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Problems of Privatizing the Seed Supply in Self-Pollinated Grain Crops

Michael Turner

Introduction

Efforts to improve seed supply in developing countries have been in progress for approximately 25 years. They have taken place mostly through the medium of development projects which were concerned specifically with seeds or in which seeds were a component among other activities such as research or extension. In the early stages, these projects established the physical facilities for producing good quality seed, notably processing plants, stores and seed testing laboratories. At the same time, they also developed the necessary human resources through staff training at all levels. While projects emphasized capital investment in hardware, they also conferred a certain system of seed supply and regulation (the software) which was based on that found in developed countries with mature seed industries. Experience has shown that in many developing countries this system is too demanding or costly to implement.

Finance was provided by external development agencies on a bilateral or multilateral basis and because of the nature of such funding, these projects were invariably implemented through an arm of government in the recipient (host) country. This was

not necessarily the ministry of agriculture itself; quite often a parastatal seed company was the focus of the project, but it was still closely tied to government in terms of policy and funding. In this way, national seed programs emerged, often of considerable size, but with the government still playing a dominant role and with little flexibility for truly commercial operation.

While the nature of project funding has been a major influence on this pattern of development, the host governments themselves were also concerned to retain a key role in seed supply as a means of strategic intervention in agriculture. Furthermore, in most developing countries, the private sector showed little interest in participating in the organized supply of quality seed, except by providing retail sales outlets. This reluctance may be attributed to the dominance of the market by government (there was no space in the market), although in some countries the private sector was actively discouraged as a result of socialist policies. However, in most cases, the private sector simply did not find seeds a very attractive area for investment. As a product, seeds have a number of features which make them difficult to market and the potential customers (small farmers) lack the cash resources to purchase on a regular basis. This is a

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University of Edinburgh, Scotland, UK. This paper is extracted from Integrating Seed Systems for Annual Crops, Proceedings of a Workshop Held in Malang, Indonesia, October 24-27, 1995. Monograph No. 32, Bogor: CGPRT Centre.

fundamental problem which will be addressed later in this paper.

For the past ten years or so, there has been a change in the climate of development with calls for more participation by the private sector and a reduced role for government. Those pressures have intensified in the past five years and there is now a routine expectation by funding agencies of private sector involvement wherever possible. In the case of seeds, this seems sensible since they are a physical product and would naturally fit into a commercial production/supply system. Indeed, that was the original reason why parastatal seed companies were established - since government accounting procedures cannot easily cope with trading operations.

The brief history set out above is well-known. Many national seed programs are now in a transition phase; there are calls for privatization of the seed supply but also problems in achieving that objective. There is also discussion about the future role of government. Should it simply create the policy environment within which the private sector can develop or will the government be obliged to maintain a direct involvement in those activities which are unattractive to the private sector. The purpose of this paper is to examine these problems and to suggest approaches which may assist this process generally, and can be applied specifically to assist the improvement of the seed supply system in Indonesia.

Analysis of the seed market

Before considering the opportunities for shifting the balance towards the private sector, it is helpful to analyze the seed market in rather more detail. The total seed requirement of a country is the quantity of seed used each year by farmers to establish their arable crops. This figure is normally calculated by multiplying the total area of each crop by the average sowing rate, taking account of known variations according to season or sowing practice. For example the seed requirement for rice varies greatly depending on whether the crop is broadcast or transplanted.

The figure calculated for the total seed requirement is interesting but of little direct value in market planning since in most countries only a small proportion of that total is actually provided by an organized production system. We now call this supply channel the formal seed sector. The

remainder of the seed requirement is supplied by informal means, mostly by seed saved on farm or exchanged/traded within the community or surrounding area.

The recognition of these two supply mechanisms is helpful in development terms since they may require quite different forms of support. While most early projects were aimed at establishing the formal sector (which did not exist previously), the limits of that sector are now well recognized and there is no expectation that it can, or should, take over the entire seed supply. Even in countries with a highly-developed agriculture, the informal seed sector may still make a significant contribution, particularly through farm-saved seed.

Seed supplied through the formal seed sector is characterized by planned production, some form of mechanized processing, named varieties marketed in identified packages and (usually) a system of quality assurance to the buyer. As a result, there is a clear distinction between seed and grain. In contrast, the informal sector does not have these elements of organization and good quality grain may simply be offered as seed as the next sowing season approaches.

The total seed market in a country is finite and relatively stable; it will change only slowly due to increases in cultivated land area, cropping intensity or new production practices. It follows therefore that any increase in the formal sector supply will be at the expense of the informal sector. However, this does not necessarily imply competition, rather that certain types of supplier on the interface may become more formalized in their approach and practices.

The boundary between the formal and informal sectors is of course not clearly defined. For example, a trader who regularly buys seed from certain farmers for selling in his shop, but without any systematic planning or quality control, could be considered in either sector. If he were to actively seek some form of quality assurance or improved packaging to enhance his product, he may then effectively enter the formal sector. Thus, while the precise definition of these sectors is difficult, a general division of the seed supply system according to the level of organization and institutional involvement seems quite clear. This interface is also interesting in the context of this paper since recruiting such local operators into the formal sector by upgrading some of their practices may be a significant way to increase the role of the private sector.

Message from the Director

This year, the Stanford Food Research Institute will cease to exist. The termination of the Food Research Institute is an event of great significance, but it does not mark the end of problems related to food. The institute was created in 1930 with the aim of addressing issues of food and welfare. It brought the analysis of production and processing of food, trade and consumption into one domain. The general conditions for such an institute were favourable in the 1930s, the time of the great depression, rural poverty and the expansion of public investment and market intervention.

If one takes a broad view, one could pose the question whether these problems have been alleviated towards the end of this century. The answer is quite obvious; rural poverty continues all over the world, but the general social political conditions seem to have changed. The late 1980s and 1990s will no doubt enter the historian's records as the years of economic globalization, retraction of public investment and expanded privatization.

Agriculture, so the free marketeers say, is riddled with subsidies, vertical linkages, political pressure groups and major political issues. It is a pity that the Stanford Institute is disappearing now, when it could help in avoiding mistakes in current developments.

The Food Research Institute established an impressive track record. The institute pioneered the systematic analysis of local production and global trade in agricultural commodities and managed to achieve transparency with many logical and synthetic insights. The institute played a catalyzing role especially in the years following World War II and continued to be a leader in the field.

The current problems in agriculture and the continuing need for agricultural production will require analysis and transparency. It is hoped that the insights of the pioneers from Stanford will be kept alive, so that the necessary knowledge will continue to be available. The lesson that agriculture and economic knowledge together can strengthen transparent analysis and facilitate decisions is possibly among the major legacies of the Stanford Food Research Institute.

HARUO INAGAKI

Some further partition can be made within these two sectors. The major division within the formal sector is between public sector organizations and private companies, since they may have very different objectives and financial arrangements.

