POLICY PAPER 12

PUBLIC-PRIVATE INTERFACE AND INFORMATION FLOW IN THE RICE SEED SYSTEM OF ANDHRA PRADESH (INDIA)

Suresh Pal
Robert Tripp
A. Janaiah

भाकृअनुप
ICAR

NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH
NEW DELHI, INDIA

In collaboration with

DIRECTORATE OF RICE RESEARCH
HYDERABAD, INDIA
&
OVERSEAS DEVELOPMENT INSTITUTE
LONDON, U.K.

Publication Committee

T. Haque
P. K. Joshi
S. Selvarajan
Ramesh Chand
B. C. Barah
P. Adhiguru

NCAP has been established by the Indian Council of Agricultural Research (ICAR) with a view to upgrading agricultural economics research through integration of economics input in planning, designing, and evaluation of agricultural research programmes and strengthening the competence in agricultural policy analysis within the Council. The Centre is assigned a leadership role in this area not only for various ICAR Institutes but also for the State Agricultural Universities. With a view to making agricultural research a more effective instrument for agricultural and rural change and strengthening the policy making and planning machinery, the Centre undertakes and sponsors research in agricultural economics relating to the problems of regional and national importance.

Public-Private Interface and Information Flow in the Rice Seed System of Andhra Pradesh (India)

Suresh Pal
Robert Tripp
A. Janaiah

Policy Paper 12

भाकृअनुप
ICAR

NATIONAL
CENTRE FOR
AGRICULTURAL ECONOMICS AND
POLICY RESEARCH
NEW DELHI, INDIA

In collaboration with

DIRECTORATE OF
RICE
RESEARCH
HYDERABAD, INDIA
&
OVERSEAS
DEVELOPMENT
INSTITUTE
LONDON, U.K.

Policy Paper 12

Public-Private Interface and Information Flow in the Rice Seed System of Andhra Pradesh (India)

First published
September 2000

Published by
Dr Mruthyunjaya
Director, NCAP

The authors:

Suresh Pal is a senior scientist at the National Centre for Agricultural Economics and Policy Research, New Delhi.

Robert Tripp is a research fellow at the Overseas Development Institute, London.

A. Janaiah is a scientist at the Directorate of Rice Research, Hyderabad.

Contents

Tables and figures

Tables

Figures

Acronyms and abbreviations

AICCIP	All India Co-ordinated Crop Improvement Project
ANGRAU	Acharya N.G. Ranga Agricultural University (formerly Andhra Pradesh Agricultural University)
AP	Andhra Pradesh
APSSCA	Andhra Pradesh State Seed Certification Agency
APSSDC	Andhra Pradesh State Seeds Development Corporation
CACP	Commission for Agricultural Costs and Prices
CMIE	Centre for Monitoring Indian Economy
CRRI	Central Rice Research Institute
DoA	Department of Agriculture
DRR	Directorate of Rice Research
HACA	The Hyderabad Agricultural Co-operative Association Ltd.
ICAR	Indian Council of Agricultural Research
KRIBHCO	Krishak Bharati Co-operative Ltd.
MANAGE	National Institute for Agricultural Extension Management
MVs	Modern Varieties
NGO	Non-Governmental Organisation
NSC	National Seeds Corporation
NSP	National Seed Project
PACS	Primary Agricultural Co-operative Society
TLS	Truthfully Labelled Seed

Foreword

Seed industries in developing countries are in transition. One of the significant changes that has taken place is the increasing participation of private sector in the provision of improved seeds. This development has led to the visualisation of appropriate roles for the private and public sectors so as to serve farmers more efficiently. These roles are better understood and encouraged in the provision of hybrid seeds. What are not understood are the conditions facilitating the entry of private sector in the non-hybrid seed market, where most plant breeding is in the public domain. This paper is an attempt in this direction.

The paper does not attempt an analysis of the cost-effectiveness of various seed agencies. It focuses on their performance in providing farmers with information and seeds and also on the interactions and information flow between the various agencies. The study analyses data collected through discussion with several key informants and from two independent surveys of seed agencies and farmers. It outlines the strengths and weaknesses of the seed system, and makes suggestions for serving farmers more efficiently, in particular, suggestions on the promotion of new varieties, improving information flow and greater public-private interface. It is hoped that policy-makers, researchers and seed agencies alike will find the results useful.

September 2000 Director, NCAP
New Delhi

Acknowledgements

Several institutions and individuals have been instrumental in the completion of this study. We are highly grateful to Dr R. S. Paroda, Secretary, Department of Agricultural Research and Education (DARE) and Director-General, Indian Council of Agricultural Research (ICAR), for permitting us to undertake the study. We are also grateful to Dr Mangala Rai, Deputy Director-General (Crops) and Dr Mruthyunjaya, former Assistant Director-General (ES&M), ICAR, for extending the necessary support to this project. Dr Dayanatha Jha, former Director, National Centre for Agricultural Economics and Policy Research (NCAP) and Dr K. Krishnaiah, former Project Director, Directorate of Rice Research (DRR), have shown keen interest in the study and provided valuable guidance and support. We are indeed grateful to them.

