INTRODUCTION

Market information is an important facilitating function in a marketing system. It facilitates marketing decisions, regulates the competitive market processes and facilitates marketing mechanisms (Kohls 1990). Market information is vital to minimize information gaps and uncertainties that exist in the agricultural sector of a developing economy such as that of Malaysia. It is much needed by farmers in planning production and marketing, and equally needed by other market participants in arriving at optimal trading decisions. The agricultural sector in Malaysia is beset with a high degree of uncertainty due to the nature and structure of the production sector, organization of the marketing system and natural hazards. Production is characterized by a large number of small, scattered farms and marketing is still unorganized, with too many middlemen handling small quantities of agricultural produce. Within such a structure, market information is deemed necessary to provide the right signal to participants. In fact, the existence and transmission of complete and accurate marketing information is the key to achieving both operational and pricing efficiency in the marketing system (Beal 1966).

This paper reviews agricultural marketing information system for selected commodities in Malaysia. The three major commodities selected are: palm oil, fish and vegetables. Palm oil is chosen to represent the agricultural export sector, while both fish and vegetables represent the food sector. The paper begins with a brief overview of the economic role of agriculture in Malaysia, with a special emphasis on these three selected commodities. A discussion on the information system paradigm is presented in the section that follows. This is subsequently followed by a description of the agricultural marketing information system for each of the three commodities.

AGRICULTURE IN MALAYSIA

Agriculture, forestry and fishing are an important part of the Malaysian economy, as evidenced by their significant contribution to the country’s GDP and export earnings. Agriculture is the second largest contributor to the GDP of Malaysia, accounting for 16.3% in 1992. Agricultural exports are also the country’s second largest foreign exchange earner, accounting for 17.4% of total earnings in the same year (manufacturing contributes more than 60%). In addition, the agricultural sector is the largest source of employment, currently employing 25.9% of the labor force (Bank Negara 1992).
Palm Oil

Malaysia is the world’s leading producer of palm oil products. Malaysia produced 53% of world output and accounted for 66.8% of world exports in 1992 (Oil World 1992). Palm oil is currently the second most important vegetable oil in the world, accounting for 14.5% of the world production of 17 major oils and fats. It ranks only behind soybean oil, which contributed 20-23% of world output.

The oil palm industry takes up about one-third of Malaysia’s total cultivated area. The area under oil palm hectarage has exceeded that of rubber since 1989 (Malaysia, Ministry of Primary Industries 1990). Palm oil contributed 5.2% of the country’s foreign exchange earnings in 1992 - the third most important source of foreign exchange earning, after petroleum and timber products.

There are three major types of oil palm producers: independent smallholders, producers in the land development schemes, and private estates. The farms of independent smallholders are generally small (less than 100 ha). Land development schemes are projects introduced by the government to resettle landless farmers on new land as producers of export crops such as palm oil or rubber. One main agency entrusted with this scheme is the Federal Land Development Authority (FELDA), which is also involved in the marketing of the produce. Other land development agencies are FELCRA (Federal Land Consolidation and Rehabilitation Authority) and RISDA (Rubber Industry Smallholders Development Authority). Private estates are farms which are larger than 100 ha and operated by private firms. Currently, private estates account for about 45% of the area planted in oil palm, land settlement schemes 46%, and independent smallholders 9% (PORLA 1992).

Each group of producers exhibits different production and marketing characteristics. As well as small farms, the independent smallholders are characterized by low productivity (compared to the estates) and dependence on private middlemen for the sale of their produce (Fig. 1) (PORIM-UPM 1988). Smallholders in the land development schemes are each given 10 ha of land to farm. Marketing of produce is done through the marketing unit of the parent institution. For instance, FELDA buys and sells fresh fruit bunches at the farm level, processes them into processed palm oil, and sells this to either local or foreign manufacturers. The private estates have a highly organized marketing system. Generally, there exists a high degree of vertical integration. A plantation firm not only has its own production farms, but also milling and processing plants. Hence, raw materials are easily absorbed into their mills and refineries, before the processed products are sold to domestic users or foreign manufacturers.

