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# ***PALAWIJA***

# ***NEWS***



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## **Integrating Seed Systems for Annual Food Crops**

### **Preamble to Workshop Proceedings**

*H. van Amstel\**

Seed is an essential element of any crop production system. For most plant species, it is the means by which crops are regenerated. It is also the vehicle through which genetic improvement is introduced and crop performance can be maintained.

### **Informal seed system**

Until recent times farmers were basically self sufficient for seed. Apart from occasional calamities and infrequent seed exchange with other farmers, they produced their own seed by selecting part of their harvest to plant their next crop. By selecting seeds and seed parents, they were also involved in crop improvement. The domestication of many wild species, and the existence of a large number of traditional varieties testifies to the ability of ancient farmers to model crops to their specific requirements. There is ample evidence that they did so by selecting desirable individuals as parents for the next generation. This traditional or informal seed (supply) system still functions in all or most developing countries. It is characterized by:

- Lack of functional specialization. Few if any farmers depend for their farm income on seed production, and farmers mostly are self sufficient for their own requirements;

- New varieties spread primarily through diffusion (farmer-to-farmer). As far as seed is traded at all, this is done by local traders not specializing in this commodity;
- Varieties developed by farmers or just multiplied by them are never pure (homogeneous). It is not always clear whether this heterogeneity is maintained deliberately. However, this character does provide crops with the necessary yield stability and in time and space that is of primary importance to many smallholders; in the course of repeated reproduction, varieties can change, adapting to changes in the environment or to changes in farmers' selection criteria.

Until early in the nineteenth century such simple seed systems were the only ones in existence. However, since then a new development took place in Europe and the U.S.A. in conjunction with the development of modern agriculture. A number of farmers started to select individual plants, mainly cereals and potatoes, to produce pure line varieties with superior performance. They also undertook multiplication of their selections and started small, local seed companies.

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\* Team Leader, Palawija Seed Production and Marketing Project, Jakarta, Indonesia.

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## **Development of the formal seed system in Europe and the U.S.A.**

By the end of the 19th century breeding and seed production began to develop as a specialized enterprise, separate from farming. Seed trading developed accordingly, soon followed by nationally organized seed quality control and seed trade. At the same time, breeders started to demand remuneration for the use of their varieties in seed production, and local protection of their exclusive right to this use.

Thus, gradually a framework of national seed laws and regulations developed that determined the structure and functioning of the national seed industry. This formal seed (supply) system has the following characteristics:

- The relatively few varieties multiplied for trading are homogeneous, and trade regulations require that their characteristics are kept constant over many reproduction cycles. These varieties generally are not as well buffered against a fluctuating environment as traditional varieties are, but they are more responsive to favorable growth conditions.
- Farmers depend relatively strongly on external seed supply instead of using their crop as the source of seed for their next planting.
- Breeding, seed production and seed trade are institutionalized and seed trade is subjected to national seed laws and regulations.

The modern private seed industry, operating in the formal seed system, is entirely profit oriented. The industry is strongly market oriented, and generally the varieties it develops meet the farmers' requirements.

There are second thoughts about the relation between the seed industry and farmers, however. For example, there are serious doubts whether, for some crops at least, the development of expensive hybrids is really in the farmers' interest. The interests of seed producers and farmers do not always run parallel. The high genetic purity of modern varieties is not pursued for the direct benefit of the farmer, nor are the present high seed quality standards likely to bring him any profit. These cost increasing quality standards rather came about as the joint result of seed certification and plant breeders' rights schemes. The recent attempts by seed companies to deny the "farmers' privilege" i.e. farmers being allowed to produce seed from their own crop without paying royalties to

the owner of the variety, point at another conflict of interest between farmers and the seed industry.

## **Development of national seed industries in the Third World**

The Green Revolution was based on the introduction of high yielding external input responsive varieties, in particular of wheat and rice. In the seventies and eighties large donor funded national seed programmes were set up to produce the large quantities of seed needed to introduce the new varieties. These seed programmes established a public formal seed sector, to some extent modeled on that of the modern seed industry in developed countries. The current model in developing countries, if one is allowed to generalize, is adapted to conditions vastly different from those in the developed countries. Nearly without exception, the newly established national seed companies in developing countries are state enterprises with a strongly centralized organization and large scale, centralized production units. Lack of competition, lack of sufficient skilled management, bureaucratic procedures and control all contribute to excessively high unit costs of the seed produced, often as high as three times the grain price in the case of most crops. Since farmers are usually not prepared to pay more than twice the grain price, there are pressures on governments to support the national seed programmes and their sales targets, usually fixed at an unrealistic high level.

To exacerbate this problem, actual demand for seed from the public seed companies turns out to be far less than forecasted by project studies. A major reason for this would appear to be that government employees and farmers hold different opinions on the benefits of improved varieties and the use of certified seed. This is true for many self-pollinating food crops, in particular where these crops are grown under sub-optimal conditions.

During the last decade, governments have come under pressure to practice stricter budget control and to abandon many subsidies, including those for seed. After the fashion of the time, donors and recipient governments now emphasize privatization of the national seed industry as a panacea to reduce seed costs and increase the circulation of certified seed. Although commercial seed companies will undoubtedly accomplish the

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## **Message from the Director**

### **Visits to Jakarta embassies of partner countries**

Recently I visited embassies of ten partner countries located in Jakarta, namely, those of Papua New Guinea, Pakistan, India, Bangladesh, Sri Lanka, Myanmar, Vietnam, Philippines, Republic of Korea, and Thailand. I met and talked with the ambassadors and officers there.

The primary purpose of my visits was to become acquainted with them and to introduce the CGPRT Centre to the members of the Governing Board of the Centre. It is quite natural to keep good contact with them, because we are located close to Jakarta.

I talked with them about the Centre's activities, the 52nd session of ESCAP, current and future programme activities, the way of future collaboration, and so forth. I found that all of the ambassadors were very pleased that we made contact. All of them were enthusiastic to discuss the importance of agriculture in their countries and eager to participate in the Centre's activities.

### **Project proposals for 1997**

The Centre submitted three new project proposals to ESCAP for approval for 1997. They include very challenging subjects. We hope for early approval of the proposals and timely funding.

The project titled *Effects of trade liberalization on agriculture in selected Asian countries with special focus on CGPRT crops* aims to provide: (i) a clear picture of the present situation and future prospects of the rural economy in selected Asian countries in the process of trade liberalization; (ii) options for improving incomes and adaptability of farmers; (iii) options in policy planning and research; and (iv) information relating to trade liberalization and adjustment.