We have greatly benefited from discussion with Professor M. V. Rao, former Vice Chancellor, Acharya N.G. Ranga Agricultural University (ANGRAU), Professor E. A. Siddiq, National Professor (ICAR), Dr P. N. Chowdary, Additional Director of Agriculture (AP) and Dr Y. Yogeswara Rao, President, Seedmen's Association (AP). We have also benefited from discussion with several officers of the Department of Agriculture, the Andhra Pradesh State Seeds Development Corporation, the Andhra Pradesh State Seed Certification Agency, DRR, ANGRAU, private seed companies and co-operatives. They deserve our special thanks.

Dr G. P. Reddy of the DRR provided valuable help during the initial phase of the study. Mr J. Muralidhara Rao provided admirable research assistance and K. N. Dutt, D. Moses Shyam, T. Krishna Prasad, T. Jayaprakash and L. L. T. Prakasa Rao assisted in the farm survey. We are grateful to all of them.

Dr Mahabub Hossain, Head, Social Science Division, International Rice Research Institute and Dr Carl Pray, Professor, Rutgers University. provided useful comments on an earlier draft of the report. We have tried to address their concerns. However, any errors of fact and views expressed remain the sole responsibility of the authors. The financial support provided by the UK Department for International Development (DFID) for the study is acknowledged with thanks.

September 2000 Authors

Executive Summary

The liberalisation of regulations, open access to the germplasm of public research programmes and the increase in demand for commercial seed have attracted private investment in the Indian seed industry. There are now a number of actors in both the public and private sectors specialising in various elements of seed provision, namely, plant breeding, production of source seed, seed multiplication, conditioning and distribution, and quality control. Effective co-ordination and an efficient flow of information between the various actors are essential for a dynamic seed system. This study examines the institutional aspects of seed system development. In particular, the focus is on the public-private interface and the adequacy of information flow and incentives in the seed system. Rice is the crop focused owing to its importance to Indian agriculture, and Andhra Pradesh was chosen for the study because of the diversity of seed provision options in the state.

The rice seed system in Andhra Pradesh offers a number of outstanding examples of the private delivery of public varieties. Several private seed companies and co-operatives are supplying an increasing proportion of rice seed, in addition to two public seed agencies, namely, the Andhra Pradesh State Seeds Development Corporation (APSSDC) and the National Seeds Corporation (NSC). The open access to source seed, the availability of growers and processing facilities on a contract basis and the well developed marketing network have reduced transaction costs, enabling the emergence of a wide range of seed enterprises, particularly in the private sector. Also, a greater degree of public-private interface is facilitated by transparent mechanisms for acquiring source seed, commercial incentives and an enabling regulatory framework.

The results of the farm survey reveal an exceptionally high seed turnover rate in AP, particularly in the coastal region. About 60-80 % of all rice seed used in 1998/99 was procured off-farm, and very little seed is retained for more than two years. A large proportion of this seed was supplied by the formal seed system. The principal reason for farmers obtaining seed from other farmers is to get hold of a new variety, whereas they acquire seed from commercial sources for reasons of quality.

A noteworthy weakness observed in the rice seed system is its inefficiency in the delivery of seed of new varieties and information about them to farmers. The proportion of area planted with 'new' varieties is much higher than commercial seed sale, and fellow farmers continue to be the dominant source. Furthermore, the majority of farmers buying seed from shops do not know the name of the company producing the seed. Many are not familiar with the seed certification tag and are unaware of whom they can complain to about seed quality problems.

India is likely to enact legislation on plant variety protection. It would be premature to speculate about the likely impact of the new regime, particularly regarding participation of the private sector in the development and popularisation of rice varieties. The private sector will participate if it finds market demand attractive in a situation in which farmers' privileges to save and exchange seed of new varieties are protected. A private company will promote a public plant variety only if it owns the exclusive marketing rights. The decision to assign such exclusive rights to a private company will be governed by the ability of the company to supply adequate seed at a reasonable price-a precondition which it is difficult to ascertain. No matter how events unfold in the near future, the public sector has to shoulder the responsibility for providing information as well as variety promotion and consumer education. The private sector can be a useful ally if it is encouraged to participate in variety testing. At the same time, private seed companies should recognise their responsibility to pass on information to fanners and establish their brand image. This would also help them to exploit the potential of the hybrid rice seed market.

An attempt to decentralise rice seed provision through the Seed Village Programme suffered from practical problems, such as lack of choice of varieties, and storage and marketing

problems. In order to revive this programme, it is important to understand and improve farmers' seed management practices. An ideal approach could be the involvement of farmers in variety testing, so that they have first-hand information about varieties and can evaluate the alternatives available to them.