The industry is governed by a number of institutions, both private and public. Besides FELDA, FELCRA and RISDA, other significant public institutions include the Palm Oil Registration and Licensing Authority (PORLA), the Palm Oil Research Institute of Malaysia (PORIM), and the Kuala Lumpur Commodity Exchange (KLCE). PORLA’s function is mainly to monitor the market situation, through registration and licensing. It also disseminates information to participants in the industry. The focus of PORIM is mainly on research and development. KLCE provides the price discovery center, as well as a hedging mechanism to market players in their attends to minimize price risk. PORLA and KLCE are more directly involved in marketing information than PORIM.

Fish

Fish is an important food item in Malaysia. It contributes about two-thirds of all meat consumed in the country. In 1990, it contributed 9.8% to the GDP and employed about 4.3% of the economically active population (Ministry of Agriculture 1991). Over 90% of the national fish catch is taken at sea. The late 1980s saw a rapid increase in catches as a result of technological development — better fishing techniques, replacement of fiber nets by synthetic ones, use of larger and more powerful vessels and rapid adoption of trawling gear. The acquisition of more extensive fishing grounds under the EEZ Declaration in 1980, and the subsequent development of the deep-sea fishery industry, also contributed to higher fish catches. Catches have increased from 198,377 mt in 1965 to 747,000 mt in 1989 (an increase of almost 300%).

The fishing industry is characterized by a distinct dualism between the small-scale and the large-scale commercial operators. Small-scale fishermen do most of their fishing close to shore, make little use of specialized skills and are characterized by low productivity, a high incidence of poverty and limited market outlets. The operations of the large-scale commercial fishermen, on the other hand, are carried out on a larger scale and are highly profit-motivated (Ishak et al. 1992). The market channel for fish is described in Fig. 2. The fish passes through the hands of assemblers, wholesalers and retailers before reaching the final consumer.
Fig. 1. Marketing channels for Palm Oil

Fig. 2. Marketing Channel for Fish
Source: Mohd Ariff et al. 1985
Vegetables

Malaysia is a net importer of vegetables, in spite of the policy emphasis since 1984 on developing production to meet domestic requirements. In fact, in the late 1980s and early 1990s, imports increased by an average of 5.6% every year. In 1992, the import value stood at US$94 million.

Vegetable consumption is rising. The Federal Agricultural Marketing Authority (FAMA) (1992) has indicated that annual per capita consumption of 53 types of vegetables has increased from 38 kg in 1982 to 53 kg in 1988. This figure, however, is relatively low compared to consumption levels in Japan, Taiwan, South Korea (94 kg) and in Western Europe and North America (145-188 kg) (Moon 1989). However, with the current increases in household income, we can expect that domestic consumption will continue to increase.

Characteristically, vegetables are produced on small, scattered farms of less than 1.3 ha, using mainly traditional methods of farming (Low 1993). However there are some areas, mainly in the highlands, where there is a concentration of commercial production. There are more than 50 commercial varieties of vegetables, including both highland and lowland types.

The marketing channel of vegetables in Malaysia is shown in Fig. 3. Farmers normally sell their produce on a consignment basis to a wholesaler or his agent or collectors. Under this system, the farmers are informed of the prices they will receive only 2-3 days after the produce has left the farm gate — i.e., after the produce has been sold in the terminal market. In other words, the producers do not have a say in the pricing decision, which is made at the major wholesale center or terminal markets in large cities. At these terminal markets, substantial quantities of vegetables converge for redistribution in other urban centers. These wholesale markets tend to have a marked influence on the prices received by farmers and paid by consumers (Low 1993).