The project titled *Hands-on training in database management and application relating to CGPRT crop development in South Asia* aims to provide: (i) in-country hands-on training in setting up and managing a cost-effective PC network; and (ii) enhancement of the capacity and efficiency in data management and use in agricultural policy planning and research for CGPRT crop development.

The project titled *Development of concept of a dynamic atlas of Asian agriculture* aims to: (i) create the concept of a regional dynamic atlas of Asian agriculture; (ii) explore of seasonal dynamics of Asian agriculture; (iii) transfer the concept and methodology to the Centre's partners; and (iv) initiate sub-regional activities and strengthen programme and project monitoring and implementation.

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first, they may be less successful in accomplishing the second. Being profit oriented, commercial seed companies can not attempt to supply the entire market and usually show little interest in the development of varieties and seed supply seed of food crops. It is likely that public participation in the seed sector will still be required to supply to the least profitable market segment. This means that, if one manages to successfully privatize part of the seed business, the remaining part will depend even more strongly than before on public support.

### **Integrated seed systems**

There is now a growing awareness that the formal system as such (the legally prescribed adherence to defined quality standards) may not be able to solve the problem of availability of quality seed. In a broad effort to modernize agriculture, many governments realize that the formal system depends on the potential of the traditional, informal seed systems. These are well adapted to the local seed requirements for annual food crops produced under variable conditions. The current seed supply relies on simple technology and low costs and can

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provide seed at a low price, with a low entrepreneurial risk. The current systems may need to be strengthened, and links with centralized seed certification may be established. It has become clear that the formal seed system needs to be linked to the current seed supply systems in order to function optimally.

The development of such integrated seed systems requires adaptation of technology, a flexible seed legislation and regulation, wise enforcement, and institutional capacity. Farmers should be recognized as essential and active partners in seed system development.

*(This Preamble and the following paper are taken from CGPRT Monograph No. 32 Integrating Seed Systems for Annual Food Crops, Proceedings of a Workshop Held in Malang, Indonesia October 24-27, 1995.)*

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## Seed Sector Development in Bangladesh with Focus on Secondary Food Crops

Marjo J. A. F. Vervoorn (editor)\*

### Introduction

#### *General information on Bangladesh*

The population of Bangladesh is around 120 million, of which about 80% is living in the rural areas. The population density of 775 persons per km<sup>2</sup> is one of the highest in the world. Population growth has come down but there is still a continued growth of over 2.0% per year. This is a dominant factor in development issues of the country.

#### *Agricultural sector*

Agriculture continues to be a major sector in the economy contributing over 35% to the GDP. In recent years, the growth of the agricultural sector in terms of GDP increase has remained behind most other sectors with just over 2% growth in constant terms, as compared to a GDP growth of over 4% for the economy as whole. Within the agricultural sector, crops are outstanding in terms of contribution to GDP (28%), while forestry and livestock sectors each contribute between 2.5% and 3% to the GDP.

Slightly more than 60% of the total surface of 147,570 km<sup>2</sup> is used for agricultural purposes. This area, of about 9 million hectares, consists of alluvial plains which are farmed annually with a multiple cropping pattern. Cropping intensity in 1991/92 was about 172%. The average cultivated area per farming household is about 2.0 acres. Nearly 50% of the farming households own less than one acre while 10% of the rural households own no land at all.

#### *Cultivated area*

Rice is by any measure the most important crop, since it occupies 74% of the area under cultivation. It is grown successively in the summer season (Kharif-1, March to June), the rainy season (Kharif-2, July to October) and the dry winter season (Rabi, November to February). Crops grown in rotation are wheat, oil seeds, pulses, vegetables and potatoes in the winter season and jute and sugarcane in the summer season.

This paper focuses on the secondary food crops, tubers, oil seeds and pulses which contribute to almost 10% of the annual cultivated area.

#### *Seed replacement rates and seed sources*

The seed replacement rate is defined as the proportion of the cropped area which each year (or season) is supplied with fresh, purchased seed from recognized sources. The remaining seed is referred to as retained seed and includes seed retained in households, locally exchanged or bought on the local market, where grain is sold as seed. In Bangladesh, the average replacement rate for all crops is very low, only 5%, meaning that 95% is retained.

In 1994/95 the total estimated seed requirements for potato are 150,000 metric tons, for oilseeds 8,000 t and 23,000 t for pulses. Estimated replacement rates based on the available market supply, show no difference with the average for Bangladesh: 6% for potato, 3% for oilseeds (with exception for soybean and hybrid sunflower) and below 1% for pulses. Tables 1 and 2 illustrate the percentage retained versus purchased seed for the three crop categories, including the market shares of the public, private and informal sectors in 1994/95.

Two main factors influence these low replacement rates. The first factor is that the production and distribution of quality seed are insufficient to meet demand. Secondly, there is a

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\* Netherlands Technical Assistance Unit, Crop Diversification Programme, Ministry of Agriculture, Bangladesh.

lack of suitable improved varieties, especially for pulses and oil seeds. At present, the available improved varieties do not differ from current popular land races. As a consequence the adoption rate by farm households for those varieties is low. Only recently, over the past three years, have improved or HYV varieties for most of the crops begun to be released for multiplication and distribution.

The government of Bangladesh (GoB) is aware of the above mentioned constraints. With a view to overcoming these constraints, a National Seed Policy was formulated. It gives directions to the development of the public and private sectors for production of sufficient quantity of improved seed and for making it available to Bangladeshi farm households in sufficient quantity, with acceptable quality, at appropriate times and at a reasonable price.

In this paper, the main features of the seed policy are outlined. Then, the state-of-the art is presented of the public, private and informal seed sectors, highlighting the secondary food crops: tubers, pulses and oilseeds. The last chapter gives suggestions to further improve the interaction between the three sectors.

### National seed policy

The new National Seed Policy was drafted in 1989 and gazetted in April 1993. The overall purpose of the policy is to make the best quality seeds of improved varieties of crops conveniently and efficiently available to farm households with a view to increasing crop production, farm productivity, per capita farm income and export earnings. To achieve this purpose, the main strategy is to rationalize the seed sector by promoting the participation of the private seed sector in all stages of the seed industry from breeding to marketing of seed. In the past, the public sector had exclusive control. The main features of the policy, to arrive at a balanced development between the public and private sectors, are presented in Box 1.