Finally, we conclude with a caveat about the wider applicability of the results of this study. The results are specific to two conditions. First, Andhra Pradesh is home to many private seed companies, thus facilitating their entry into the rice seed market, and secondly, its agro-climatic conditions inflate rice seed demand, attracting large number of actors in the provision of seed. These conditions may not be present elsewhere, and wider application of the conclusions drawn here may therefore need to be approached with caution.

1 Introduction

INDIAN policy-makers face a number of difficult decisions related to development of the national seed system. Rapid changes in the economy and in technology have occasioned a serious re-examination of national seed policy. There has been a strong tradition of public sector provision of seed that has served the nation's farmers well. Part of the success of the Green Revolution can be credited to well-organised public seed production. But the past two decades have seen the advent of policies that seek to liberalise the agricultural input sector. The private seed industry has grown at a remarkable rate and has responded effectively to farmers' needs (Pal *et al.,* 1998). But it has now reached a point where choices need to be made about the most appropriate roles for the public and private sectors and greater linkages need to be fostered between them. These choices will be affected by a number of factors governing the process of seed system development.

1.1 Seed System Development

The private sector responds to commercial incentives, and it is not surprising that India's private seed industry (like that of most other countries) has concentrated on hybrids (which are generally purchased every year) and other high-value seeds. But many of India's most important crops (such as rice, wheat and pulses) are based on non-hybrid seed which farmers can save from year to year. Private sector participation for these types of seed has been more modest, and there are questions about the potential private role for such crops. In addition, the highest demand for formal sector seed comes from more commercially orientated farmers. There are concerns that, without proper incentives, the private seed sector may ignore the requirements of farmers in more marginal areas.

In theory the public sector alternative should be able to address the needs of those farmers who do not participate in the commercial sector, but the record to date has been uneven. The efficiency and incentives of public enterprises are increasingly being called into question. Although a number of India's public seed enterprises have managed to perform effectively, others are beginning to drop by the wayside. As a dynamic private input marketing system takes hold in the country, many observers are redefining a facilitating role for the public sector in seed production (Jaffee and Srivastava, 1994).

The option of decentralisation of seed provision is also part of the debate. Seed provision at the local level may be able to respond to farmers' needs more effectively than large public or private enterprises. Co-operative seed production is a possible alternative. In addition, there are a number of initiatives that can be taken by government agencies and non-governmental organisations (NGOs) to stimulate village-level seed production.

No matter how the debate over seed production is resolved, there are a number of key supporting roles for the public sector in seed system development. Although private sector plant breeding has experienced rapid growth in recent years, the greater part of seed sold in India is still based on public germplasm. Public sector plant breeding will certainly maintain an important role, but how should it interact with private and local-level seed production? In addition, any seed system requires some type of regulatory framework, and seed policy must identify the appropriate public contribution to the regulation of an expanding and diversifying seed sector. Finally, what should be the public sector role in providing information to farmers about the growing number of seed options?

This study hopes to contribute to the debate about seed system development. It examines the performance of several options for seed provision. Its focus is on the information and incentives that are required to support the emergence of a seed sector that meets acceptable criteria for equity, efficiency and diversity. Seed system development is heavily dependent on information. Farmers need to know about the options for seed supply, the quality of the seed provided, and the characteristics of the varieties that are available. Seed enterprises require

information on farmers' requirements and on the potential partners in seed provision. Efficiency of information flow plays a large part in determining the incentives for organising seed provision options.

1.2 The Case of Rice Seed

This study uses the example of rice seed (Rice seed is actually unhulled paddy. We shall use the term 'rice seed' in this paper, but it is important to recognise the difference between grain and paddy. Although the conversion ratio varies by variety, milled grain weight is approximately two-thirds of paddy weight.). Rice is India's most important crop, with an annual production of over 80 million tonnes. Rice is sown on approximately 43 million hectares of land, 45% of which is irrigated. The majority of the rice seed planted in India is saved or obtained from other farmers, but a significant amount is also supplied by public seed corporations, cooperatives and, increasingly, by the private sector Official statistics estimate a national annual seed turnover rate of approximately 14%.

The study focuses on Andhra Pradesh (AP), which is among India's leading rice-producing states. It has an annual production of about 9.4 million tonnes on 3.7 million hectares {Appendix I). All farmers, irrespective of their size of holding, grow rice mostly under irrigated conditions (about 95% of the rice area is irrigated). More than two-thirds of the rice is produced during the monsoon *kharif* season and most of the rest is grown in the post-monsoon rabi season.