THE AGRICULTURAL INFORMATION SYSTEM PARADIGM

The agricultural information system paradigm provides a framework for discussing the agricultural marketing information process. Before one embarks on establishing an information system, it is important to realize that information is not equivalent to data or statistics. Information is generated from data or statistics. Raw data must be given form and meaning through analysis and interpretation to generate information that will be useful to decision-makers (Bonnen 1975).

The general structure of an information system is illustrated in Fig. 4. The system begins with some understanding of the problem (reality) — in other words, we must answer the question of what the problem is that we are trying to solve. Since reality is highly complex, we have to use theoretical explanations. Theoretical concepts are operationalized through suitably defined empirical variables and hence measured. This theoretical concept of reality is the conceptual base of the data. In short, there are three steps in producing data: conceptualization, operationalization and measurement.

As is true for most products, production of data is for a purpose. The demand for data usually comes from decision-makers faced with the need to make decisions regarding particular situations. However, to be useful, data need to be interpreted or evaluated through statistical and economic analyses, and hence transformed into information which can easily be used by decision-makers. This transformation process gives form and meaning to the data. This process is represented in the left side of Fig. 4. There are also three distinct steps in the analytical process. Analysis begins with a set of theoretical concepts that tries to explain reality. These concepts must be operationalized by defining the variables. Data, which are measured representations of these variables, are then collected and used in the analytical framework (or model) to test its predictions concerning the reality. The right hand side of Fig. 4, represents this analytical process. Thus, production of data and analysis share the first two steps. For the data to be useful to the analyst, it must be based on the same set of theoretical concepts and, ideally, the same set of definitions used to operationalize the concept through the measured variables. The results of analysis and interpretation produce information needed by the decision makers.

There are several implications of this view of the information system.

Improving the information system is not entirely a measurement problem. Remember that data is a symbolic representation of a concept. If to begin with, the concept is not an accurate representation of the reality, increasingly sophisticated statistical analysis of the measurements will not lead to a better understanding of the reality.

Since both data and analysis are dependent on the conceptualization of reality, if the concept of reality or reality itself changes, the information system must change. It is widely accepted that the
Fig. 3. Marketing Channel for Vegetables in Malaysia
Source: Low 1993

Fig. 4. The information systems paradigm
Source: Bonnen 1975
market for agricultural produce is constantly evolving and highly dynamic. This is even more the case in developing countries where significant structural changes are occurring. The problems faced vary over time, and this requires similar adjustments in the information system.

While industrialization and development increase the demand for information, it also increases specialization so much that data collection is often separated from analysis and interpretation. However, to leave data collection to the statisticians, and blame data problems on statisticians, is not justifiable. Close cooperation between those responsible for data collection and those who use the data is crucial.

As mentioned before, the purpose of data collection is to generate information, and the purpose of seeking information is to help managers in their decision-making. It is important to realize that there are several levels of management. Most books on management indicate that upper level management is responsible for directing the organization's future course. Upper level management is primarily required for strategic planning, and setting long-term goals and plans. Middle level management is involved in control and in shorter term planning, tactical planning, or finding the best way to get the job done. Low level management is generally responsible for overseeing the operations of the organization. Since the kinds of decisions to be made are different, it is not surprising that the information needs of these levels of management are different. There is a greater need for information external to the organization as we go up the management scale. The need for a longer time scale, and a greater degree of summarization of the information, is evident for higher level management. Nevertheless, irrespective of the level, for the information to be of any use it must be available, comprehensible, relevant, useful, timely, reliable, accurate and consistent.

AGRICULTURAL INFORMATION IN MALAYSIA

The center of the agricultural information system in Malaysia is the Ministry of Agriculture. The function of establishing the information system is entrusted to the Management Information Unit — a major unit in the Macro and Strategic Planning Division. This Division is responsible for coordinating the collection and compilation of statistical data to support the planning process of the Ministry. The sources of these data are varied and widespread, and include six other Ministries (for instance the Department of Statistics in the Prime Minister’s Department) and 36 departments and agencies under the Ministry of Agriculture. There are also around 30 agricultural associations, trade associations and chambers of commerce in Malaysia which collect and provide agricultural information for their members.