However, the revised seed ordinance still has to pass the Parliament after which the MOA can approve the new seed rules. In the meantime, registration of seed dealers and varieties has started at the Seed Wing of the Ministry of Agriculture. This Seed Wing was created primarily to serve as a Secretariat for the National Seed Board (NSB). One of its main functions is to help

### Box 1 Main features of the National Seed Policy.

<p><i>Development and promotion of improved seed varieties</i></p> <p>The National Agricultural Research Institutions (NARS) will continue to pursue breeding programmes for the so called notified crops: rice, wheat, jute potato and sugarcane. However, special effort should also be made to evolve improved varieties for pulses, oilseeds, tuber crops, vegetables, fruits and other species.</p> <p><i>Liberalization of the release and import of varieties</i></p> <p>This opens a window for the private seed sector to become involved in the international seed market through contracts and joint ventures with foreign seed companies. Seed entrepreneurs are encouraged to undertake plant breeding programmes and are allowed to import breeder and foundation seed for variety development and promotion purposes.</p> <p><i>Variety registration and release</i></p> <p>New varieties of wheat, rice, jute, potato and sugarcane developed by the private and public sectors have to be notified by the National Seed Board (NSB). Developed or imported varieties of all other crops only have to be registered with the NSB, giving prescribed cultivar descriptions, but will not be subject to any other restrictions, such as testing and other procedures.</p> <p><i>Seed multiplication and processing</i></p> <p>The Seed Wing of the Bangladesh Agricultural Development Corporation will be restructured. In the future, the institution will concentrate primarily on production of foundation seeds of rice, wheat, jute, potato and sugarcane on its own farms. It will gradually cease to grow certified seed.</p> <p><i>Access to breeder and foundation seed</i></p> <p>Breeder and foundation seed of all varieties developed by the public sector will be made available to registered seed producers both in the private and public sectors for multiplication purposes.</p> <p><i>Availability of facilities and equipment</i></p> <p>With the restructuring of BADC, the excess facilities and equipment such as storage space, drying floors, dryers, and cleaning equipment will be made available on a lease basis to the private sector.</p> <p><i>Seed certification</i></p> <p>Only public sector breeder and foundation seed will be certified as a matter of policy. All other seed will be certified on a voluntary basis.</p> <p><i>Quality control</i></p> <p>Seed quality will be ensured by requiring seed packaging in labeled containers or packages. The seed quality has to meet the standards specified on the label.</p> <p><i>Seed distribution and marketing</i></p> <p>BADC's seed sale centres at sub-district levels (<i>Thanas</i>) will be phased out and replaced with a network of private seed dealers.</p> <p><i>Seed pricing</i></p> <p>BADC's seed prices should more closely reflect costs and subsidies should be phased out gradually to give private seed companies a fair chance to compete in the market.</p>
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Source: National Seed Policy 1993.

**Table 1A Seed requirements, market supply and replacement for tubers 1994/95.**

Crop	Area ( <sup>'000</sup> ha)	Requirement (tons)	Market Supply (tons)	Replacement (%)
HYV	71	106,684	9,115	9
IPV	46	45,580	280	1
Total/average	117	152,264	9,395	6

**Table 1B Seed requirements, market supply and replacement for oilseeds, 1994-1995.**

Crop	Area ( <sup>'000</sup> ha)	Requirement (tons)	Market Supply (tons)	Replacement (%)
Groundnut	37	3,740	62	2
Rapeseed/mustard	339	2,710	133	5
Linseed	75	1,125	2	0
Sesame	83	660	-	0
Soybean	2	120	58	48
Sunflower*	1	9	11	100
Total/average	537	8,364	267	3

\* Average hybrid and composite

**Table 1C Seed requirement, market supply and replacement for pulses, 1994-1995.**

Crop	Area ( <sup>'000</sup> ha)	Requirement (tons)	Market Supply (tons)	Replacement (%)
Grasspea	240	5,927	-	0
Lentil	213	7,442	21	0
Chickpea	101	4,036	22	1
Blackgram	79	2,361	4	0
Mungbean	60	1,785	13	1
Fieldpea	19	1,502	-	0
Total/average	710	23,053	60	<1

Sources: For area: Monthly Statistical Bulletin of Bangladesh 1 July 1993, Bangladesh Bureau of Statistics;  
for market-supply: Seed Industry Promotion Unit of the Crop diversification Programme, 1995.

**Table 2A Volume of market supply of tubers for the different sectors.**

Sector	1992/93		1993/94		1994/95	
<i>HYV</i>						
Public	6,530	100%	6,310	78%	6,415	70%
Private	-	0%	1,730	22%	1,940	21%
NGO	10	0%	-	0%	760	8%
Total	6,540	100%	8,040	100%	9,115	100%
<i>IPV</i>						
public	-		-	0%	-	0%
Private	-		69	35%	120	43%
NGO	-		130	65%	160	57%
Total	-		199	100%	280	100%
<i>Total tubers</i>						
Public	6,530	100%	6,310	77%	6,415	68%
Private	-	0%	1,799	22%	2,060	22%
NGO	10	0%	130	2%	920	10%
Total	6,540	100%	8,239	100%	9,395	100%

**Table 2B Volume of market supply of oilseeds for the different sectors.**

Sector	1992/93		1993/94		1994/95	
<i>Groundnut</i>						
Public	23	90%	37	97%	59	95%
Private	-	0%	-	0%	-	0%
NGO	3	10%	1	3%	3	5%
Sub-total	26	100%	38	100%	62	100%

**Table 2B (continued)**

Sector	1992/93		1993/94		1994/95	
<i>Rapeseed/mustard</i>						
Public	50	99%	87	99%	130	98%
Private	-	0%	-	0%	-	0%
NGO	1	1%	1	1%	3	2%
Sub-total	51	100%	88	100%	133	100%
<i>Sesame</i>						
Public	-		-	0%	2	100%
Private	-		-	0%	-	0%
NGO	-		-	0%	-	0%
Sub-total	-		-	0%	2	100%
<i>Soybean</i>						
Public	20	44%	30	27%	12	21%
Private	25	56%	80	73%	31	53%
NGO	-	0%	-	0%	15	26%
Sub-total	45	100%	110	100%	58	100%
<i>Sunflower</i>						
Public	-		2	48%	5	44%
Private	0	7%	3	52%	3	26%
NGO	2	93%	-	0%	3	30%
Sub-total	2	100%	5	100%	11	100%
<i>Total oilseeds</i>						
Public	93	75%	156	65%	208	78%
Private	25	20%	83	34%	34	13%
NGO	5	4%	2	1%	25	9%
	123	100%	241	100%	267	100%

**Table 2C Volume market supply of pulses for the different sectors.**

Sector	1992/93		1993/94		1994/95	
<i>Blackgram</i>						
Public	-	0%	4	100%	4	100%
Private	-	0%	-	0%	-	0%
NGO	-	0%	-	0%	-	0%
Sub-total	-	0%	4	100%	4	100%
<i>Chickpea</i>						
Public	13	100%	24	100%	22	100%
Private	-	0%	-	0%	-	0%
NGO	-	0%	-	0%	-	0%
Sub-total	13	100%	24	100%	22	100%
<i>Lentil</i>						
Public	-	0%	18	100%	20	97%
Private	-	0%	-	0%	-	0%
NGO	-	0%	-	0%	1	3%
Sub-total	-	0%	18	100%	21	100%
<i>Mungbean</i>						
Sub-total	-	0%	5	100%	13	100%
Private	-	0%	-	0%	13	100%
NGO	-	0%	-	0%	-	0%
Sub-total	-	0%	5	100%	13	100%
<i>Total pulses</i>						
Public	13	100%	51	100%	59	99%
Private	-	0%	-	0%	-	0%
NGO	-	0%	-	0%	1	1%
Total	13	100%	51	100%	60	100%

update the policies and plan strategies for the development of the seed industry, with special attention to promoting private sector seed enterprises.