The rice farmers of AP are served by two public seed corporations. The Andhra Pradesh State Seeds Development Corporation {APSSDC) supplies the greater part of public sector rice seed, while the National Seeds Corporation (NSC) also provides a small amount. AP also has an exceptionally high concentration of private sector seed production. Although the majority of this is devoted to hybrids of various crops, there is a rapidly growing trend towards private rice seed production. In addition, a number of co-operatives have recently begun rice seed production. Finally, there is a Seed Village Programme, initiated by the Department of Agriculture (DoA) that attempts to stimulate rice seed production and distribution at the village level. The farmers of AP thus have a range of options for rice seed supply.

Seed provision statistics are imprecise, but, as a first approximation, various DoA estimates indicate about 55,000 tonnes of rice seed supplied by public, private and co-operative agencies in AP. These estimates indicate a seed turnover rate of more than 30%, well above the national average (Appendix I) (The DoA uses a seeding rate of 50 kg per hectare when estimating rice seed requirements for AP.)

Although India has invested considerable resources in hybrid rice development in recent years (Barwale, 1993), the study does not address this subject. There are two reasons for this. First, our interest is in strategies for non-hybrid seed provision. Although hybrid rice production presents its own set of challenges, private sector interest and investment are widely recognised. There are already more than a dozen private companies in India working on hybrid rice development, complementing the significant commitment of public research resources. Secondly, although both public and private rice hybrids have been on the market for several years in India, they have so far had little impact. The technology is in its infancy, and there are still many problems to be resolved in developing hybrids of acceptable agronomic and consumer quality that can compete with conventional varieties. Hybrid rice currently represents an insignificant proportion of rice cultivation in AP.

In summary, the case of rice seed in AP presents a set of characteristics that make it a particularly useful example for considering seed system development. Rice is an important crop with high seed requirements. Because farmers can save rice seed, it has been a less attractive crop for private sector activity, and the majority of formal rice seed provision has been managed by the public sector. The APSSDC is recognised as one of the better-managed state seed enterprises in the country and it has done an effective job of supplying rice seed. However, the commercial orientation of many rice farmers has led to a growing demand for purchased seed. A well-developed private seed industry in the state has begun to

respond to this demand, and is supplying an increasing proportion of rice seed. A number of co-operatives are also playing an important role in rice seed provision, and the Department of Agriculture is attempting to promote decentralised rice seed production. We thus have an opportunity to study the roles and contributions of public, private, co-operative, and village-level seed provision. Because AP has outstanding examples of all of these seed provision strategies it offers a useful perspective on the future of seed system development in India.

1.3 Outline of Report

The remainder of this report examines these issues in greater detail. Chapter 2 describes the public sector contributions to the rice seed system of AP. This includes public responsibilities in plant breeding, source seed production, seed certification, seed inspection, and extension. Chapter 3 examines the performance of rice seed provision alternatives, including the public seed corporations, private seed companies, co-operatives, informal farmer-to-farmer seed supply, and formal attempts to encourage decentralised production. Chapter 4 presents a farm-level view of seed system alternatives. It summarises the results of a survey of seed practices for 286 rice farmers in three districts of AP. Finally, Chapter 5 presents some conclusions, focusing on the major responsibilities of the public sector, the perspectives for increased private sector participation, and the requirements for better information.

2 Public Sector Roles in the Rice Seed System

THE elements of seed provision are variety development, provision of source seed, multiplication, conditioning and distribution of commercial seed, seed quality control and variety promotion. All these elements, historically, have been in the public domain in India and the state of AP is no exception to this. However, as noted in the previous chapter, the situation is changing rapidly with the participation of private and other sectors. This chapter gives a brief account of the public sector's role in rice seed provision in AP.

2.1 Plant Breeding

Modern varieties (MVs) constitute the vast majority of the rice grown in AP. All of these varieties are the products of public sector plant breeding. State-level plant breeding is the responsibility of the Acharya N.G. Ranga Agricultural University (ANGRAU), which has research stations in the major agroclimatic zones of the state. The university rice breeding system is also part of a national All-India Co-ordinated Crop Improvement Project (AICCIP), which develops and tests rice varieties throughout the country. There are also two rice research organisations with a national mandate. The Directorate of Rice Research (DRR) has its headquarters in Hyderabad and concentrates on research for irrigated rice systems. The Central Rice Research Institute (CRRI) is located in Cuttack (Orissa) and focuses on technologies for rainfed rice and for the special environments of north-east India.

India's public research system has released over 500 rice varieties. Approximately 50 of these are produced for commercial (public and private) sale in AP each year. Some are grown widely throughout the state, while others are targeted at specific environments. The vast majority of these varieties have been developed by the state university system, although some are the products of national research programmes (such as the DRR) or have been released by other states.

The procedures for variety release are based on a complex testing system. Varieties are screened in a series of trials managed by the state university. Later stages in this trial system include adaptive trials and minikits (2 kg. packs of seed of a new variety), involving the participation of the DoA. The results of trials are reviewed at annual meetings held for each of the state's seven agroecological zones. Varieties are released at the zonal level, although they may be approved for the entire state. Rice varieties may also be entered in the national AICCIP trials; in this case successful entries are released (for designated environments) by the Central Variety Release Committee. Once a variety is released at the state or national level it may be considered for notification. Only when a variety is notified is it eligible for seed certification. Most of the rice varieties grown in AP have been notified.