The type of data collected varies according to the objectives of the particular institution.

There is some duplication of information output among the institutions. As noted by the Ministry of Agriculture (1994a), each department and agency is developing its own database center. Also, there is a wide range of computer systems and data formats used. The development of many independent database centers has given rise to a number of problems. There is a lack of data unity, which makes direct data exchange among institutions impossible. Variations in the methods of maintaining the databases also hinder the efficient exchange of information. Information is not consistent, due to differences in data collection and interpretation. Hence, there is a need to coordinate and integrate all these information systems into a single comprehensive central database under the Ministry of Agriculture.

A number of ministries and institutions are involved in the agricultural marketing information system. These institutions include MARDI, FAMA, FDAM, LPN, the Ministry of Primary Industries etc. This paper gives a brief review of the agricultural marketing information system for the three commodities discussed earlier — palm oil, fish and vegetables.

Palm Oil

The two main institutions involved in marketing information for palm oil are PORLA and the KLCE. The KLCE, which was founded in 1980, aims at providing a hedging facility to reduce price discovery function and hedging facility to reduce the risks to industry participants. It publishes prices of futures contracts — for spot and distant months — nationwide through various media. In view of its efficiency in information system and the minimal participation by the smallholders in hedging, further discussion on KLCE is omitted here.

The major function of PORLA is to ensure efficient marketing for palm oil by means of market monitoring (licensing and registration), data collection and information dissemination. Hence, establishing an information system is an integral function of PORLA in implementing its policy objectives.

PORLA collects data on prices, production, imports and exports, stocks and inventory
levels of palm oil products. It collects daily prices of crude palm oil (CPO), processed palm oil products (PPO), palm kernel oil (PKO) and palm kernel cake (PKC). Prices collected are based on the contracts traded, which have to be registered with PORLA within 24 hours after the contracts are signed. These prices are then keyed into personal computers. Currently there are 300 traders registered with PORLA.

To provide information on the current supply situation of palm oil products, PORLA collects data on production and stock of fresh fruit bunches, processed palm oil, palm kernel cake and oil and oleo-chemical products. The firms concerned are required to fill out standardized forms before the 14th of each month. Currently, there are 275 palm oil mills, 38 refineries, 15 oleo-chemical firms, 50 palm kernel cake processing plants and 35 bulking installations firms which supply the required data.

To discover the import and export flow of palm oil products, PORLA collects data from Custom Declaration forms collected at five important ports. About 5000 forms are collected monthly. PORLA is currently using a mini computer (PDP version 11/24) for data processing.

The major output produced by PORLA is market information on a daily, weekly and monthly basis. PORLA provides daily prices to the mass media, publishes the weekly ‘PORLA Press Release’ and the monthly report “Palm Oil Update” and other reports. This information is sent to Bernama, Reuters, other government agencies and also made available to the public by telex, fax and telephone.

Fish

Marketing information for the fish industry is the responsibility of the Fisheries Development Authority of Malaysia (FDAM), better known by its Malay acronym, LKIM. Although this information system was planned as long ago as 1985, it was not implemented until 1991. It is designed to help FDAM in its decision-making to ensure the growth and development of the fisheries sector (LKIM 1994). Relatively more emphasis is given to the role of information in its marketing function, as the nature of fish marketing requires it to do so. The framework for FDAM’s marketing information is governed by its marketing objective, that is to ensure the dynamic development of the marketing sector. The strategies identified to achieve this objective are market monitoring, trade promotion, and monitoring the landing of fish at the FDAM landing complexes by Fishermen’s Associations.

FDAM has established 3 major modules—Integrated Accounting System, Marketing Information System and Fishermen’s Institutions’ Information Monitoring System. The first module was finalized in December 1992 for internal financial and administrative purposes. The Marketing Information System, which was finalized in 1992, is designed to provide relevant information for FDAM’s marketing division to use in implementing its marketing policies. The Fishermen’s Institutions’ Information Monitoring System monitors the membership and activities of the Fishermen’s Associations.