### Status of the public seed sector

#### Variety research and development

The National Agricultural Research Stations (NARS) involved in the variety development of

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tubers, pulses and oilseeds are Bangladesh Agriculture Research Institute (BARI), Bangladesh University of Agriculture (BAU) and Bangladesh Institute of Nuclear Agriculture (BINA).

So far, the NARS have not directly collaborated with the private sector for screening of varieties which are commercialized outside Bangladesh. Therefore, the Crop Diversification Programme (CDP) of the MoA took up an adaptive research programme with the objective of testing varieties successfully commercialized in similar growing conditions to those of Bangladesh. Contacts were made with various organizations in India, Thailand, the Philippines, Australia, USA, Pakistan and Myanmar (Burma). Screening programmes have been implemented with various collaborators in the public, private and informal sectors during the last three years. The major conclusion of the programme is that the current commercial hybrids of maize and sunflower have significantly out performed the varieties released through NARS.

#### *Oilseeds*

Variety research in the field of oil crops has since 1970 resulted in the release of twelve varieties of rapeseed and mustard, five varieties of groundnut, four varieties of soybean, two varieties of sesame and one variety of sunflower. Despite this development, there remains a lack of suitable high yielding, short duration varieties which would improve the crop's financial competitiveness with other crops and facilitate its incorporation into the rice dominated cropping pattern. So far, none of the existing varieties is responsive to high doses of fertilization and irrigation. Six promising oilseed lines are expected to be released by BARI in 1996.

#### *Pulses*

Variety development of pulses has not been very successful so far. The research institutes have set priorities for varieties with high yield levels and good response to irrigation. However, due to lack of disease resistance under high input technologies and irrigation, whole crops have occasionally failed. Therefore, since 1971 only six varieties have been released, four by BARI and two by BINA. Eleven more are in the pipeline for release in 1995/96. The lack of suitable varieties is the underlying reason why pulses grown as a food crop in the dry winter season are being replaced by other crops such as rice, wheat and potatoes.

#### *Tubers*

The Tuber Crops Research Centre (TCRC) of BARI is the main public institution involved in the release of HY potato varieties. Through its initiative, an accelerated variety release system for modern potato varieties has been approved by the NSB. Between September 1980 and November 1994, fifteen varieties were released. Maintenance of indigenous potato variety (IPV) germplasm is taken care of by BAU. Considering the need for selecting and recommending more high yielding and consumer oriented sweet potato varieties, a variety screening programme was initiated at BAU during the 1994/95 dry season. Initially 30 local and exotic germplasm materials were collected from different sources.

#### **Production of breeder seed**

##### *Pulses and oilseeds*

Institutions involved in the breeder seed production are BARI, BAU and BINA. So far, breeder seed of pulses and oil seeds is supplied solely to the Bangladesh Agriculture Development Corporation (BADC). There was a shortage of breeder seed. In 1991, 1992 and 1993, when 51, 76 and 69% respectively of the breeder seed demand could be met. To achieve its area targets, BADC therefore had to upgrade its own purified foundation seed.

##### *Tubers*

HYV potato breeder seed is imported on a limited scale from the Netherlands. Imports have been reduced from almost 1500 tons in the early 80s, to 123 tons in 1995. The balance is produced under TCRC's own breeder seed programme (150 tons) and BADC's first stage seed multiplication activities (330 tons). Techniques used are clonal selection, tissue culture and rapid multiplication (stem cuttings). Of great concern is the maintenance of the quality standards of these early generations.

IPV breeder seed will be produced on a commercial basis by BAU and a few private companies and NGOs.

Hybrid true potato seed (TPS) is imported on an experimental scale through CIP India and looks promising for small scale, homestead based operations, as well as remote areas.

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## **Multiplication of foundation seed and certified seed**

### *Pulses and oilseeds*

The Seed Wing of BADC is the sole public institution involved in the production of foundation and certified seed of the pulses and oil crops. There are three foundation seed farms of 12, 20 and 10 hectares respectively.

For certified seed production, BADC has established contract grower zones in restricted areas around its seed processing centres. In these zones, the main bulk of certified seed is produced. The different schemes in the zones are selected by BADC staff. A lead grower is appointed by the growers in each scheme to co-ordinate the cultural practices and to keep liaison with BADC. However, agreements and distribution of foundation seed take place on an individual basis. Quality control through field inspections is carried out by BADC staff at three stages: after sowing, at early flowering and prior to harvest. During the harvest period, the seed price is set based on the prevailing market price plus a premium of 20 to 25%.

In Table 2 the volume of seed supplied of certified seed is presented for the last three years. The market share of BADC is nearly 100% (59 tons) for the pulses. Blackgram, lentil and mungbean were only recently taken up into the seed portfolio. In 1994-95, the market-share for oilseeds amounted to 78% (208 tons) of which rapeseed/mustard (130 tons) and groundnut (59 tons) formed the bulk. New Life Seed, a private seed company, takes more than half the share of the soybean 53% (31 tons). The small portion of sunflower (5 tons) is composite seed while the share of the private sector (3 tons) is imported hybrid seed.

### *Tubers*

Imported and locally produced breeder seed of HYV is multiplied into 1500 tons of foundation seed in two multiplications (F-1 and F-2). This takes place on one seed nucleus farm of BADC (F-1) and four additional seed farms (F-2).

The final multiplication into 6000 tons of certified seed takes place in 10 contract grower zones. Although the production per hectare is more than 17 tons (seed quality), BADC only purchases 10 tons per hectare. The balance (approximately 2000 tons) is sold by the growers as improved seed

to neighbours or cold store owners. This lateral spread system of high quality seed contributes considerably to the improved production of table potatoes.