Variety testing is a lengthy process, and it may take about six years for a variety to be released and hence available for formal seed production. Plant breeders engage in a number of activities that help to popularise the variety during the latter stages of testing and that set the stage for seed production. Field days are held at the experimental stations to familiarise farmers with new varieties. In addition to the minikits produced for the DoA, research stations often produce their own minikits of promising varieties in order to obtain feedback from farmers. Small quantities of breeder seed may also be sold to farmers for testing; in many cases these farmers further multiply this seed for informal sate or distribution to other farmers.

The university stations occasionally produce pamphlets or other literature describing new varieties. Newly released varieties are also featured in newspaper and magazine articles as well as in agricultural programmes on radio or television. The combination of seed distribution, field days, and other promotion serves to provide information to farmers about new varieties. However, the investment in these activities does not appear to be very great. There is little evidence that the university actively promotes its new varieties with seed

producers, appearing to rely instead on communication among farmers to generate sufficient demand on the seed companies.

The emphasis in the testing and release procedures is on state varieties. This is an understandable outcome of a strategy that attempts to target plant breeding at specific environments, but it also diverts attention from the possibility of taking advantage of varieties released in other states. There are few incentives for the state university system (or the DoA) to test or promote varieties from other states. There is evidence that this state-level emphasis is responsible for many missed opportunities to introduce useful varieties from other parts of the country (Witcombe and Virk, 1997). The major exceptions are a few varieties that are released at the national level and gain widespread popularity.

2.2 Source Seed Production

The seed production process is supported by a sequence of stages in which the original quantity of seed of a new variety is multiplied to obtain sufficient commercial seed. With regard to rice seed in India, the earlier stages are referred to as breeder seed and the intermediary stages are known as foundation seed. Together, these precursors to commercial seed production are known as source seed. Source seed production constitutes a serious bottleneck in many national seed systems, but India has taken major steps to improve access to source seed. The procedures followed in AP are particularly effective.

Since 1994, the majority of breeder seed production for state-released varieties in AP has been managed at the state level. Previously, breeder seed production was co-ordinated at the national level, and some states still depend on this centralised system. There is a National Seed Project (NSP) that helps meet many of the requests from these states, as well as providing breeder seed of centrally released varieties. Public seed corporations, private seed companies or co-operatives that wish to obtain breeder seed submit a request ('indent') to the university, along with a pre-payment. The price of the breeder seed is established by the Indian Council of Agricultural Research (ICAR) and for rice it is currently about twice the price of certified seed. The indents are made once a year and the university then apportions the requests among its research stations. Ideally the breeder seed production of a variety should be managed by the station that developed the variety, but in some cases (particularly for very popular varieties) it has to be assigned to several stations. The plant breeder is responsible for the quality of breeder seed, hence it is not eligible for certification. In 1997-98, ANGRAU produced approximately 77 tonnes of breeder seed of rice.

The companies and co-operatives receiving breeder seed multiply it to produce foundation seed. It takes approximately two years from the time an indent is made for breeder seed until the resulting commercial seed is ready for the market, so seed producers need to plan their requests for breeder seed carefully and need to know which varieties are likely to be in demand. University stations also produce some foundation seed. This is used mostly for demonstrations or for distribution to farmers in order to promote new varieties; some stations also produce foundation seed for use in the DoA's Seed Village Programme.

2.3 Seed Certification

Seed certification is managed by the AP State Seed Certification Agency (APSSCA), which charges fees for its services and is self-supporting. Because AP is an important seed production state, the APSSCA certifies seed of 21 crops and 250 varieties. It employs 120 seed certification officers.

In 1998-99 the APSSCA certified approximately 44,000 tonnes of rice seed. The majority of this seed (more than 80 %) was for sale by public and private seed enterprises within AP, although some certified rice seed produced in the state is sold elsewhere. The certification of rice seed includes inspection of the seed multiplication plot twice during the growing season and testing of the harvested seed for germination, moisture content and purity.

Not all rice seed is certified. Indian seed legislation allows for the sale of truthfully labelled seed (TLS), which is sold with a label describing the minimum standards to which the seed must conform. Several factors influence the decision of a company to certify its seed. The seed producer must pay the APSSCA for the certification process, although this amounts to no more than 2 % of the retail price of the seed. Certified seed of new varieties is eligible for a subsidy from the state government, and this is an incentive for certification. Perhaps the major reason for choosing to forgo certification and sell TLS is the time required for testing after the seed crop is harvested. Rice seed is produced in both the *kharif and rabi* seasons. Some of this seed is stored for sale in the same season of the following year, but seed is often produced to be sold in the season immediately following {e.g., *kharif seed* production for the *rabi* season). In these cases, the time required for drawing seed samples, seed testing, and fixing the certification labels is often too long to allow for marketing in the subsequent season, and companies often choose to sell such seed as truthfully labelled. In addition, there are some varieties (particularly newer ones) that have been released but not notified, and these are not eligible for certification. Approximately 60% of the rice seed produced by the major public company (APSSDC) is certified. Statistics for the private seed companies are not available, but our data indicate that about 42% of their rice seed is certified.