The Marketing Information System comprises four sub-modules which are:

1. Market Operation System (MOS)
2. Marketing Monitoring System (MMS)
3. Complex Management System (CMS)
4. Trade Promotion System (TPS)

To date, only MOS is fully operational, as the other sub-modules are still under review. Fig. 5 shows the structure of its marketing information system. Each submodule was designed to provide FDAM with information on the relevant policy objectives of the sub-module. For instance, the market operation module is aimed at collecting and processing data concerning the operational aspects of the fish market at all levels — landing, wholesale, retail, import and exports.

Before the MOS was formalized in 1991, FDAM had already implemented an informal version of the system from 1982 which collected data on landings, prices at landing points and wholesale and retail centers, and import and export figures. The introduction of MOS was aimed at improving data collection so that it could be integrated as one of the systems in the main Marketing Information System. Under the new MOS, the same type of data is collected — daily prices (wholesale and retail), landings by type of boat at the various FDAM landing complexes, and fish imports and exports.

FDAM has 13 landing complexes situated in major fishing areas. These complexes send daily information on the quantity and value of catches according to the type and size of fish. The quantities sold are classified into auction or non-auction sales. A standard form is used by the complex managers, who have to fax it to the FDAM head office daily. The same procedure is applied to wholesale and retail fish marketing centers, for the reporting of daily prices.

The main output is data on daily prices of fish at all market levels, which are distributed to the mass media, and to the Ministry of Domestic Trade and Consumer Affairs as well as the Ministry of
Agriculture. Both Ministries are also provided with data on fish landings at the FDAM complexes, and on fish imports and exports. FDAM also publishes monthly reports on the current fish market situation in Malaysia, which is distributed to government agencies and private traders.

Data entry and processing is handled by the computer unit of FDAM, which was established in 1991. Since the IT section of FDAM is still relatively new, it faces a number of organizational, management and implementation problems. The problems identified are (LKIM 1994):

- Poor planning: management staff were not able to identify the real needs of the users during the planning stage. Hence, the system designed was inadequate to meet the requirements of users.
- Lack of staff and expertise to develop the system.

FDAM hopes to establish an Integrated MIS (IMIS), integrating the Integrated Accounting System, Marketing Information System and Fishermen Institution Monitoring System. The feasibility of the IMIS will be studied once the MIS, IAS and FIMS have been implemented successfully. FDAM is also planning to acquire Client Server Technology to implement the MIS.

**Vegetables**

FAMA is one of the first institutions in Malaysia to have employed the MIS concept. Its MIS center was established in 1969, and concentrated on collecting data on marketing activities (Mukhtiar 1992). Since then, its MIS has evolved into one of Malaysia’s leading marketing information systems, and is considered to play a major role in helping FAMA realizes its goal as a development agency for the marketing of horticultural produce, food and agroindustrial products through market development. The market will be developed by means of increasing the demand, determining the supply and developing marketing chains. The role of MIS is to provide and process data and information to help FAMA in its planning decisions.

MIS in FAMA serves two major groups, the external agencies and the internal divisions of FAMA. For internal purposes, MIS provides the information on the business performance and other
activities of FAMA branches all over the country, and other data related to personnel and management. Agricultural marketing information is the most important contribution to external agencies. The data collected and distributed are mainly daily, monthly and annual prices of selected commodities, quantities of imports and exports, and general information on production and consumption for selected commodities.

Currently, FAMA has a computer mainframe IBM 4331-L02 (which was acquired in 1982) and 84 PCs. FAMA has also established its own Local Area Network, comprising a total of 28 micro computers connected to a computer server at the computer branch Ethernet. A total of 10 micro computers are connected to a computer server located in the Finance Department. Both servers are connected through a backbone cable.