Within the informal sector also, one can consider a division between seed which is saved directly on the farm and that which is obtained through local trading and exchange within the community, for which there may be a distinct market, particularly before the sowing season.

These broad divisions of the seed requirement or market are represented in Figure 1. This diagram indicates the key parameters for describing the seed industries of different countries and how the total seed requirement is supplied. It is also helpful in defining the subject of the paper, which is to consider how the proportion of seed handled by the private sector, in the widest sense, may be increased.

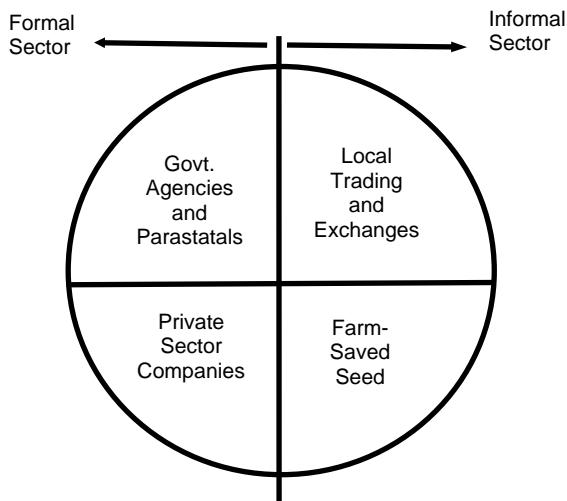
It is necessary to mention the strong influence that different crops may have on the seed supply

system, since this also creates divisions within the seed market. The cost of seeds varies greatly between species reflecting characteristics such as seed size, sowing rate, the type of variety (whether hybrids exist) and the final value of the crop produced. We recognize that the seeds most attractive to the private sector are those of high value, low volume and which cannot easily be produced by farmers themselves, e.g. many hybrid vegetables.

To summarize, the total seed market may be divided into different sectors or components on the basis of the type of supplier and the type of crop. However, the purpose of this paper is to consider only those crops which are most problematic in terms of private sector seed supply i.e. those which are easy to produce and store on the farm. In practice, these are the self-pollinating cereal and legume crops where the normal product is a grain and where farmers are reluctant to spend their limited cash resources to buy in seed which is often similar to that

which they can save themselves or obtain locally within the community.

Figure 1 Major divisions within the national seed supply system.



One final point of clarification; it is often assumed that the informal sector is only concerned with traditional varieties which the formal sector does not supply, but that is a serious misconception. Many farmers who wish to use improved varieties, of say rice and wheat, may obtain their seed requirements perfectly well through informal channels while still obtaining the benefits of genetic improvement.

Mechanisms of privatization

It is necessary to define what is meant by privatization. This is conveniently done in terms of the diagram presented in Figure 1. For the purposes of this paper, privatization can be regarded as an increase in the volume of formal (organized) seed supply which is handled by the private sector. The key elements of organized seed supply are:

- planned production and marketing,
- use of named varieties from a known seed source,
- sold in identified packages with quality standards indicated,
- by a commercial entity which has a continuing involvement in seed supply.

Such an entity must have access to secure storage, will probably have some simple processing equipment and should have some means of testing the quality of the seed it sells. It does not have to be a company because a cooperative, a farmers' association or a large farmer could certainly meet

these criteria. Included here are enterprises in which there is a physical focus for the work and some staff associated with it on a regular basis, so that the enterprise is able to acquire and retain experience from year to year.

In developed countries, the term privatization came into general use in the early 1980s in the context of returning state-owned enterprises, especially public utilities, to private shareholders. It was a policy pursued vigorously by the UK government at that time and it has subsequently been adopted in many other countries. The actual mechanisms of privatization may include offering the share capital of the company for sale to the public, inviting bids to purchase the company, or allowing the existing management to raise the capital necessary to buy the company. Whatever the mechanism, the end result is that the company moves out of government control and financial constraints, thus gaining much greater managerial flexibility. At the same time, its objectives will probably also change from providing a service to generating profits for shareholders.

In developing countries, especially those that had centrally-planned economies, there were many parastatal enterprises covering all major sectors of the economy and often employing very large numbers of staff. The sale of such organizations to the private sector is unlikely to attract interest from the private sector because of their size, unprofitability and management problems.

In the case of seed companies, the same problems are likely to arise especially where project funding has established large or complex processing operations. Projects were seldom established with truly commercial objectives in mind and thus they cannot be easily privatized by intact transfer to a new private owner. In many cases, these investments were of doubtful value; they were often under-used, even within the government system, and they are of little interest to private entrepreneurs. They were justified by highly questionable economic analysis intended to satisfy the lending criteria and political objectives of donors. However, we may still need to consider how such facilities can be made available to the private sector.

The diagram presented in Figure 2 identifies two general mechanisms of privatization. Either existing activities and facilities of public sector undertakings are transferred to the private sector (essentially a redistribution), or new enterprises are encouraged to enter the seed market. I believe this latter approach

will be the more fruitful and I shall consider in a later section how to encourage and assist that process. These new enterprises may take over some existing market share from public sector suppliers, but hopefully they would also increase the total market for quality seed through their promotional and distribution activities.

Special problems associated with low-value crops

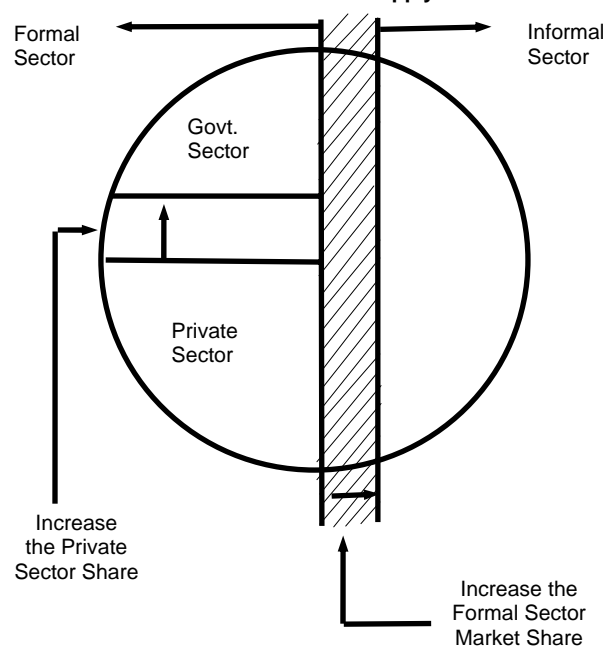
The purpose of this paper is to focus on the difficult crops which are relatively unattractive to the private sector. It is useful to consider in a little more detail the actual nature of these problems and why farmers are reluctant to buy these seeds. As is so often the case in seed technology, this is the result of an interplay between technical and economic factors, the most important of which are as follows:

- Seeds of cereals and legumes are available within the community as grain and all farmers are therefore aware of the grain price, which is nowadays usually a free-market price. That provides their point of reference in assessing the price and value of seed.
- Typically these seeds are quite large and are used at high sowing rates so the cost of transport soon becomes a significant element in the total cost. Even movement over say 50 km to and from a processing centre may add a significant cost. It follows that the benefit obtained from such transport and processing must exceed the cost, but in many cases this is difficult to demonstrate.
- These seeds are normally relatively easy to store because they are part of the traditional agriculture of the region. Rice is a good example, being tolerant of humid tropical conditions which are unfavourable for seed storage. In contrast, wheat, which has been introduced into some tropical regions, is much more difficult for farmers to store safely.
- In self-pollinated crops, genetic deterioration is slow between generations and farmers may see little difference in crops grown from certified seed, unless their own stocks have become seriously contaminated.