2.4 Seed Quality Enforcement

There are more than 8,000 seed dealers in AP, although not all of them sell rice seed. All seed dealers in the state must be licensed. The applicant must have adequate storage facilities, demonstrate personal credibility, and detail the sources from which the seed will be obtained. The licence fee is modest (Rs 50 for 3 years).

The DoA employs inspectors to monitor the quality of seed and other inputs sold in shops and to collect statistics on input sales. The inspectors draw approximately 15,000 seed samples (for all crops) each year. If the seed is found to be below standard, a series of sanctions may be applied. In some cases the dealer may only get a warning. In more serious cases the shop may be closed or have its licence suspended. The DoA may also bring a court case against the seed company, but it is noteworthy that the initial sanctions are applied to the dealer and not to the producer. DoA officials estimate that there are about 40 licence suspensions each year because of problems with seed quality, although only a minority of these concern rice seed.

If farmers have complaints about seed that they have purchased they can go to a DoA office. A series of such complaints about a particular type of seed will lead to follow-up and the possible application of sanctions. In some cases the DoA can arrange for the farmers to obtain replacement seed from the dealer.

An additional mechanism is also available for the enforcement of seed quality. Each district has a Consumer Forum that functions as a small claims court. Consumers can bring cases up to a maximum of Rs 500,000. There are a small (but growing) number of instances in which farmers have brought cases concerning seed quality to the Consumer Forum. This provides a means of seeking compensation not only for the value of the seed purchased but also for the losses incurred in working the field where the defective seed was sown. This option is most likely to be utilised for instances of significant loss, especially as it usually requires the services of a lawyer and the investment of considerable time on the part of the farmer.

2.5 Extension

The DoA organises various activities such as demonstrations and farmer meetings to promote new technologies. Probably the most prominent activity related to variety promotion is the distribution of minikits. Theoretically these are used to assess the performance of varieties being proposed for release, and the major activity is organised at the state level. In 1998 the minikits included five varieties: two which were being considered for release, one which had been recently released, and two older varieties. A total of 29,000 minikits (each consisting of 2 kg. of a single variety) were distributed by DoA agents. Each farmer receives only one kit, so there is little opportunity for any direct comparisons by the individual farmer.

The DoA officials at district level are responsible for collecting data on yield and farmer reactions to the minikit varieties. These are returned to the university and are used in decisions about variety release. The relevant breeders and extension agents are supposed to visit as many minikit sites as possible, but time and funding constraints make this difficult. The purpose of channelling farm-level testing through the DoA is to provide an independent assessment of the university's varieties proposed for release. Opinions vary regarding the utility of these data, and as the extension agents have no say in decisions regarding the composition of the minikits, and little voice in the assessment, their incentives for carefully collecting minikit results are minimal. Major research stations also manage their own minikit activities (on a zonal level), using DoA staff.

Minikits are also sometimes described as a promotional tool, allowing farmers to become familiar with new varieties. But a significant proportion of minikit varieties have already been released, and minikits are rarely distributed to farmers with any additional information that would, encourage them to learn about the particular characteristics of the new variety. Nevertheless, there are occasional instances where seed distributed as a minikit proves popular and is used for local multiplication and diffusion among other farmers.

3 Options for Rice Seed Provision

THIS chapter discusses the main characteristics of the elements of rice seed provision under various options, namely, public and private seed agencies, co-operatives and the community-level seed programme. This is followed by a discussion of the conditions facilitating greater public-private interface in the provision of rice seed.

3.1 The Public Sector

The vast majority of public sector rice seed in the state is produced by the APSSDC. The corporation was established in 1976 and produces seed of rice, maize, sorghum, pearl millet, cotton, various pulses and oilseeds, and several other crops. Rice accounts for approximately 80% of its seed production. In 1998 it sold 32,400 tonnes of rice seed.

The APSSDC produces and processes rice seed at 17 centres throughout the state. Part of the rationale for this exceptional dispersal is the obligation of the corporation to maintain a presence throughout the state. Although every attempt is made to sell seed close to the area in which it is produced, a considerable proportion of its rice seed is transported between centres. Approximately 40% of its total production comes from three centres in northern Telangana, where conditions for rice seed multiplication are particularly favourable. The APSSDC produces all of its own foundation seed (some on its own farms) and organises seed multiplication through individual farmer seed growers, the majority of whom are shareholders in the corporation; a minimum of 5 shares (at Rs 100) is required to be eligible. The APSSDC also contracts additional farmers for seed production depending on its requirements. An attempt is made to concentrate these growers for ease of supervision, but the corporation does not attempt to organise seed multiplication at the village level.