The Price Information System flowchart is summarized in Fig. 6. Data collected are mainly daily prices of selected commodities, collected by staff of FAMA’s branches in all the states in Malaysia. FAMA’s branches send this data to the FAMA state office, by either telex or telephone, three times a week (Tuesday, Thursday and Saturday). These data are summarized in a predefined fax form which is then faxed to FAMA’s head office, also three times a week (on the same days). At the Head Office, these data are keyed into the mainframe computer. These data are stored and processed to produce market price reports on a daily, monthly and annual basis.

The data are disseminated in two ways. Firstly, FAMA provides a telephone answering service at its head and state offices for consumers. Consumers can get access to price information by phone every Tuesday, Thursday and Friday.

Secondly, FAMA has set up a database system called TELITA to provide a link between information supplier and user. The TELITA system flowchart is presented in Fig. 7. The major output produced is prices at a national and state level, supplies and market potential (Appendix IV).

The functions of MIS in FAMA are shared by the Market Information Unit and the Computer Unit, both under the Corporate Planning Division. The two units are instrumental in providing information to help FAMA in its planning decisions. Details of the hardware and software components are given in Appendix V.

The funds allocated FAMA for information technology have increased from US$46,300 under the Second Malaysia Plan (1971-1975) to US$8.5 million under the Sixth Malaysia Plan (1995-2000). The amount spent on information technology has increased from 1.2% of development funds to a staggering 28% during this period. In terms of personnel, a total of 250 staff are currently employed to implement the marketing information service, with a total salary expenditure of more than US$800,000 per annum.

Currently FAMA is undergoing a change in its objectives. While maintaining its developmental role, it intends to commercialize some of its activities in order to be a self-financing institution. With this shift in objectives, marketing information will play an even greater role in the decision-making process. The role of marketing information in the new system will be to inform producers about market demand (domestic and external), and dealers and consumers about the supply status and other market developments which are significant to their decision-making (Mukhtiar 1992).

In order to realize this new role, FAMA has outlined the future developments for its LAN and WAN. As for the LAN, it intends to upgrade its capacity to provide services using voices, image and text. Some of its long-term LAN projects include:

- Installing LANs at a state level. Each FAMA state branch will have its own server to which all its PCs are connected. Computer servers at the state level will be connected to FAMA’s head office.
- Integrating the current system of LANs by means of PABX, fax, telephone and a Relational Database Management System with WAN. This integration is expected to establish an integrated desktop Computing Information System for Executives.
- To provide PCs for all FAMA’s staff, giving them direct communication with each other by LANs, making possible workgroup computing and providing more effective communication.

As for WAN, FAMA intends to upgrade its computerized system through its FAMA Network System (Appendix VI). It intends to use the DATEC (public telephone service) to connect district offices with the FAMA state offices. Each FAMA state office will have dial-up access to receive and send information from the FAMA head office.

Appendix VII presents the components involved in the FAMA Network System. Carbon Copy Plus will be used to integrate a voice response system of both a state and head office level. TELITA will be terminated. The database at head office will still be updated three times a week, but a new batch program
Fig. 6. Flowchart of price information system
Source: FAMA 1994
will be developed to update the data in the PCs at a state level.

It is hoped also that through WAN, information in the data bank at the Head Office will be shared with other agencies. Included in the data bank will be publications, for which customers will have to pay according to the computer time they utilize. FAMA’s WAN will also be linked with the International Network Corporation (INC), for international users.

CONCLUSION

We can now draw some general conclusions with respect to the agricultural marketing information system in Malaysia. The above analysis suggests that there is a strong awareness in each institution of the important role of information systems in performing their tasks — be it for internal or external purposes. For instance, a significant amount of resources are devoted to maintaining each organization’s own information system. This is not surprising, as any organization has to keep its house in order first, so to speak, before it can concentrate on supplying services (in this case information) to external organizations. FDAM’s Integrated Accounting System module is basically monitoring its own financial and accounting system. The complex management portion of the Marketing Information System sub module is concerned with the management of the FDAM’s landing complexes. In the case of FAMA, two of the four information systems, Financial Position Information and Personnel and Management Information, deal with FAMA’s operational aspects. This point is not meant as a criticism but rather to stress the fact that this is a necessary developmental phase for the organization. A more pertinent question concerns the optimal amount of resources to devote to internal operational aspects.