For all these reasons, farmers will critically assess the costs of buying in seeds and the benefits they may expect to obtain. This is a separate issue from the choice of variety. A farmer may use an improved variety but may keep it within the farm/household for many years without feeling the

need to renew the stock. There is no doubt that a good farmer can do this quite satisfactorily for many seasons. It is equally true that the seed stock may be ruined at any time by contamination, pest attack or poor storage conditions. This is why it is impossible to generalize about the recommended replacement rate for seed, that is how often the farmer should purchase a new stock, and what additional yield advantage may be expected from using certified seed.

Figure 2 Methods for increasing the private sector contribution to total seed supply.



While cereals are the most important crops in this category, the special problems of grain legumes should also be mentioned since the various beans and peas are important sources of protein in rural communities, and of course groundnut is a major oilseed in many countries. In general, the legumes suffer all the same problems listed above, but with some special features of their own. For example, the large-seeded beans are very prone to mechanical damage during handling or transport and some are also very prone to insect attack. These are problems which apply in any supply system, formal or informal. Soybean is notoriously prone to physiological deterioration in storage and may demand special production, storage and distribution techniques to ensure a reasonable seed quality. Groundnut is one of the most difficult crops of all to handle in an organized system, due to its large seed bulk, high

sowing rate and susceptibility to damage once it is removed from the shell.

How to increase the demand for seed supplied by the private sector?

When seed production is undertaken by government organizations, there are usually subsidies which mean that the sale price of seed does not reflect the true production cost. However, that clearly cannot apply to private companies which must cover all their costs in the sale price and are therefore concerned with the efficiency of all their activities. Quality control, likewise, is often provided as a free or subsidized service by an official agency. The future of such services, and especially their financing on a regular basis, is being increasingly scrutinized by governments.

If we accept that in the future the seed market will not be distorted by subsidies, then it must be driven by real demands from the farmers. The real costs of production will have to be covered by the sale price and farmers will purchase seed only if they expect the benefits to exceed the cost. Despite the well-known strengths of the private sector in marketing, it is doubtful whether aggressive promotion will have a substantial effect on demand if the benefits claimed are not actually realized in practice by farmers. In other words, pressure whether by government agents or commercial salesmen will (thankfully) have little effect on naturally cautious farmers. The purchase of seed will have to be justified on its true merit and value to the farmer.

There are only two general approaches by which regular seed purchase can be encouraged in these crops - by reducing the production cost to a minimum and by ensuring the highest possible quality. We know that seed quality has many components but the most important are the potential to achieve good crop establishment, which is mostly a function of germination, and the genetic characteristics/purity of the variety. Ultimately these are issues of technology, economics and management. We know how to produce seed of high quality; the question is can this be done on a large scale and at a moderate cost?

Regular purchase was referred to above - but what does that mean? There is no expectation that farmers will buy seed of these staple crops every year. The significant point is that farmers see sufficient benefit from purchased (certified?) seed to replace their stock from time to time. The problem

however is that such purchases are, by definition, unpredictable. After a poor harvest, there may be a shortage of grain and many farmers may hope to buy seed. If the harvest has been good and there is plenty of high quality grain left in store, they may expect to use some of that for sowing. Again this opportunity to convert grain to seed has a fundamental impact on the market.

Another reason why farmers purchase seed from the formal sector is to obtain a stock of a promising new variety. This can create a significant demand for a short time as the more innovative and richer farmers purchase. However, once the variety has diffused into the local system, and its usefulness has been confirmed by farmers, such a new variety can be obtained through the informal sector.

How to reduce the costs and improve the efficiency of production?

In considering production costs, it is possible to generalize and to use experience from quite different countries because the essential elements and costs of seed production in these self-pollinating crops are similar in virtually all situations. They are as follows: producing the seed - usually through contract growers; careful handling, drying and storage after harvest; transport to a processing centre; mechanical processing to improve quality; laboratory testing to check quality; storage costs and losses; packaging to provide a sealed, identified unit for sale; distribution to sales points; and sales - usually through agents who receive a commission.

These are all direct costs which are necessarily incurred in producing seed of known quality. In addition, there will be some overheads costs such as: management/administration and financing of the entire operation; and depreciation on equipment and fixed assets such as stores.

This is not a complete list and a much more detailed analysis of these costs is possible but they are all essential cost elements in an organized seed production system. If each cost element adds between 5 and 10% to the basic cost, then the seed offered for sale must cost at least 75% more than the grain market price, which farmers use as a point of comparison. In fact, a figure of about 100% is more realistic in many situations, i.e. certified seed costs twice the price of grain.

If we look for economies of scale, then the only major opportunity lies in larger processing plants which, in theory, could have lower overheads.

However, that benefit is usually offset by the extra cost of transport required to the processing plant since a larger plant automatically implies a larger production and distribution area. In fact, transport costs are usually a significant cost element, especially if the local infrastructure is not good. To reduce the average distance and cost of transport requires more and smaller processing centres, but obviously they must still have some minimum facilities and throughput otherwise the management overheads become too high. Despite the attractions of small-scale units, they do raise other problems because it may be more difficult to maintain regular quality assurance.

The routine management of processing centres must be of a high standard to avoid wastage, for example in the disposal of unsold seed as grain. It is also essential to use labour effectively. The seasonal nature of seed processing and marketing means that it is very costly to maintain the full staffing requirement throughout the year and it is common practice for companies to take on temporary staff to cover the peak labour demands. These related issues of throughput, capital investment and close managerial supervision in processing units, are crucial in the organization of an efficient formal sector supply, and they are often lacking in government controlled organizations.

One alternative approach to the processing centre is to have a mobile processing unit mounted on a truck, which visits locations and cleans seed on site. These machines are widely used in the UK to clean farmers own seed, but they have not yet found a significant role in developing countries.