The APSSDC previously concentrated on seed production, leaving marketing to the DoA. This strategy changed in the mid-1990s, and the corporation now markets its seed commercially, as well as through its own outlets. Approximately 75% of its seed is sold through private dealers and, cooperative marketing societies. The APSSDC designates one private dealer in each district as Its distributor (a strategy followed by many private seed companies). Dealers must pay for their seed in advance and are not allowed to return unsold seed. They get a 9% commission on seed sales and the corporation provides free delivery if a full truck (9 tonnes) of seed is ordered. Unlike the case of many hybrid seeds, orders usually have to be placed in advance, except for a few varieties which may be in exceptionally high demand.

In more remote areas of the state the DoA still assists in seed distribution, collecting orders from villages and arranging for transport from the APSSDC depots. The APSSDC seed is also sold by the DoA and other development agencies such as the Integrated Tribal Development Agency, under several development programmes of the state government.

The APSSDC attempts to produce seed of a wide range of varieties. In *kharif* 1998 it produced seed of 42 different rice varieties, and in *rabi* of 21 varieties. Despite this diversity of production, there is a heavy concentration on a few varieties; in 1998 the top three varieties (BPT 5204, MTU 1001, and MTU 7029) accounted for slightly more than half of total seed production.

The APSSDC plans its seed production based on its previous year's sales and reports from its various offices. Planning meetings are also organised under the auspices of the DoA where future variety demand is discussed. Until recently the corporation has been expected to cover the majority of the demand for formal sector seed in the state, and anticipating likely demand has often proved a challenge. For instance, when the variety MTU 1001 was first released, the APSSDC was able to produce only 100 tonnes of seed, which sold out very quickly. The following year it produced 3,000 tonnes, but because the variety's grain had

been classified as 'coarse', farmer demand was modest, and it only sold about 500 tonnes, disposing of the remainder on the grain market. When the classification changed the following year it was unable to meet the demand, selling its entire production of 2,500 tonnes.

Although the APSSDC tries to follow demand trends, it does little to promote the use of its rice seed or to advertise particular varieties. Seed is distributed to dealers with no literature or other promotional materials, and that the farmers are expected to know which varieties they wish to purchase.

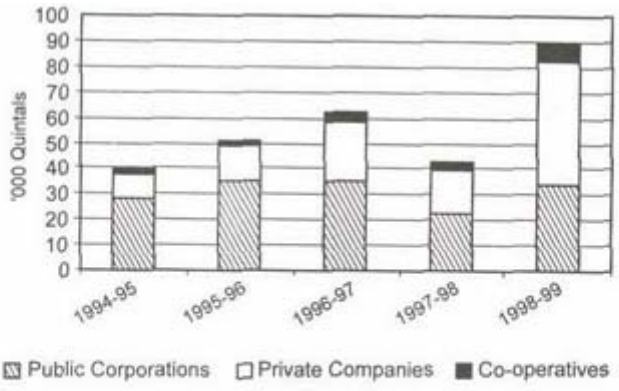
Some rice seed is also provided by the NSC, which has five production centres in AP as well as a foundation seed farm. Established in 1963, the NDS has had much of its earlier mandate taken over by the various state seeds corporations. About half of the seed it produces in AP is destined for sale in other states, particularly in the north-east. In 1998 it sold 1,476 tonnes of rice seed (13 varieties) in AP.

3.2 Private Seed Companies

There is a large concentration of private seed companies in AP. This is due in large part to the excellent seed production environment of the northern Telangana region, particularly for crops such as sorghum and pearl millet, which were among the first hybrid seeds produced by the private sector after liberalisation In the 1980s. The seed industry has continued to grow, and the AP Seedsmen's Association lists 147 members.

Rice seed has not been a traditional focus for the private sector, but within the past few years private sector participation has increased dramatically. There are several reasons for this. Because the seed industry is already established, it can easily take advantage of economies of scope and expand into other crops. Rice seed production is fairly straightforward and requires no special equipment beyond a seed cleaner. Because rice seed is not treated with chemicals, unsold seed can be taken to the grain market; the risks are therefore lower than for many other types of seed. Some of the larger companies have embarked on rice seed production as a way of positioning themselves for the potential hybrid rice market, but for many smaller companies rice seed represents an important part of their business. In addition, the rice area in AP is large and stable, ensuring a fairly steady demand for seed. Rice is an important cash crop, and fanners increasingly appreciate the convenience of packaged seed. The state government allocates a subsidy (Rs 2 per kg) to some rice seed, which may help stimulate general demand, but the private sector has not been able to take advantage of this subsidy until recently.