The above discussion indicates that the three institutions studied have adequately defined their role and functions in marketing their respective commodities. The agricultural marketing information system in each institution is designed to provide the policy makers who are the major users with the marketing information they need for policy decisions. FAMA, for instance, has long recognized the structural inefficiency of the vegetable market. This has caused it to carry out a number of marketing margin studies. To assess the market prospects for a particular commodity, FAMA has also embarked on a number of studies on market potential and forecasts. PORLA, in its bid to ensure healthy competition in the palm oil industry, has designed a standardized form to be filled out by those applying for a license, asking for details on their current state of business. In short, the institutions are correctly performing their role in solving the marketing problems of their respective sectors.

However, all three institutions encounter problems in data collection. One of the major problems cited by FDAM and FAMA is the difficulty of getting the data input. As for palm oil, reporting of information is made mandatory by law. Hence, PORLA is able to collect comprehensive data on the current status of business and the market situation, from a farm to an export level. For the other two commodities, data collection tends to be a demanding exercise in terms of both the funding and the personnel required. Fish and vegetables both include dozens of species and varieties sold on the market, although the structures of the industries are very different.

While we must keep in mind that improving the information system is not entirely a measurement problem, there are obvious problems with respect to the hardware. The case of PORLA is outstanding. The PDP machine currently in use is simply obsolete, and cannot handle PORLA’s computing needs. What should take only minutes to compute is currently taking several hours. The applications are written in COBOL, and whatever data generated cannot be downloaded to PCs for use by the Economics Division, the main user of the data. We are happy to note that PORLA is planning to install a new hardware system. FDAM has reported that it, too, is unable to interphase its mainframe computer and PCs.

A more general concern related to computing power is the optimal mix of hardware, software, and personnel. A related issue is the question of the computer skills of the end user. If the software is more user-friendly, and the skills of users of the data system enhanced, the burden of the computer centers can be somewhat reduced, as can the problem of ensuring that the data is relevant and useful. The other major issue concerning the hardware is the problem of obsolescence, which requires institutions to weigh the alternatives of leasing vs buying a machine. They also have to measure the relative advantage of buying a commercially available software package or writing their own programs. The latter has its advantages, but is cumbersome and demanding in terms of manpower.

As discussed earlier, information is data that has been transformed to meet the needs of the user. Ideal information is readily available, comprehensible, relevant, useful, timely, accurate and con-
programs have been designed and funds allocated to between institutions difficult. This makes interconnection of computer systems (a total of 8 out of 13 agencies are using such system). Thus, encouraged to practise open system interconnection, to make possible the sharing of information. A feasibility study of the viability of establishing such a database system is recommended.

There is no doubt that information is going to play an increasingly vital role in the more developed and technologically oriented economy of the future. With increasing specialization of the data collection and analysis functions, coordination and management of the information base is of critical importance. Bonnen (1975, p. 753) points out that the information base should be viewed as a capital stock that requires increasingly greater investment over time. "The problems of agriculture and rural society, indeed societal problems generally, are best understood as fundamentally problems of information processing. Thus, if we agricultural economists wish to solve problems in the society, we must first solve the implicit information system problem."