To summarize, if the full cost of seed production has to be covered in the sale price, then the component costs have to be cut to an absolute minimum by efficient management and adoption of an appropriate scale of operation. These commercial realities have been neglected for many years when governments or projects simply covered these costs out of a general budget. This in turn removed the incentive for efficiency and that is one reason why transferring existing government enterprises to the private sector can be painful!

How to provide quality assurance for purchasers?

There is a clear link between cost and quality in the mind of the purchaser. Since quality in seeds has several distinct components and is virtually

impossible to assess visually, farmers will make an overall judgment of the cost/value of seed based mostly on their previous experience. The problem in the case of these self-pollinated grain crops is that there is little mystique about seed production which can be exploited to assist marketing. Farmers naturally make a comparison with the grain they have produced themselves.

Because of the characteristics of seed as a product, quality assurance assumes a special significance as an aid to marketing. The concept of seed testing has been established for well over a century and seed legislation was one of the first examples of consumer protection. It is also important to recognize that some internal quality assurance is essential for those who market seed in a systematic way as a business. Regardless of any legal requirements, there must be easy access to seed analysis to monitor quality at the time of seed purchase from growers, during processing operations, and in storage prior to sale.

The establishment of quality control facilities and procedures has been a standard component in national seed projects with the overall objective of supplying certified seed through the formal sector. However, the full implementation of these procedures can be technically and financially demanding and in practice seed certification agencies have often been given insufficient resources to do their work properly. As a result, certification has been brought into disrepute in some countries and farmers have lost confidence in the label.

The key problem which arises from privatization is that new enterprises entering the seed supply system may find it very difficult to establish the necessary quality control routines initially and may depend on outside support and verification. Thus, quality assurance is one of the most vital aspects of seed marketing but it may also be a major weakness for small enterprises. In view of this, it is necessary to consider the role of the existing seed certification services in supporting and perhaps advising the private sector about quality control, rather than simply controlling them.

What kinds of new seed enterprises can we expect?

Given the difficult economics of seed production in these crops, it is clear that new enterprises cannot expect large profits. It is therefore necessary to consider who will enter the seed market and why. I

suggest that the main motivating factor will be the complementarity of seed to existing activities or products. These businesses may regard seeds as a means of diversification to spread risks and management costs or they may represent a vertical integration, intended to obtain more added value for their products. If seed activities form part of other businesses, they will at least gain some financial security. It will be more difficult to establish an enterprise as a specialist seed producer/supplier because the business then is vulnerable, for the reasons stated above, and particularly because of the fluctuations in demand. Some possible growth points for new seed enterprises are as follows:

- input suppliers (agricultural merchants) who wish to extend their product range,
- existing rural industries (eg. processors),
- larger farmers - who produce seed and market it themselves to neighbours,
- growers' associations in favourable production areas - for example, existing contract growers who want to market their own production directly,
- coops and farmers groups - producing on behalf of members,
- seed traders and merchants - extending into contract production and processing to provide a greater range of crop seeds to their clients or to reduce their costs,
- industrial organizations with rural interests.

If some of these new participants enter the seed market in the next few years and establish a secure business selling seeds, we may say that privatization has taken place. However, what is more important than the ownership by private business, is the commercial diversity this will create in the supply system. There is ample evidence in biological and agricultural systems that too much uniformity increases risk, since there is less flexibility to respond to changes in the environment. The same applies in the commercial environment and a diversity of suppliers, each with their own strengths and specialties, would be a more secure basis for the future development of the seed industry.

How to encourage new enterprises?

It is clear that those who consider entering the seed market will do so for a variety of reasons, but mostly to do with expanding their existing enterprises or extending their range of services. They will do so cautiously and they may need reassurance and

support in the early stages. How can government provide this? I suggest two possibilities, but others may be discussed during this meeting.

The inducement most favoured by the private sector entrepreneurs is that of financial incentives, such as grants or tax relief for setting up the business. Ideally, they would like the government (or a project) to pay for the start-up costs; this is understandable but in many cases unrealistic. Such schemes tend to be used by those who are already involved to subsidize the expansion of their businesses and there are many opportunities for exploitation. Access to loans at low interest rates for specific activities may be more likely to encourage new participants, especially if the loan conditions are clearly defined. There is a great interest in the development of small and medium-size enterprises (SMEs) in many countries and seed enterprises may be able to utilize these schemes. However, the basic problem of profitability still remains and it may be difficult to show sufficient returns on investment.

A different type of support is the provision of services to the private sector, especially those which they may find the most difficult to create themselves. The obvious example here is quality control, since it is most unlikely that small scale seed suppliers would have the necessary facilities or expertise for proper quality control in their early stages of development. It would therefore be a logical step for those companies to use the established government certification agency to check its seed crops and samples. Provided the overall standard of certified seed is maintained at a high level, this would have the additional benefit of being an aid to the marketing of the seed by providing independent quality assurance.

Of course this is not a new concept, it is exactly what certification schemes are supposed to do and indeed some such schemes were started by seed growers themselves in an effort to develop a quality image/guarantee for their products. However, that vision has often been lost and in some countries, certification is little more than an administrative ritual for seed produced by official government agencies, who are obliged to sell only certified seed.

If this idea were to be adopted, small private sector companies would use the certification scheme both to save the cost of investing in their own facilities and to support their own marketing through the use of the certification label. In these circumstances, the provision of these services at a subsidized rate could be a very valuable catalyst to seed enterprise development. The only problem is the opportunity

which always exists for malpractice and the risk this presents if the value of the certification label becomes degraded in the eyes of the farmers it is supposed to assist. Nevertheless, if the subsidies now so often put into production (to conceal the economic realities) were diverted into supporting quality control, they would make a very significant contribution.

Policy formulation by government

We are now familiar with the concept that the task of government is to create the right policy environment or framework, instead of being directly involved in production activities as was often the case in the past. The theory is that once that climate is right, the natural energy of the private sector will be released to take up commercial opportunities and thus satisfy the needs of customers.

I entirely support that idea and some of the points mentioned in this paper could form part of that policy, for example the removal of subsidies from production to avoid unfair competition and the provision of support services for the private sector. Two further points which are of crucial importance in this connection should be made.

First is the need for policy stability. Nothing is more likely to deter the private sector than the prospect of the government changing the rules for its own political purposes, for example, if the government were to introduce a subsidy on the seed it sells itself, thus undercutting private sellers. This has happened in some countries.

Second is the need for proper representation of the private sector in the policy making process. Most countries have a high level committee which manages the national seed program and policy. It is usually called a National Seed Council or something similar. The composition and effectiveness of this body varies greatly from one country to another. It may be active and powerful or relatively insignificant! However, such bodies have traditionally been composed of representatives from government institutions, who were there *ex officio*. Sometimes these are very large committees and many of the members are not actively involved in seed activities.