IPV seed is only produced by several private seed farms and NGOs. The production of TPS hybrids is done on an experimental scale by TCRC. BADC and several private companies and NGOs take care of the tuberlet production.

## **Seed certification and quality control**

Quality control and certification are the mandate of the Seed Certification Agency (SCA). This agency is at present implementing a strengthening project with assistance of the Netherlands government, in order to enact the tasks and duties as described for the SCA in the new National Seed Policy. The FAO Quality Declared Seed System will be adopted for most crops. Certification on a voluntary basis for secondary food crops is not foreseen before 1997 (HYV potatoes) and 1998 (oilseeds and pulses).

### *Pulses and oil seeds*

Seed certification has so far played no role in inspection and certification of pulses and oil seeds. Also, breeder seed is not certified. The internal quality control at the foundation farms is implemented by the deputy director of the farm and its staff. The main constraints are at present the lack of uniformity and distinctive characteristics of some varieties. Most crops do not have clear varietal descriptions. Only recently has BADC started to treat breeder and foundation seed with seed dressing chemicals. Certified seed will not be treated because of fear that farm households may consume the seed. First an extension campaign should be launched to make people aware that the seed is treated and thus unsuitable for human consumption.

### *Tubers*

Internal quality control activities are carried out on a voluntary basis: fields of TCRC breeder seed production programme are visited by the future buyer, BADC and the private sector companies. BADC's Foundation and Contract Growers Certified Seed Programmes are under the supervision of a separate quality control section within the Tuber Crop Division. Final field inspection is done in collaboration with staff from TCRC and SCA.

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## Seed distribution and marketing

The certified seed is distributed from the processing centres to one of the 64 seed sale centres at district level. From here the seed is further distributed to the sale centres at the sub-district level. Since June 1993, in line with the National Seed Policy, BADC has been closing down these sub-centres, from the original 464 to 36 in July 1995. The idea is that these will be replaced by a network of private seed dealers. The regional centres would be developed as wholesale centres. There is reason to believe that the present distribution network of BADC and dealers is not sufficient to cover the whole country.

## Seed extension and promotion

The Department of Agricultural Extension (DAE) is the main party involved in seed extension. Improved varieties are demonstrated in a crop demonstration programme. Block supervisors (extension agents) form the main contact points for the farm households to get information on variety development. However, on average one block supervisor has to serve about 900 farm households with very little means. Not surprisingly, he is reaching very few households (about 3% according estimates of the World Bank). The bigger farms which also happen to be the early adopters are mainly visited. Moreover, as discussed before, there is a lack of suitable varieties released from the research stations. Superior varieties introduced by the private sector are not yet included in the crop demonstration programme, because, as a matter of policy, DAE demonstrates only varieties developed by the public sector. This will be changed with the introduction of the Seed Policy.

## Status of the private seed sector

There are two registered seed associations in Bangladesh: the Seedmen's Society of Bangladesh (SSB) and the Bangladesh Seed Merchants Association (BSMA). The latter is the oldest, and at present it has taken the lead role in the private sector organization associated with the seed industry development. Together, both associations have about 150 genuine seed members. The majority of these derive from the vegetable seed sector. It is expected that the seed market for secondary food crops will be developed mainly

through the existing network in the vegetable seed sector.

In line with the National Seed Policy, the seed associations will play an important role in communication between public and private sectors. For example, they are representing the private sector in NSB.

A joint assessment of the Seed Industry Promotion Unit (SIPU) of CDP and FAO indicated that there are possibly 1,000 to 1,500 permanent wholesale and retail seed dealers in the country. This means that only about 10% are members of one of the associations. In the future, to be able to make use of the benefits of the new Seed Policy, dealers will have to register themselves at the Seed Wing of the MoA.

There are two main constraints identified for private sector involvement in the production, storage and marketing for all crops and especially for the secondary food crops, namely marketing expectation and financing possibilities.

### *Marketing expectation of secondary food crops*

The present marginal rate of return as well as the uncertainty of the market imply that the seed entrepreneurs are very careful in investing in these crops. In the next section, the present involvement in the market for these crops is presented in more detail.

### *Financing possibilities*

In principle seed companies can register themselves with the Board of Investments and as such make use of several facilities like exemption of customs duties. The seed industry, being registered as an agro-based industry, may be financed by banks with loans up to 70% of the total equity. However, at present the banks do not accept that seed production, storage and marketing are agro-based industrial activities. The seed business is considered more as a trade activity. Therefore, most banks are reluctant to make credits available to potential investors. There clearly exists a need for sound seed business plans to convince the banking sector about the viability of the seed business. At present, seed credit norms are being established to provide directives for seed production of various crops. These norms are expected to support and stimulate the banks to assess the credit and finance level for any request on seed production or seed enterprise development.

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## **Private sector involvement in tubers, oilseeds and pulses**

Table 2 shows clearly that the private sector is only involved on a very small scale in the market of the secondary food crop seeds. Exceptions are HYV potato and soybean.

### *Tubers*

About 20% of the total production and marketing of HYV potato is taken care of by the private seed companies. This market share was achieved in only three seasons which clearly indicates that the crop is a profitable market product with a commercial demand.

Variety development of IPV started very recently at BAU, which also maintains a stock of breeder seed. In line with the National Seed Policy, BAU has linked up with a private seed company and a network of NGOs for multiplication and distribution.

### *Oilseeds*

Private sector involvement for these crops is limited to soybean and sunflower. Actually, one single company, New Life Seed (NLS), takes the main share of the market (over 50%). NLS originated from an international NGO and is involved in all stages from variety development to seed marketing. Private interest is also mounting for hybrid maize.

### *Pulses*

The actual marginal rates of returns, the non availability of suitable varieties and the easy storability of these crops make them less attractive for private entrepreneurs. Therefore, not much private interest is expected for these crops in the near future.

## **Status of the informal seed sector: traditional seed systems**

The informal seed sector is defined as the seed production and trade, which is not institutionalized, of purchased (improved) varieties. This may involve groups of farm households producing seed for their own use as well as selling seed to surrounding farm households or local seed dealers. In this context, the traditional seed system stands for the seed production and trade of retained seed.

Seventy percent of farm households own less than one hectare of land out of which 50% have less than one acre (0.4 hectare). Therefore, the majority of the households belong to the category of small and marginal farmers. Leasing land or sharecropping are common systems. Estimates indicate that about 35% of all households are cultivating land that is not their own. The dominant rice cropping systems are low-input subsistence systems. Secondary food crops are planted in the winter season and have to compete with the winter rice (*Boro*) and the wheat crop.