Under the Sixth and Seventh Malaysia Plans, programs have been designed and funds allocated to improve the agricultural marketing information of these three institutions, as well as other institutions in the country. The above discussions suggest that a number of improvements have to be made to ensure a more effective system. Firstly, there is a need to establish a user committee, to determine what information is required by the various types of users from the private and public sectors. This is greatly needed to reduce the gap between system designers and users. An important user group that needs to be emphasized is the producers, in particular the smallholders and fishermen who do not yet get much direct benefit from the information system. It is suggested that research be carried out to determine the information needs of this group, as well as of private firms, and to identify a suitable communication system to relay market information to them effectively. Their needs have to be identified and understood, so that the system is designed accordingly.

Secondly, any upgrading of the computer systems of the institutions implies that the relevant personnel have also to be upgraded in number, expertise and skill through appropriate training programs. Thirdly, the discrepancies in data collection methods and data bank systems have resulted in an inefficient exchange of data between related agencies involved in agriculture information. As recommended by the institutions themselves, there is a need to centralize all information services under a central database at the Ministry of Agriculture. As one of the requirements of centralized data base management, the institutions involved must be encouraged to practise open system interconnection, to make possible the sharing of information. A feasibility study of the viability of establishing such a database system is recommended.

There is no doubt that information is going to play an increasingly vital role in the more developed and technologically oriented economy of the future. With increasing specialization of the data collection and analysis functions, coordination and management of the information base is of critical importance. Bonnen (1975, p. 753) points out that the information base should be viewed as a capital stock that requires increasingly greater investment over time. “The problems of agriculture and rural society, indeed societal problems generally, are best understood as fundamentally problems of information processing. Thus, if we agricultural economists wish to solve problems in the society, we must first solve the implicit information system problem.”
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DISCUSSION

Dr. Sardido commented that the situation described by Dr. Fatimah in Malaysia is very similar to that found in the Philippines and Indonesia. Agricultural production is dualistic in nature, and information needs vary according to the type of commodity, the size of the farm, and the nature of the market. He referred to Fig 6, which shows access by fax and phone to FAMA Head Office and district offices. He commented that this is quite an advanced system, and asked for further details on how it works. Dr. Fatimah replied that MIS of FAMA collects data for various commodities (vegetables, flowers, poultry, beef etc), at a district level. Staff at district offices have to fill out a standard Fax form, and also deal with public enquiries. This information is sent to the State Office, and finally to FAMA Head office. It is also sent overseas. The major users are policy makers and traders.

Dr. Shin commented that the fact that the system is mainly used by government officials and traders is no problem in the case of export crops. However, for locally consumed domestic production, marketing information should be used by farmers. In the non-centralized marketing system of the type described by Dr. Kuo for Taiwan, (see FFTC Extension Bulletin 393), farmers have the option of choosing the buyer who gives the best price. The centralized market has the best system of data collection, but this should not be the only criterion.

As an example, Dr. Shin described the main marketing system for fish and vegetables in Malaysia, most of which are sold on consignment. Farmers sell to the wholesaler, who sells to wholesale markets in Kuala Lumpur and elsewhere. It is there that the market price is discovered, and this information is relayed to the farmer about three days later. Farmers rely on middlemen for most of their marketing information, which means that the bargaining power of the two parties is unbalanced.

Dr. Choi of FFTC agreed with Dr. Fatimah that the logical framework of a marketing information system should start with conceptualization, which then serves as the basis for designing the system. He pointed out that in practice, this ideal model is seldom followed. In most developing countries, organizations tend to purchase the hardware first, and then find out what they can do with it. There is a diversity of software, including some written by organizations for their own use which is protected, so others cannot use it. Similarly there is a diversity of hardware, with some organizations using IBM and others using different kinds of computer. He suggested that there are three important technical points. What type of equipment should be purchased? Should organizations write their own software or use commercial products? Should the hardware component be uniform or diversified? He added that although uniform hardware is usually desirable, it may mean that a number of information collectors for the same commodities are replaced by a monopoly.
Appendix V: Computer hardware and software used by FAMA, 1994

Source: FAMA, 1994
Appendix VI: Conceptual Framework of FAMA’s WAN
Appendix VII: Network Components for FAMA’s WAN