We must recognize that it is not always easy to represent the private sector properly. It often happens that a few influential farmers or businessmen promote their own interests through such representative bodies, but those interests and needs may be quite different from the small

entrepreneurs whom we wish to encourage. The best way to overcome this is to have an association of some kind which is responsive to the membership and represents their interests in discussions with government. Such associations are certainly not immune from domination by power groups but at least there may be a better prospect of democratic consultation.

What must the government continue to do?

Optimists may believe that the private sector can take over virtually every aspect of the organized seed industry and that may be true in high value crops or those in which hybrids dominate. However, there will be a continuing role for government in certain activities. For example, it seems probable that the government will remain the major plant breeder in self-pollinated crops, as it was in Europe until Plant Breeders Rights were introduced. The immediate downstream activities of variety maintenance and the production of basic (foundation) seed are also likely to remain a government activity to ensure that sufficient material is available to feed the later stages of the seed production chain.

Official agencies are likely to retain some responsibility for promoting improved seed in a general way through the extension services, although private companies will naturally assume responsibility for providing information to support their marketing at the point of sale. There is a real opportunity for collaboration between official agencies and the private sector in the organization of trials and demonstrations. For example, the extension service may organize the sites and invite the private sector to contribute materials and publicity.

Another function which the government may have to maintain is that of seed security to cope with emergency shortages. It is very difficult for the private sector to accept this responsibility because of the costs of maintaining stocks which may not in the end be utilized. The need for this function may of course vary between countries or areas depending on the risk of natural disasters.

Conclusions

Privatizing the seed supply in these self-pollinated cereal crops is not easy, as they do not offer an opportunity for large or quick profits. Furthermore, the disposal of existing parastatal corporations may also be difficult. However, there are

many opportunities for new participants to enter the seed market as an extension of existing businesses. This can create a much needed diversity in the supply system which will hopefully be more responsive to farmers' needs.

The greatest problem likely to be encountered by such enterprises is that of quality control and assurance, since that is technically demanding and specialized work. It is therefore appropriate for the government to offer quality control or certification as a continuing support to the private sector. The other important action that the government should take is to ensure that private sector interests are properly represented at the national level, that they receive equal treatment with those of the public sector and, above all, that the policy remains stable so that private businesses feel confident about making an investment in seeds.

Market Prospects for Upland Crops in India

*Praduman Kumar**

Introduction

Agriculture occupies an important place in India as it contributes nearly one-third of the gross domestic product. Two-thirds of the population are still engaged in it. The diverse agro-climatic conditions in India are conducive to growing tropical, subtropical and temperate crops. Upland crops comprising coarse grains, pulses, root and tuber (CGPRT) crops dominated the Indian agriculture in terms of both area and production till the mid-sixties. With the introduction of new seed-fertilizer based technology favoring wheat and rice in the mid-sixties, the production of upland crops underwent a continuous decline as all the research and development efforts were directed towards tapping the potential of this new technology. The ongoing economic reforms in India, international trade reforms and attempts to integrate the Indian economy with the global economy are likely to result in structural changes in India's farm economy. Upland crops and their products are likely to

become important in increasing farm income and in attaining balanced regional development. The specific objectives of the study are (i) to analyze changes in the domestic demand for major upland crop products; (ii) to arrive at the medium term demand projections for the major upland crop products; and (iii) to review/analyze domestic marketing systems, policies, export promotion efforts and suggest strategies for improving domestic market prospects and exports of upland crop products. The study covers the major UCPs (soybean, maize and cassava), the major staple foodgrain crop (rice), fresh fruits (mango, grape and apple), a fresh tuber crop (onion), processed fruit (mango pulp) and a vegetable (mushrooms) and cut flowers.

Domestic demand and market potential of UCPs

The upland crops, namely rice, soybean, maize and cassava constitute an important source of feed and staple food. Of these, soybean, maize and cassava are mostly used as feed and they constitute the major share in feed ingredients for dairy cattle, poultry and pigs in the world. However, in India, the share of these UCPs in total animal feed is only 12.4%, comprising 10.3% of soy meal, 1.1% of cassava and 1% of maize. The reasons for the lower share of these crops in animal feed in India vis-a-vis the rest of the world are: (i) maize and cassava are primarily grown by subsistence farmers who use them as staple food, (ii) most of the soy meal produced in India is exported, and (iii) the major components of animal feed in India are other UCPs. In light of the global importance as feed and staple food, these commodities are selected for detailed analysis of domestic demand and market potential. This section presents the production and utilization pattern, and domestic demand for these commodities. Most of the upland crops have been traditionally grown by subsistence farmers and therefore their products are directly used as human food. Some part of the produce is also fed to animals. This utilization pattern might have changed over time because of developments in crop technology and generation of a market surplus. Precise information on various uses of UCPs is, however, not readily available. Using FAO Food Balance Sheet data and other published information, we have generated utilization patterns of selected UCPs. In addition to this, marketing,

* Indian Agricultural Research Institute, New Delhi, India. This paper is extracted from Market Prospects for Upland Crops in Asia, Proceedings of a Workshop Held in Bogor, Indonesia February 25-28, 1997. Monograph No. 34, Bogor: CGPRT Centre.

processing and external trade performance of these commodities are also analyzed.

Soybean

Although soybean came to be commercially exploited in the mid-sixties, the lack of processing facilities severely constrained its production growth by depressing soybean prices which in turn adversely affected its area and production. Processing facilities were developed only in the eighties consequent to the introduction of various incentive schemes. While large scale processing results in economies of scale on account of higher oil recovery and lower per unit processing costs, processing of black soybean is still a problem. In this variety, the soy meal recovery is low and it also fetches a low price in the international market because of poor product acceptance with the consequential adverse effect on profitability of the industry. However, farmers still grow this variety because of its lower working capital requirement. Small quantities of soybean are retained by the producers as seed, food and feed and part of it is used as soy food (soya milk, nutrella, etc.). Some is lost in the process of handling. The remaining part is processed for oil and meal. While soy oil is chiefly used domestically, soy meal is largely exported with a mere 10% of it consumed domestically, as the price of soy meal is higher than those of its substitutes. The price of soy meal in the world market is high and exports have grown at an annual rate of around 26%.

About 77% of the production is demanded by the crushing industry to produce soy meal and oil, while seed, feed and soya food together account for 19%. By the year 2000 AD, the total demand for soy meal will be around 2.5 million tons which in turn will require about 3 million tons of soybean. Since only 77% of the production is available for crushing, the demand for soybean will be on the order of about 3.9 million tons by 2000 AD (Table 1). The demand for animal feed is expected to grow in the future and the use of soy cake as animal feed may increase if the prices are favorable (low). Exports of soy cake and soy meal have grown over time and are likely to grow in the future also. Since India enjoys a comparative advantage in Asian markets compared to European and Latin American markets on account of lower freight charges, much of our exports have been confined to these markets. A large export market exists in Europe where India faces stiff competition from American countries.