As mentioned earlier, seed replacement rates are low, on average about 5% for all crops. Secondary food crops are no exception. The low replacement rates mean that the majority of seed is farmers' retained, farmer-farmer exchanged or traded on the local market where grain is sold as seed. At present, there are no actual data available about the seed flow in the traditional seed systems.

Low replacement rates may be the result of low input use and risk avoiding behaviour of the subsistence farm households. However, it is assumed that even resource-poor households would be willing to pay for good quality seed and improved varieties if this were profitable, in other words giving more yield or financial income. As mentioned before and illustrated in Tables 1 and 2, the two underlying main reasons for the dramatic low replacement rates are the lack of suitable varieties (pulses and oilseeds) and the low volumes of improved seed on the market (potato, oilseeds and pulses). A third factor is the lack of information about new varieties. Most of the resource-poor households are not reached by the existing extension network.

The National Seed Policy aims at privatization of the seed market. However, for the secondary food crops this market is small and dominated by the public sector. The private sector still has to develop. To bridge the gap between the withdrawing public sector and the developing private sector, an important role is foreseen for the informal seed sector to become involved in the production and distribution of improved varieties and quality seed at the grassroots.

## **Role and experience of NGOs in the seed sector**

Bangladesh has a dense network of NGOs. There are about 900 NGOs registered with the NGO bureau. However, estimates indicate that

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when all smaller non registered groups of local clubs, charitable societies and other voluntary organizations are taken into account, the network consists of about 6000 NGOs.

The network started to develop after independence in 1971. Initially NGOs were involved in relief and rehabilitation programmes helping the government with returning refugees who had taken shelter in India during the war of independence. During the early seventies, they became involved in integrated rural and community development activities of which agriculture formed a major component. In the late seventies, most NGOs realized that their approaches mainly benefited the local elite. Therefore, more and more NGOs shifted from community development towards a target group approach. Homogenous groups of poor people with similar economical interest were selected to participate mainly in income generating activities. Although NGOs may differ from each other in style and emphasis, they all follow similar trends. They carry out social awareness programmes, group formation activities, formal and informal training courses, saving and credit programmes.

Since NGOs have a network of organized rural groups and well-developed training and credit facilities, they are considered an important vehicle for developing the informal seed sector. The role NGOs are assumed to play includes distribution of quality seed and improved varieties, organization of certified seed production, and promotion of new varieties and the use of quality seed. If seed activities are being developed, they may also, as a next step, become involved in variety screening.

Basically there are two ways for NGOs to follow: either they develop into a local seed enterprise as in the case of New Life Seed, or they assure their role as an intermediate between seed grower groups and seed companies and between seed customers and seed suppliers.

The Netherlands Technical Assistance Unit of the Crop Diversification Programme (CDP) has initiated seed activities on an experimental basis with five selected NGOs. The seed activities are focused on secondary food crops and include training and demonstration programmes on seed production. Criteria applied to select the NGOs were the following. The NGO should have:

- operational field crop activities;
- a group and programme infrastructure to reach poor households, including female members;

- prior experience in commodity production and/or marketing;
- a sound credit programme linked to agricultural activities;
- willingness to operate the seed programme on a non-subsidized basis.

Lessons learned so far are summarized below.

#### *Organization of a seed unit*

Most NGOs do not have experience in seed production and marketing since this was the sole domain of the public sector. Prior experience with seed is often limited to seed distribution (mainly rice and wheat) in rehabilitation programmes following natural disasters. Only very recently have some of them, such as the agricultural branch of the Grameen Bank, started to organize seed procurement from commodity crops. In this case, the NGO procures grain as seed from selected farm households belonging to their target group. After procurement the NGO processes, stores and redistributes the so-called improved seed to other target group members.

The NGOs involved in the CDP have appointed seed agronomists or seed technologists to run the seed related activities. These persons were included in the CDP's training courses on seed production, storage and marketing. At present, they are capable of organizing seed production programmes. Further improvement requires the development of an appropriate seed strategy and seed plan. In this context they are advised to create a separate seed unit and keep accounts of the cash flow involved. The latter is of importance because most NGOs have high overhead costs for the implementation of their programme components. To be competitive and sustainable in the seed market, they should at least recover their costs.

#### *Seed distribution and sale*

The phasing out of BADC's seed sale centres has created an enormous gap in the national seed distribution. This is considered an opportunity for NGOs to establish themselves in the seed market. However, none of the NGOs is very keen to buy seed from BADC and redistribute it on credit or cash to their target groups. There is an aversion to procurement of seed from BADC. Most of them prefer to produce their own seed. Moreover, the margin between BADC wholesale and retail prices is at present between 3% and 7% which is a very small margin and not sufficient to recover the costs

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for distribution. Most NGOs estimate at least 10% distribution costs.

Another factor is that most NGOs are not yet aware of the actual seed demand of their target groups. It is assumed that there exists a demand for quality seed and that the main benefit they can provide to their target groups is seed at the right time for a reasonable price. A market oriented approach should be adopted in the ongoing NGO seed activities

#### *Seed production*

The selected NGOs show a keen interest in seed production as an income generating activity for their target groups and for themselves as seed entrepreneurs. Although cost-benefit analyses for contract growing with their target groups are still in preparation, the indication is that the target group approach is most likely not the right approach for contract growing.

Target groups of NGOs are mainly landless and marginal farm households which have no land or only a small acreage of land. The scattered plots make it difficult to organize growers in adjacent blocks necessary for seed production. Therefore, most NGOs are arranging land on lease or share-crop basis. This practice is increasing the production cost and, thus, reduces the profit margin for the already resource-poor growers. Besides, seed production has to be regarded as a cash crop. Due to the rather high input, it carries considerable risks. The resource-poor target groups are not able to take such risks.

Considering the above discussion, it has been suggested that NGOs separate seed distribution from seed production. For seed production, they were advised to select groups of farm households which are known to produce a good crop and which show keen interest in producing seed. Preferably, the selected growers should be sufficiently self-reliant to be able to accept losses in meager years. The seed produced would be procured by the NGO and distributed to its target groups. Most NGOs, however, are very target group conscious and hesitate to involve non-target group members in their programmes. Moreover, they claim that they do not have credit facilities available for outside, non-target groups. The proposed concept of separated production and distribution groups should be further explored to see if it can be adapted to make it fit into the existing organizational structure of NGOs.

#### *Seed processing and storage facilities*

The NGOs lack processing and conditioned storage facilities necessary for some crops such as potato and soybean. If they want to be involved in seed production, they either have to arrange for these facilities for example through BADC, or find financial means to build these facilities. Like the private sector, they lack capital to develop their seed related activities.

