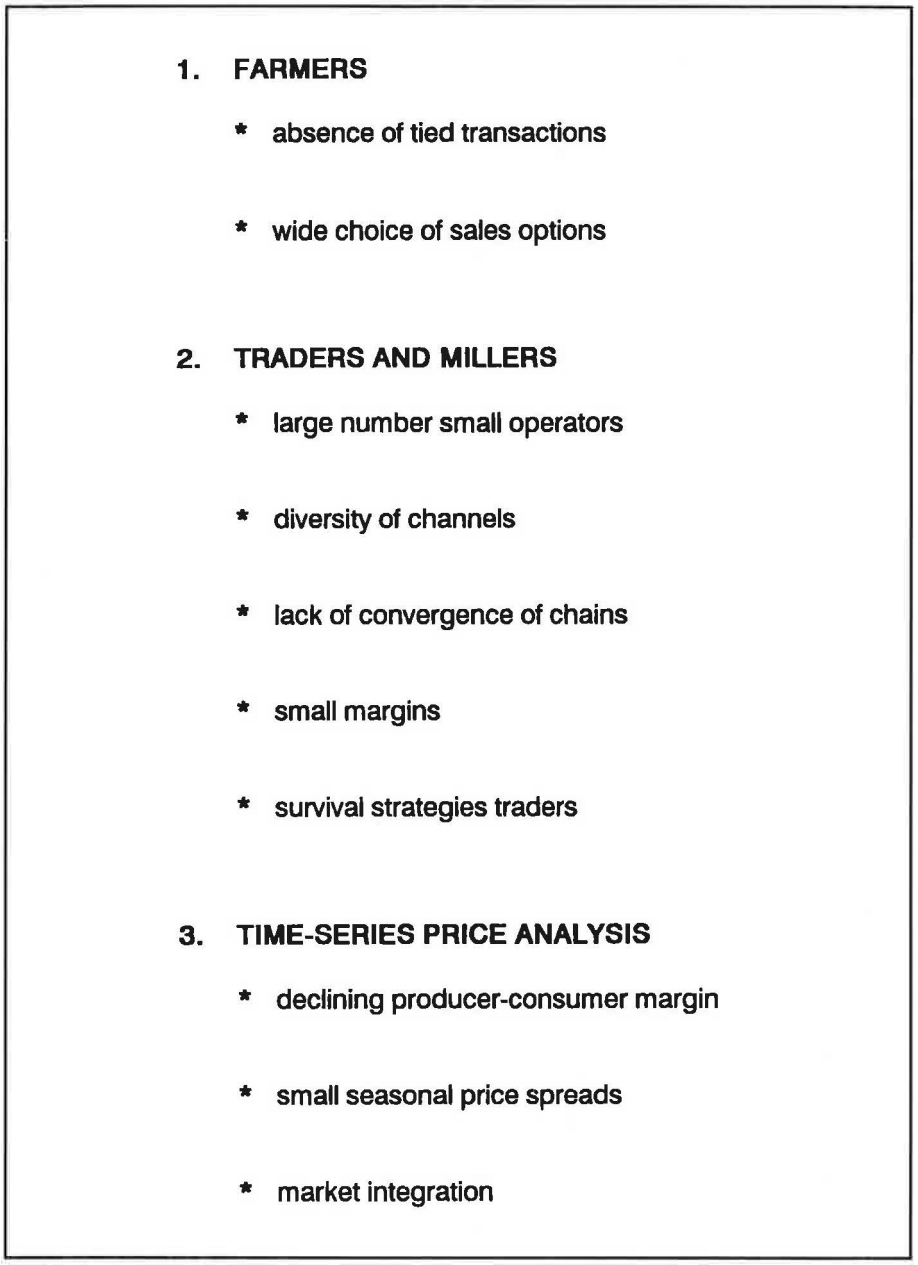


Figure 15 Competition

The time-series price analysis indicates that the producer-consumer margin has tended to decline slightly in real terms over the decade of the 1980s. At the same time, seasonal price changes at the retail level have also been declining, and are low in real terms. Indeed they are on average too low to provide a positive real rate of return to storage, given the level of interest rates in Indonesia in the early 1990s. Finally, correlation analysis of price trends, even allowing for its limitations as a measure, shows a high degree of spatial integration in the Indonesian rice market.