Research and extension efforts aimed at improving productivity, reducing the real cost of production, and developing suitable varieties for processing are essential to exploit this export potential. The future soybean development strategy should aim at strengthening linkages between production, processing and exports.

Table 1 Demand composition of soybean, India.

Demand Composition	Demand (million tons)		Share in Total (%)
	TE 1992	2000	
Soybean for crushing	2.103	2.987	76.56
Soy meal	1.745	2.478	63.53
Domestic use	0.227	0.348	8.26
Export	1.518	2.130	55.26
Soy oil	0.358	0.509	13.03
Seed, food & wastage	0.644	0.914	23.44
Total	2.747	3.901	100

Maize

Although maize is an important crop in India, the country does not occupy an important position in the world as a maize producer. Although a large number of private seed companies in the country are now producing hybrid maize seed, a large number of farmers continue to grow local varieties. Maize still remains a subsistence crop on account of the lack of demand for its non-food uses, despite the fact that maize is included in the government price support policy and the market prices for maize have generally been higher than its procurement prices. The processing industry is not well developed mainly due to uncertainty in the supplies of raw products of desired quality and their high prices. Manufactured feeds are also not very popular in India. Only 19% of the maize production is used for seed and processed products, while around 79% of the production is consumed as staple food and 2% as feed. By the year 2000, the demand for maize is expected to be around 10 million tons. Exports of maize have been quite erratic and confined mostly to the neighboring countries, Malaysia, Sri Lanka and Iran.

Cassava

The area under cassava has shown a decline during the last decade but this has been offset by increases in its productivity. The production of cassava has, therefore, been stagnant. Cassava markets are not well developed in the country and a major proportion of the produce is retained by the producers for self consumption. The feed manufacturers also do not use cassava as a main

ingredient in feeds although producers use dried cassava chips as cattle and poultry feed. However, cassava is processed into products such as starch, sag, glucose and dextrine. The demand for cassava by 2000 AD will be around 5.4 million tons (Table 2).

Table 2 Demand for cassava in million tons in India.

Demand Composition	TE 1992	2000	Share in Total (%)
Food	2.132	2.379	40.1
Industrial use	2.343	2.191	44.0
Animal feed	0.484	0.464	9.1
Wastage	0.363	0.368	6.8
Total demand	5.322	5.402	100

Rice

Rice is a major foodgrain of India constituting about 40% of the foodgrain production. India ranks first in the area under rice and second in production in the world but the productivity levels are very low. India is a major producer of the aromatic super fine basmati rice variety which commands a premium price in the international market. Although a fairly strong formal market for rice has been developed in India, a significant quantity of rice is still traded in informal village markets in several parts of the country. Recent efforts at globalization of the Indian economy have led to the abolition of quantitative restrictions on exports, minimum export prices and export licensing, thus giving a big boost to rice exports, especially to the super fine basmati varieties. Significant improvements are required to modernize rice milling to cash in on the world markets. While the manufactured use of rice is negligible in India, rice processing, especially of rice bran, is an important activity and the processed products are used as animal feed, edible oil and as raw material for industrial products.

In Table 3, the utilization pattern of rice reveals that around 87% of the production is used as food, around 12% as seed, other uses and wastage, while only 0.5% is used as animal feed.

Table 3 Demand for rice in million tons in India.

Demand composition	TE 1992	2000	Share in Total (%)
Food	63.54	76.98	86.7
Animal feed	0.35	0.50	0.5
Seed, other uses & wastage	9.38	11.37	12.8
Total Domestic demand	73.27	88.85	100

Given the high degree of export competitiveness of Indian rice, exports are expected

to improve significantly in the post-GATT era. Indian basmati rice exports have so far been confined mainly to Saudi Arabia, the United Kingdom, UAE and Kuwait, while the non-basmati varieties are exported to a large number of countries. It is estimated that the exportable surplus of rice from India is around 1.3 million tons per year. Infrastructural developments for efficient trade flows and quality improvements are important prerequisites for exploiting the vast potential of export markets.

Emerging markets of fruits and vegetables

India is a major producer of fruits and vegetables. Both the area and production of these crops have been steadily increasing since 1950. Rapid urbanization, changing lifestyles, increasing incomes and population and growing export demand potential have all raised the demand for horticultural products significantly. The domestic demand for fruits and vegetables during 1995 to 2000 AD is expected to grow at average annual rates of 3.97 and 3.64%, respectively. India is gradually emerging as an important domestic consumer and exporter of fruits and vegetables. There has been, in the recent years, a sudden spurt in the exports of fresh and processed fruits and vegetables, the environment for which has been made conducive by the recent trade policy liberalization and increased investments on horticultural development. However, the export commodity mix of fruits and vegetables is narrow with emphasis mainly on mango, grapes, onions, and mango pulp, all of which are highly export competitive.

Mango

India is the largest producer of mango in the world, with a 59% share in total world production. World trade in fresh mango forms an insignificant proportion of the world production (only 0.6%). India's share in the world mango market is less than 15%, but mango accounts for around 39% of the total fruit exports from India. Indian mango is moderately export competitive and in the last decade the quantity of mango exports has grown at an average rate of 7.8% per annum. In the near future, mango exports from India are likely to grow annually at a rate of 6.1 to 7.8%, and by the year 2000 the export of fresh mango is projected to reach 38 to 43 thousand tons. Around 95% of

India's mango exports are routed to the Middle East countries. Given the strong consumer preference for Indian mango, well planned export and commodity promotion programs can help the country to achieve a dominant position in the world market.

Grapes

Grapes occupy an important position in the exports of fresh fruits from India after mango. In the recent past, the quantity of grape exports has witnessed an annual growth rate of over 23%. Indian grapes are highly export competitive and India has been able to achieve a good market penetration with grapes currently being exported to about 30 markets. It is projected that by 2000 AD India will be exporting over 68 thousand tons of grapes. Currently, the Middle East, UK and South Asian countries are the main importers of Indian grapes with the UK and Bangladesh markets growing rapidly.

Apple

With 1.17 million tons of output, India accounts for about 2.7% of the world apple production. However, owing to the existence of a very large domestic market, India has not been very successful in exports of apples and its contribution to the world trade in apples is only about 0.15%. Although India exports apples to nearly 13 markets, major exports go to the neighboring countries, Bangladesh and Sri Lanka. These two countries together account for 99% of India's apple exports. It is expected that India will not be exporting more than 12 thousand tons of apples by the year 2000.