#### *Seed production training and seed promotion*

NGOs have demonstrated that they are very successful in organizing groups of farm households for seed demonstration and training programmes. Actually, this is their greatest strength. Therefore, their major contribution in the informal seed sector is foreseen in organizing, training and institutionalizing contract grower groups and linking these groups with private seed companies for a fee. Seed grower groups may also be organized for seed exchange between farm households. In this situation, the NGO plays the intermediate role. An important task for NGOs is foreseen in organizing seed promotion and awareness campaigns at the grassroots level.

#### **Independent contract grower groups**

An alternative to initiation of seed contract growing in the informal sector is to use already existing groups of organized farmers in adjacent blocks. An example is the organized land and water users' groups of the Bangladesh Water Development Board (BWDB). At present, CDP and BADC are implementing a seed production programme with BWDB. The extension officers of the BWDB organize the growers and BADC is doing the field inspection and procures 50% of the seed produced. The other half is processed by the seed growers and stored jointly in the godown of BWDB. The next season the growers are expecting to sell their seed to farmers' cooperatives and to local dealers. The concept is that these groups, after being trained and experienced in seed contract growing and trading, will turn into independent seed contract grower groups.

#### **Integration between public, private and informal seed sectors**

The formal seed sector In Bangladesh is gradually changing. The dominant role of the public

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sector is decreasing and the private seed sector is expected to fill the subsequent gaps as well as expand the market of purchased seed. In the process of this development, an important role is foreseen for the informal seed sector to become involved in seed production, storage and marketing of certified seed at the grassroots level. The following suggestions are made for the interaction between the three sectors during the transitional period.

#### *Linkages with the traditional seed systems*

The existing seed flows in the traditional seed systems should be outlined crop-wise, to get a clear picture of the constraints and needs of farm households. Only then can an effective strategy be developed for integration between the formal and informal seed sectors. In this respect, the CDP project will implement three surveys for the secondary food crops on household seed systems, seed dealers and seed contract growing.

#### *Transfer of knowledge*

BADC should transfer its existing technical knowledge about seed production, processing and marketing to the private and informal seed sectors. Although activities in this field are already ongoing by making use of BADC staff as resource persons in training programmes, more systematic transfer of knowledge is required. Means and ways for transferring knowledge will include developing a curriculum for training of trainers, publishing practical manuals and organizing on-the-job training courses at BADC seed farms and seed processing plants.

#### *Variety development*

As stated also in the Seed Policy, the public sector should tune its breeding and variety development activities more to the needs of farm households, especially for pulse and oil seed crops. Private seed companies are expected to take up the lead role in importing commercial varieties for evaluation in Bangladesh. However, they will be interested only in seed of crops which have a high profit margin. Therefore, the NARS should play a more pro-active role in the screening of less profitable crops. Informal seed organizations like NGOs, which have established themselves as excellent seed producers, might be included in the variety screening programmes for a fee.

#### *Seed production*

It is foreseen that for the near future the public sector will remain responsible for the breeder and foundation seed production of most secondary food crops. As such, sufficient government funding should be assured. All efforts should be made to increase the efficiency of production. Certified seed production could gradually be transferred to seed enterprises and contract growers' associations in the private and informal sectors.

#### *Availability of processing and storage facilities*

In line with the Seed Policy, BADC should make its excess facilities and equipment available to the private and informal seed sectors on a lease or rental basis. This is crucial for the development of the private and informal sectors because there is no seed processing equipment available in the country outside BADC. The charges for storage, handling and processing should strike the right balance between covering the cost and attracting interest from the private sector.

#### *Seed distribution and marketing*

Price setting between wholesale and retail prices of all categories of seed has to cover the production cost and leave enough margin to get the private and informal sectors involved in the seed distribution and marketing. Practically, this implies that BADC or any other public sector organization should start charging realistic prices for their products. A market information system jointly operated by the three sectors will play an important role in marketing management decisions.

#### *Seed extension and promotion*

All three sectors should combine their efforts in seed extension and promotion campaigns. Important topics to cover in seed extension, next to production and seed care, are seed labeling, types of seed, seed sources and seed quality. Through their extensive grassroots network, the NGO sector is probably the best player to organize seed awareness activities. To streamline these activities, close collaboration with agricultural research institutions and the Department of Agriculture Extension (DEA) is a prerequisite.

#### *Seed labeling*

So far, only imported seed and seed derived from BADC have been labeled. Developments in New Life Seed show that labeling and introduction of a brand name are essential ingredients for

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promotion and confidence building. Therefore, a systematic labeling system for seed sources and quality should be built up in the informal seed sector, so that farm households will know where the seed is coming from and what seed quality they are buying. Such a labeling system should be supported by independent quality monitoring institutions and an extension campaign on the labeling, types and sources of seed classes. The quality control monitoring should be implemented by the Seed Certification Agency of the government. Seed extension on labeling can be implemented jointly by NGOs and the Department of Agricultural Extension. Seed and variety promotion are tasks of the seed suppliers from all the three sectors, public, private and informal.

#### *Seed quality control*

Seed, being the single most important input in agriculture, has a price. Farmers all over the world are willing to invest in high quality seed as long as an independent service oriented organization assures its quality. In Bangladesh, seed quality assurance of secondary food crops, together with varietal development are areas which the government should consider continuing to subsidize.

#### **Summary**

The seed sector in Bangladesh is gradually

developing. Exclusive control by the public sector in the past has not been conducive to market-response developments. The use of improved seed by farm households is still small. Over 95% of all seeds is farmers' retained or purchased from local markets where the grain is sold as seed. This low replacement rate is mainly caused by to the non availability of suitable varieties and, if available, the lack of quality seed. Only recently, the public sector started releasing, producing and distributing improved varieties. The new Seed Policy gazetted in April 1993, gives broad outlines and directives on the rationalization of the seed sector, while it also emphasizes full participation of the private sector. Since then, the private sector has become increasingly involved in the import and trade of improved varieties. Not surprisingly, the seed companies started to deal with seed of crops for which a commercial demand exists such as vegetable seeds, hybrid maize, hybrid sunflower and seed potatoes. In view of the actual marginal rate of returns of the pulses and most oil seeds, it is expected that seed companies will not be interested in these crops in the near future. An important role therefore is foreseen for the informal sector in seed production, storage and marketing at the grassroots level. This paper discusses the situation in secondary food crops and gives suggestions how interaction between public, private and informal seed sector can be further improved.