Given this high degree of competitiveness, it is legitimate to ask whether any role remains for the state price stabilization agency, BULOG. One answer to this is that it is difficult to gauge how much of what is observed – in terms of small operators, low margins, and low seasonal price changes – is predicated on the stabilizing influence of BULOG in the market. It is possible that in the more unstable and high risk free market a process of concentration would take place, resulting in the formation of local trader monopolies as a means of reducing risk or avoiding its effects on the prospects for trader survival.

The idea that Indonesia might be able to dispense with a price stabilization agency altogether is superficially attractive, but probably dangerously naive about the negotiating position of farmers in an unregulated market in the peak season. After all, there is not a single industrialized country which permits the free fall in farm-gate prices that would occur in the absence of regulation at harvest time in temperate grain markets. The view put forward here, which is elaborated below, is that price stabilization at the farm level remains a valid policy goal in Indonesia (see also Timmer, 1989a; 1989b).

PRICE STABILIZATION AND THE ROLE OF BULOG

The analysis described in Section 3, supported by the findings of the sample survey, demonstrates the continued significance of peak season marketed surplus for the seasonal behaviour of the rice market in Indonesia. To recap those findings, 57% of the annual rice harvest occurs in the four-month period February–May. In this season farmers sell onto the market nearly 40% of annual consumption i.e. 10.2 million tons out of 26.5 million net tons. As a result, peak season sales involve a surplus above farm and non-farm consumption of about 6.1 million tons, equivalent to nearly a quarter of the total annual volume produced and consumed.

There are many reasons for the high volume of sales during the period February to May each year (Rudra, 1983). One reason, as we have seen, is the pattern of harvests associated with irrigated high yielding varieties, in which for many farmers the first harvest occurs early enough for a second harvest to take place within the same seasonal period. Other reasons are associated with farm household decisions and constraints. They include (a) the need of households for cash income after the lean season (*paceklik*), (b) the lack of on-farm drying capacity for wet *gabah*, and (c) the need for farmers to switch quickly to land preparation and sowing for the next crop (whether rice or *palawija*).

In the absence of the BULOG floor price and procurement system, there seems little doubt that these considerations would result in the farmgate price of rice falling sharply in the peak season. Events in 1985, when BULOG temporarily lost control of the floor price due to lack of storage capacity, are a reminder that even with a competitive marketing system the seasonal nature of agricultural supply makes the market prone to large seasonal price swings (for evidence on the 1985 peak season price fall see Figure 9 in Section 4 above).

The size of the peak season price fall which would occur in the absence of intervention by BULOG depends on a number of inter-related economic factors: the price elasticity of rice demand, the supply elasticity of storage, the formation of price expectations by traders, the interest rate costs of storage, and many others. The RMS finding of relative inelasticity of the quantity stored by private agents with respect to seasonal price margins is relevant to the outcome. Also relevant is that greater uncertainty would prevail at peak harvest time, and farmers would tend to be at a negotiating disadvantage due to the urgency of moving wet *gabah* from the fields. Without being able to quantify precisely these various factors a severe downward fluctuation in peak season prices is strongly indicated.

The conclusion is that BULOG's price stabilization role remains relevant for output and income stability at the producer level, and desirable for income distribution reasons at the consumer level. However, the aggregate data also suggests that there is scope for reducing the scale and spread of BULOG operations required to implement price stabilization. This is a matter which would require careful consideration from an operational viewpoint, especially taking into account seasonal and locational variations in patterns of procurement. However, two aspects of seasonal rice flows do stand out from the exercise set out in Section 3: the *first* is the concentration of effective procurement within four months of the year; the *second* is the large role played by farmers themselves and private traders in undertaking interseasonal rice flows.