Onion

Onion is one of the most important horticultural products of India, forming 87% of the country's export of fresh vegetables and 33% of the export of horticultural products. India is the world's second largest exporter of onions with a market share of 13.6% in 1992-93. Since 1980, India's onion exports have grown at an annual rate of 4.9%. By the year 2000, onion exports are expected to reach 490 thousand tons. India's exports have been mainly confined to the neighboring South East Asian countries and a few Middle East nations. The UAE, Bangladesh, Malaysia and Sri Lanka are the major importers of Indian onions together accounting for around 75% of the country's onion exports. There is considerable scope for increasing the exports of dehydrated onions from India, the demand for which

is growing at a rate of 7% per annum, into EC markets. India should take advantage of this by strengthening its processing facilities.

Mango pulp

The quantity of mango pulp marketed in the world market is estimated at 40 thousand tons and India is a major supplier of mango pulp, constituting about 10% of the total exports of horticultural products from India. Between 1982 and 1993, there was a phenomenal increase in the export of mango pulp from India due mainly to high acceptability and preference for Indian mango pulp in the international market. Future exports are projected to grow at an annual rate of 6.6% and by 2000 A.D. the exports are likely to reach 44 thousand tons. The exports are routed mainly to the Gulf countries with Saudi Arabia, Yemen Republic, UAE and Kuwait being the major importers. In Europe, the UK is the major market for Indian mango pulp. India is currently facing stiff competition from several countries in the world market which underscores the need for reducing the high cost of this product by selecting appropriate raw materials for processing and by increasing the processing capacity.

Mushroom

Mushrooms are a relatively new entry in India's export basket of horticultural products. The international trade in mushrooms is mainly in the canned form. Exports of mushrooms from India began to pick up only after 1990 with the setting up of export-oriented integrated projects for the production and export of mushrooms. India mainly exports preserved canned mushrooms of the white button variety. The USA and Canada are the major buyers which together account for about 99% of our exports. Indian mushrooms are highly export competitive. India has the advantage of cheap labour as mushroom production is highly labour intensive and the country has conducive agro-climatic conditions for mushroom production. India must diversify its markets and take a serious look at the world markets in order to benefit more from its comparative advantage.

Constraints to export of fruits and vegetables

India has relatively well developed markets and well established marketing systems for fruits and vegetables. Even the export marketing systems are generally well developed and free from government restrictions and regulations. To increase the income

of producers and to augment the exports of fresh and processed fruits and vegetables, India must attempt to reduce post-harvest losses through efficient processing and packaging, develop infrastructure facilities for quick handling and treatment of export consignments, and undertake research and development to produce large quantities of high quality products.

Poor infrastructure (in terms of storage, transport, cargo space, facilities at air/sea ports, vapour heat treatment, etc.), insufficient institutional support (credit arrangement, promotion of Indian fruits & vegetables overseas) and low research and development efforts (in terms of quality and productivity comparable to those in other producing and exporting countries) are the major constraints to the export of fresh fruits and vegetables.

The institutional arrangements for (i) widening the production base for exports, (ii) efficient post-harvest processing/handling and product promotion technology, (iii) supply of raw materials at reasonable costs, (iv) provision of adequate and timely credit, (v) creation of strong infrastructure, including uninterrupted power and water supplies, and efficient transportation system, and the provision of technical support and conducive labour legislation are prerequisites for high export performance and marketing.

Successful and failed marketing attempts

Some case studies relating to both successful and unsuccessful domestic and export marketing experiences were undertaken for selected commodities. The relevant qualitative as well as quantitative information was obtained through field surveys by interviewing a cross section of representative farmers, traders, exporters, bankers, and policy makers. Based on results derived from these case studies and other market studies, efforts were made to identify the marketing constraints and comparative advantages and to develop appropriate strategies and policy packages to improve their market prospects. The case studies cover floriculture products (chiefly cut flowers), grapes, apples, onions, and also fresh and processed fruits and vegetables. Cut flowers, grapes and onions are commodities that India exports successfully. In the case of apples, India has not been very successful on the export front but has been quite successful in domestic marketing, while in the case of processed

fruits and vegetables products, India has succeeded neither in their export nor in their domestic markets.

Floriculture

India produces a variety of flowers including roses and gladioli which are currently in great demand in the international market. The agro-climatic conditions are very suitable for the cultivation of high quality flowers in India. Relatively cheap and abundant labour availability favours India with a distinct competitive advantage. The rapidly growing world markets for flowers are holding out adequate inducement for India to expand her production and exports of flowers. Moreover, India is an important source of cut flowers for the European market in the winter months when the supplies of flowers from Holland and Germany are considerably reduced. These factors, coupled with the government's favorable policies in recent years have contributed to the success of India's cut flower exports. Exports are likely to grow to the tune of five billion rupees by 2000 AD.

Grapes

Various development programmes launched by the state/central governments have helped to increase the production and supply of grapes in India. Several varieties of grapes which are currently in demand in international markets are produced and exported from India. The entry of cooperatives such as MAHAGRAPE and NAFED, which have strived hard to establish a considerable infrastructure for exports, has helped to increase our exports and has also enabled the export of good quality products. Many growers are now growing grapes solely for the export market. The entry of cooperatives into grape exports and the cultivation of grapes solely for the export market are the factors largely responsible for the success of grape exports from India.

Onion

Onion exports from India are channeled through NAFED, a national level cooperative organization. NAFED has been able to establish markets for Indian onions abroad as it takes sufficient care to ensure export of good quality produce. The storage and grading facilities created by NAFED have helped to promote and ensure quality. Realizing the need for quick handling of export orders, NAFED has established large scale facilities for grading and packaging in order to

quickly handle the consignments. Since NAFED is both a channeling agency and an exporter, it has an information advantage.

Apple

India has not made much headway in the export of apples as its apple industry is not export-competitive and the efforts were largely concentrated in expanding the domestic market. Moreover, India lacks suitable varieties of apple for export markets and the proper quality control measures as well. India has not been able to do well in the export of apple despite achieving a large production of apples in the country. The main reason for this poor performance in export marketing is the existence of a large domestic market for apples. Aside from HPMC, there is no other organized cooperative marketing organization involved in the export of apples. This is particularly necessary as most of the orchard owners are small and are not in a position to export individually. Coupled with this, the absence of suitable varieties of apples for exports and the lack of proper quality control measures have hampered the growth exports from India.

Processed fruits and vegetables

Despite being the second largest producer of fruits and vegetables in the world, India has not, in general, done well in the export as well as in domestic marketing of processed fruits and vegetables. One important reason for this is that commercial processing of these commodities is highly limited and costly. This leads to considerable wastage of these commodities. The absence of exportable varieties of many of the potential products is another reason. The country has concentrated more on the exports of traditional processed products like pickles and chutneys and much less on the exports of pulps and juices which are currently in great demand in the international market. Most of the processing units are concentrated in the home, cottage and small scale sectors. Very few processing units fall under the category of large scale units. The location of processing units at long distances from the producing centres is an important factor contributing to the high cost of the finished products. Even in terms of export markets, the country has concentrated on a few neighboring countries and the Middle East at the expense of European and other western markets which can yield better unit values. Perhaps the main reasons for this failure are the lack of promotional efforts for our products in the world markets and the high cost of processed products in the domestic market.

can be a viable alternative to private trade in both the domestic and export sectors.