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## **CGPRT Centre News and Activities**

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### **New Faces at the Centre**

Starting April 1, 1996, Dr. Kedi Suradisastra started work at the Centre. He assumes responsibility as the Centre's Programme Leader for Research and Development, succeeding Dr. Mansur Lande who worked at the Centre for two years. In May 1996, Ms. Marion Versapuech also joined the Centre to work with the DIVAPOL project with Dr. Françoise Gerard. In addition, Ms. Isabelle Marty is also briefly back to the Centre to continue her contribution to the DIVAPOL project.

Meanwhile, Mr. Klaus Zambra and Dr. Frederick Lançon have returned to their respective countries. They have completed their assignments

with the Centre. Mr. Zambra worked for the Regional food crop demand and trade (MPUPA) project and has completed his monitoring trip to Pakistan and China. He also worked in a trade focused project on pulses in South Asia. He left for Austria in June 1996.

Dr. Frederick Lançon has left for France. He was engaged in the Centre's soybean focused project SYGAP and completed data processing and formatting of all field-collected data. He developed the MATA Model (Multilevel Analysis Tool for Agricultural Policy), together with Dr. Gerard. He completed his assignment at the Centre with a geographical-economic analysis of price formation of food crops in the Indonesian archipelago.

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## Pulse Trade Study

This small study is aimed at new trends and prospects of future pulse trade among South Asian countries. Changing consumption habits and an impressive economic performance of most Asian countries are the reasons for the growing demand for various pulses, long neglected minor crops. Five countries in South Asia (Bangladesh, India, Myanmar, Pakistan and Sri Lanka) were selected for participation.

Organized in collaboration between the CGPRT Centre and the Trade Promotion Section of ESCAP Bangkok, this study is financed through contributions the United Nations Development Programme. On 7 May 1996 a planning meeting of

staff of CGPRT, ESCAP Bangkok and the regional expert was held at the Centre in Bogor. Dr. Nico L. Kana from Satyawacana University, Indonesia was recruited as the regional consultant to prepare the study on the basis of individual country reports provided by five national experts.

Data will be collected and compiled in each participating country in May and June. Subsequently, a country report will be submitted to the Centre by mid July, where the regional consultant will prepare the overall report by summarizing constraints, trends, prospects of trade in pulses in the region. The report will be published at the end of this year and distributed to selected institutions, universities and related government agencies.

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## International Courses and Meetings

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### 10th International Course on Seed Production and Seed Technology

**International Agricultural Centre  
Wageningen, the Netherlands April 13 - July, 1997**

Through the course, the International Agricultural Centre proposes to harness relevant knowledge and available experience in the Netherlands towards the training of seed agronomists and seed technologists in developing countries.

For further information, contact:  
International Agricultural Centre (IAC)  
P.O. Box 88  
6700 AB Wageningen  
the Netherlands  
Lawickse Allee 11  
Telephone +31-317-490111  
Telefax +31-317-418552  
E-Mail IAC@IAC.AGRO.NL  
Telegram INTAS  
Telex 45888-INTAS NL

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### Indigeneous Strategies for Intensification of Shifting Cultivation in Southeast Asia

**February 24-28, 1997 Bogor, Indonesia  
Cornell International Institute for Food,  
Agriculture and Development and International  
Centre for Research in Agroforestry**

#### **Workshop Announcement and Call for Papers**

- The general objectives of the workshop are to:
- review a series of case studies where farmers have successfully developed strategies for intensification of shifting cultivation, and synthesize current knowledge on these indigenous systems;
  - evaluate if farmer innovations are situation-specific - or are replicable in other stressed swidden agroecosystems in the S.E. Asia uplands;
  - elucidate emerging research questions, and formulate a longer term research agenda;
  - compare and evaluate research methods and develop a common research approach for a set of parallel studies of fallow management in the region;

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- highlight the importance of farmer-generated innovations, and stimulate donor interest in funding further research; and
  - establish the collaborative structure that will enable a regional research thrust.

For further information, contact:

Workshop Secretariat  
ICRAF Southeast Asia  
Jl. Gunung Batu No. 5,  
P.O. Box 161, Bogor 16001  
Indonesia  
Tel. (62-251) 315-234  
Fax (62-251) 315-567  
E-mail icraf-indonesia@cgnnet.com

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## Diploma/MSc Course on Grain Storage Management

**Natural Resources Institute, Chatham, UK**  
**September 2 - December 17, 1996**

The course covers the principles, practices and management of stored cereals, pulses, seeds and a range of other durable commodities at producer, trader, processor and national levels. The training focuses on the skills required to evaluate commodity management systems in order to formulate and implement operational improvements. The professional ability and confidence of the participants are developed to enable them to influence policy makers and to function on an individual basis or part of a multi-disciplinary team. At the same time the course covers the operational and management implications of changing technology.

For further information, contact:

Dr Mark Wright  
Natural Resources Institute  
Central Avenue  
Chatham Maritime  
Kent ME4 4TB, UK  
Tel. +44 1634 883761  
Fax +44 1634 883567  
E-mail mark.wright@nri.org

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## 12th Diploma/MSc Course in Post-harvest Horticulture

**Natural Resources Institute, Chatham, UK**  
**February 10 - May 16, 1997**

The course is designed for professionals in commercial, government and educational organizations who need to acquire improved expertise and technology in handling perishable horticultural produce. It covers the principles and practices fundamental to good post-harvest management of horticultural produce including tropical, sub-tropical and temperate crops. The course emphasizes a practical, integrated approach to evaluating post-harvest management and marketing systems for fresh produce.

For further information, contact:

Mrs Annabelle Malins  
Natural Resources Institute  
Central Avenue  
Chatham Maritime  
Kent ME 4 4TB, UK  
Tel. +44 1634 880088  
Fax +44 1634 880066/77  
E-mail annabelle.malins@nri.org

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## 26th International Potato Course: Production, Storage and Seed Technology

**International Agricultural Centre**  
**Wageningen, the Netherlands April 13 - July 18, 1997**

The objective of the course is to provide persons working in developing countries who are engaged in aspects of potato production, with further knowledge and understanding of and skills in various aspects of their work. These aspects include physiology, growth and production; storage, handling and utilization; disease and pests; seed technology, seed production and seed supply; breeding and varieties.

For further information, contact:

International Agricultural Centre (IAC)  
(details on page 16)

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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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CGPRT CENTRE  
Publication Section

Editor:	Douglas R. Stoltz
Production:	Deddy Subandi M. S. Tayanih (Yayan)
Distribution:	Fetty Prihastini Deddy Subandi M.
Printer	SMT Grafika Desa Putera



CGPRT Centre  
Jalan Merdeka 145,  
Bogor 16111, Indonesia  
Telephone: (0251) 336290, 343277  
Fax: 62-251-336290  
Cable: ESCAP CGPRT Bogor  
E-mail: cgprt@server.indo.net.id

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