Taken together with the RMS finding of a high degree of competition in private rice marketing channels, these aspects suggest that BULOG's price stabilization role – at both farmgate and consumer levels – could be achieved using a smaller and more focused infrastructural scale of operations than is currently used for these purposes. Procurement is highly concentrated in a few

months and a few locations (with important exceptions, as exemplified by the district of Sidrap); market operations (certainly on Java) would be effective with market injections in a few well chosen locations; and overall the private rice marketing system works well for the rapid adjustment of supply to demand in different locations and across the seasons.

Some additional points of policy relevance to BULOG stem from the RMS findings that (a) a significant volume of interseasonal transfers is undertaken by farmers and traders, and (b) this interseasonal storage is relatively insensitive to price and margin changes within typical ranges of seasonal price changes, because it represents storage for operational convenience rather than for own profitability.

Due to the price insensitivity of the quantity stored across seasons by farmers and traders, BULOG's role can be interpreted as the 'swing factor' in the market. This means that the quantity procured by BULOG tends to swing widely according to whether the market is in underlying deficit or surplus. In an even slightly deficit market, BULOG encounters difficulty in procuring as much as 1.5 million tons, which is below its obligations for distribution to budget groups. The years 1986–88 and 1990 correspond to this situation. By contrast when the market is in surplus, as occurred in 1984 and 1989, BULOG procurement jumps to around 2.5 million tons.

The policy relevance of this finding to BULOG lies in the frequency of deficit years compared to surplus years, as departures from trend self-sufficiency in rice. The experience of the past six years suggests that the surplus condition occurs perhaps only one year in five years. This means that BULOG could encounter problems in procuring enough domestic rice to fulfil its distribution obligations in four out of five years. This was the experience of the second half of the 1980s.

SUMMARY AND LESSONS

The Rice Marketing Study examined seasonal, locational, and structural aspects of private rice marketing in Indonesia, in the context of the future role of the government price stabilization agency, BULOG. The research was undertaken in 1989–91, and was composed of three components: a sample survey, key informant interviews, and time-series rice price analysis.

From a viewpoint of transferability to other situations it is probable that the methodology is more relevant than the policy context or the conclusions. While this research took place within a broadly similar set of concerns as other marketing studies, namely, private vs. public roles in food grain markets, the Indonesia and wetland rice focus has little in common with the conditions and commodities encountered, for example, in the African context.

With respect to methodology, a distinction must be made between the sample survey component and the time-series rice price analysis component. The time-series analysis was predicated on the existence of a broad range of published rice prices, collected and compiled in a manner which gave the researcher a reasonable degree of confidence concerning data accuracy. These conditions are unlikely to prevail in many of the situations where studies are being undertaken into the working of private food markets.

The sample survey approach, beginning with farmers and following marketing chains, worked well. The experience in Indonesia would suggest that this is a useful way of obtaining information on the working of private markets. As is common with sample surveys, rather too many questions were asked of farmers and traders, and experience revealed the set of questions which provided useful and accurate answers relevant to the aims of the study.

With good reason, farmers tend to be more forthcoming and more accurate than traders in the information they give on sales and prices. Traders, also with good reason, tend to falsify data related to the margins within which they operate. Therefore the following of marketing chains, and interviewing of traders, is more useful for learning about market structure and marketing channels, than for accuracy of prices and margins.

The conclusion of this study for marketing systems research elsewhere is to go and ask the farmers. It is farmers who make the decisions about how much to store, how much to sell, when to make sales, and so on. It is also farmers who know how well the marketing system works with respect to farm-gate prices received, the degree of choice of buyer, and the way local traders operate.

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Appendix
Monthly Data for Seasonal Rice Market Analysis