Policy implications

- Export quotas and the system of minimum export prices should be abolished. Exports and imports of rice and coarse cereals should be dechannelled. The Essential Commodities Act should be amended to allow the trader/exporter to hold larger quantities of grains. The rice milling industry should be delicensed and removed from the reserved list of small scale industries. Bulk storage and handling facilities should be developed/improved at procurement centres, rail heads and ports by encouraging private investment.
- Maize has greater potential as an export commodity and poultry feed among the coarse cereals. Investment in irrigation and research and extension efforts should be increased to augment the maize yield in dryland areas.
- The future strategy for soybean development should aim at strengthening the linkages between production, processing and exports.
- Land use and credit policies should be oriented to encourage the growth of fruit and vegetable commodities by inducing large scale cultivation and processing operations as well.
- Since there is limited scope for increasing the area under cultivation, it is essential to promote improved cultural and management practices to increase productivity levels.
- Many existing orchards are in a state of neglect and need to be rejuvenated through scientific methods and management.
- To augment the supply of vegetables, there is a need to promote the cultivation of off-season vegetables. Suitable areas need to be identified and both research and extension efforts should be intensified for this purpose.
- Adequate marketing support should be provided. Cheap and efficient transportation and storage facilities, including cold storage chains, must be made available. Increased availability of institutional credit will support both domestic and export marketing.
- Co-operatives should strive hard to enhance the bargaining power of producers and they

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- Direct contact between producers and processing factories should be encouraged to ensure better prices for producers.
 - Location of processing centres in the producing areas will help to reduce transportation costs and transit losses, consequently making the processed products cheaper and more competitive in domestic and export markets.
 - For exports, especially of perishable fresh fruits and vegetables, special facilities for handling and despatch of the produce at air and sea ports need to be created. Both public and private sectors should be involved, but the government has to generate a suitable environment through its policy support.
 - The product characteristics demanded for the export markets are quite different from those demanded for the domestic markets. Also the export markets demand high quality products. Hence there is a need to undertake research and development not only to increase productivity levels but also to develop varieties with product characteristics which are suitable for export marketing and processing.
 - Packaging is one area which requires considerable attention. Proper packaging will reduce transit losses and help to maintain the quality of the product.
 - Branded products are preferred in the markets of developed countries as brand names are associated with certain quality characteristics. Thus, proper branding of products, especially for the export markets, needs to be encouraged.
 - Grading and sorting should be done at the production site.
 - Concerted efforts must be made to promote export of new commodities and products and to expand the export product mix. Exporting a large number of diversified products rather than relying on a few commodities will enhance export potential and hold on to the world market throughout the year.
 - Efforts must be made to tap a large number of international markets in the bid to expand and diversify India's export markets.
 - Export promotion is weak and should be undertaken by the private sector.
 - While many incentives have been provided to develop the domestic seed industry, efforts are required to encourage speedy multiplication and distribution of good quality seeds and planting materials.

CGPRT Centre News and Activities

Effects of Trade Liberalization on Agriculture in Selected Asian Countries with Special Focus on CGPRT Crops (TradeLib)

Upon arrival of the project expert on 28 March 1997, the TradeLib project started activity. In preparation for the planning meeting, a preliminary discussion with four senior agricultural economists from India, Indonesia, Pakistan and Thailand was held at the Centre 16-17 June 1997. At the meeting, the project implementation framework was critically discussed. The comments and advice will be included as input for the planning meeting.

The participating countries, China, India, Indonesia, Japan, Malaysia, Pakistan, Philippines, Rep. of Korea, Thailand and Vietnam, nominated their national experts (Nes), and a candidate for the post of regional advisor was selected.

A planning meeting assembling the Nes, the project expert and the regional advisor is scheduled to be held on 27-28 August 1997 in Bogor.

SUASA-2

For the project, Economic Assessment of Selected Resource Management Techniques in Marginal Upland Agriculture (SUASA-2), an interim meeting was held with the participation of the national experts of China and India at the Centre in March to discuss the detailed case study site specific work plans and common approach/methodologies to be applied in each participating country.

The draft reports of the case studies in the participating countries have been submitted by the four national experts (two for each participating country). They are now being reviewed by the Centre project expert, Mr. Min Jae Kim. He is going to visit the participating countries with Dr. Kedi Suradisastra, the Program Leader of Research and Development, in late September and in late October, to discuss the problems and questions found in the draft reports with the national experts.

Announcements

International Symposium on Agro-Environmental Issues and Future Strategies: Towards the 21st Century

May 25-30, 1998, Faisalabad, Pakistan

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Regenerative Agriculture for the 21st Century

**Rodale Institute, Kutztown, PA, USA
October 28-31, 1997**

The Rodale Institute, which for three generations has been making the vital connections between healthy soil, healthy food and healthy people, announces the opportunity for interested individuals and institutions to participate in the first

of its Natural Resource Management Training Series.

The purpose of this training is to familiarize emerging professionals in the fields of agriculture, international and community development, and natural resource management with concepts of regenerative agriculture technologies that recognize the interdependency between agriculture, human health and environmental responsibility. Since many of the solutions to the world's health problems are linked to our agricultural production and distributions systems, a new agenda for food and agricultural development is needed, one for a "greener revolution" directed at increasing the production of nutritionally adequate food supplies in ways that protect and maintain community health, socio-economic environments, and ecological sustainability.

For more information, please contact:

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CGPRT Centre

The Regional Co-ordination Centre to Research and Development of Coarse Grains, Pulses, Roots and Tuber Crops in the Humid Tropics of Asia and the Pacific (CGPRT Centre) was established in 1981 as a subsidiary body of UN/ESCAP.

Objectives

In co-operation with ESCAP member countries, the Centre will initiate and promote research, training and dissemination of information on socio-economic and related aspects of CGPRT crops in Asia and the Pacific. In its activities, the Centre aims to serve the needs of institutions concerned with planning, research, extension and development in relation to CGPRT crop production, marketing and use.

Programmes

1. Research, which entails the preparation and implementation of studies covering production, utilization and trade of CGPRT crops in the countries of Asia and the South Pacific.
2. Training of national research and extension workers,
3. Information and documentation which encompasses the collection, processing and dissemination of relevant information for use by researchers, policy makers, and extension workers.

Palawija News

Contributors are invited to submit concise summaries of significant social research related to CGPRT crops for publication. Figures (graphs or tables) may accompany the article. All articles are subject to editing to meet space limitations.

Please send all queries relating to articles in *Palawija News* to Publications Section, CGPRT Centre, Jalan Merdeka 145, Bogor 16111, Indonesia.

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