Category	Jan	Season 3 Oct-Jan	Feb	Mar	Apr	May	Season 1 Feb-May	June	July	Aug	Sept	Season 2 June-Sept	Oct	Nov	Dec	TOTAL
Net output	986	3 818	2 626	4 712	4 961	2 707	15 006	1 736	1 698	2 298	1 943	7 676	1 324	846	662	26 500
% Year total	3.7%	14.4%	9.9%	17.8%	18.7%	10.2%	56.6%	6.6%	6.4%	8.7%	7.3%	29.0%	5.0%	3.2%	2.5%	100.0%
Consumption	2 208	8 833	2 208	2 208	2 208	2 208	8 833	2 208	2 208	2 208	2 208	8 833	2 208	2 208	2 208	26 500
(Deficit)/surplus	(1 223)	(5 015)	418	2 503	2 753	498	6 173	(472)	(510)	90	(265)	(1 157)	(884)	(1 362)	(1 546)	(0)
% Net output	–124.0%	–131.4%	15.9%	53.1%	55.5%	18.4%	41.1%	–27.2%	–30.1%	3.9%	–13.6%	–15.1%	–66.8%	–161.1%	–233.4%	0.0%
Farm consumption	663	2 650	663	663	663	663	2 650	663	663	663	663	2 650	663	663	663	7 950
% Net output	67.2%	69.4%	25.2%	14.1%	13.4%	24.5%	17.7%	38.2%	39.0%	28.8%	34.1%	34.5%	50.0%	78.3%	100.0%	30.0%
Non-farm consumption	1 546	6 183	1 546	1 546	1 546	1 546	6 183	1 546	1 546	1 546	1 546	6 183	1 546	1 546	1 546	18 550
% Net output	156.8%	162.0%	58.9%	32.8%	31.2%	57.1%	41.2%	89.0%	91.0%	67.3%	79.5%	80.6%	116.8%	182.7%	233.4%	70.0%
Marketed surplus	323	1 168	1 964	4 049	4 299	2 044	12 356	1 074	1 036	1 636	1 281	5 026	661	183	(0)	18 550
% Net output	32.8%	30.6%	74.8%	85.9%	86.6%	75.5%	82.3%	61.8%	61.0%	71.2%	65.9%	65.5%	50.0%	21.7%	0.0%	70.0%
PROCUREMENT	Feb	Nov-Feb	Mar	Apr	May	June	Mar-June	July	Aug	Sept	Oct	July-Oct	Nov	Dec	Jan	TOTAL
Procurement	12.0	29.0	158.1	468.2	452.8	275.2	1 354.3	132.3	52.4	25.1	17.0	226.7	9.7	3.7	3.6	1 610
% Year total (1986-90)	0.7%	1.8%	9.8%	29.1%	28.1%	17.1%	84.1%	8.2%	3.3%	1.6%	1.1%	14.1%	0.6%	0.2%	0.2%	100.0%
% (Deficit)/surplus	–1.0%	–0.6%	37.8%	18.7%	16.4%	55.2%	21.9%	–28.0%	–10.3%	27.8%	–6.4%	–19.6%	–1.1%	–0.3%	–0.2%	
% Market surplus	3.7%	2.5%	8.0%	11.6%	10.5%	13.5%	11.0%	12.3%	5.1%	1.5%	1.3%	4.5%	1.5%	2.0%	–2 645.8%	8.7%
% Net output	1.2%	0.8%	6.0%	9.9%	9.1%	10.2%	9.0%	7.6%	3.1%	1.1%	0.9%	3.0%	0.7%	0.4%	0.5%	6.1%

Source: BPS, BULOG, Balance sheet calculations, RMS results.

RICE OUTPUT PER MONTH: (based on 1986-89 monthly area data; assumes balanced market equivalent to 1990 consumption)
Net rice output: 26 500 (net output after allowing 11% for waste, seed, animal feed etc.)
Rice consumption: 26 500 (net consumption after allowing for the difference between procurement and distribution)

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4

There is a continuing trend in developing countries, as elsewhere, to devolve activities which have hitherto been performed by the public sector to the private sector, and to less regulated markets.

The marketing of staple foods is no exception to this trend, but it raises important issues about national food security, price stability, and the protection of poor people from price rises which could mean malnutrition or starvation.

Rice Marketing in Indonesia describes a research project which explores these issues in depth for a staple food commodity in a large developing country. The research focuses on seasonal rice price formation, on storage and sales decisions by farmers and traders, and on competition and efficiency in marketing channels.

The research approach, which involves tracing marketing chains from sample farmers, is likely to be of interest to all those concerned with studying the liberalization of food markets in developing countries.