Fig. 3.1 Trends in certified rice seed production by agency



Note : Original data for 1998 and 1999 were for foundation and certified seed. We have adjusted them downward to give certified seed only.
Source: APSSDC records and survey of seed companies and cooperatives

The breadth and diversity of the private rice seed sector in AP make it difficult to quantify its precise contribution. As part of our study, we conducted interviews and sent postal questionnaires to *a* total of 23 companies. The main results of the survey are summarised in Table 3.1. We do not pretend that the survey is complete, but it does give some idea of the nature of the private rice seed industry in AP. The private companies reported selling 19,370 tonnes of rice seed in AP in both seasons of 1998. The DoA attempts to assess companies' marketing plans for the coming season and their estimates for *kharif* 1999 indicated a total of about 21,000 tonnes. Another way of estimating the growth and relative importance of private rice seed production is to examine the statistics for certified seed production. Figure 3.1 shows certified rice seed production for the past 5 years. These figures must be treated with caution because only about half of the rice seed sold is certified; in addition, up to 20% of the rice seed produced in AP is destined for sale in other states. Nevertheless, the figures indicate a clear trend towards increasing private rice seed production.

The private rice seed sector in AP includes some of India's largest seed companies as well as many small and medium-sized enterprises. All of these depend on public sector rice varieties and most of them indent to ANGRAU for breeder seed. Some prefer to purchase foundation seed from other companies rather than produce it themselves. This may reduce their flexibility, because foundation seed of particular varieties may not always be available.

Table 3.1
Nature of private rice seed industry in AP, 1998

Rice seed activity	
Total seed sale	19,370 tonnes
Proportion of certified seed	42%
Proportion of total seed sold in	
Kharif	57%
Rabi	43%
Proportion of total seed sold in	
Coastal AP	33%
Rayalaseema	16%
Telangana	51 %
Number of companies	
Owning seed processing unit	18
Producing other seed types	19
Producing hybrid rice seed	4

Note: based on survey of 23 private seed companies.

All the companies organise seed multiplication through contract seed growers. Company staff may contract the farmers directly, but they often work through organisers with contacts in villages, who take responsibility for identifying and supervising the growers. The company contracts the organiser to deliver a specified quantity of seed. Some organisers have their own seed cleaning and storage facilities and offer this service to the companies. Much of the private rice seed production takes place in northern Telangana. Although this is also an

important rice-growing area, much of the seed is transported to the delta region. There are also a number of private rice seed producers on the coast, closer to the major rice-growing area. Their close contact with farmers and their lower transportation costs are counterbalanced by the generally less favourable seed production environment. There are also instances of rice seed producers in the southern part of AP, many of whom also produce other seeds such as hybrid cotton.

Once the seed has been produced it must be cleaned, bagged and stored. Many seed companies have their own seed conditioning facilities, but in an area such as northern Telangana the concentration of companies means that it is also easy to rent these facilities.

The companies usually sell their seed through a network of distributors and dealers. The dealers make various arrangements with the companies; in some cases they may be allowed to return unsold seed, but the amount of seed provided under these conditions is limited. Various arrangements are also made with regard to transportation costs. When dealers are unable to obtain sufficient quantities of seed they may contact producers and small companies in the principal seed-growing regions.

Seed dealers often sell rice seed for more than one company; a large dealer may sell seed from two or three private companies and for the APSSDC, for instance. The dealers are fairly knowledgeable about the seed companies they represent and choose these companies on the basis of seed quality, reliability, and the mark-up they are permitted. Farmers with complaints about seed quality often take them first to dealers, who are likely to base their future choice of company on this experience. The dealers are generally well informed about the names and characteristics of the varieties they are selling, but the private companies make no effort to advertise or promote particular varieties. A typical dealer's shop is full of banners, posters, calendars, and other promotional material for private hybrids (of proprietary and sometimes public origin), but there is no indication of the varieties of rice seed available for sale (or of the producing companies). Dealers say that it is very rare for a farmer to ask advice about rice varieties; the vast majority of them arrive at the shop knowing what they want to purchase. Some dealers report that companies solicit feedback regarding the prospects or performance of particular rice varieties, but this is not common.

A number of factors have facilitated the growth of the private rice seed industry in AP. Most important has been the presence of well-established commercial seed producers for other craps, particularly hybrids. It has been relatively easy for these companies to expand into rice. In addition, there have been opportunities for new entrants. Some contract seed growers have used their experience to develop their own small enterprises. Some organisers who began their careers as intermediaries between the companies and the growers have also expanded into independent seed production. In addition, there are cases of dealers taking advantage of their contacts and knowledge to initiate seed production.

These opportunities for the development of a diverse commercial seed sector have been helped by the availability of information. Any potential producer finds it relatively easy to learn about and obtain source seed, through the university's indent system for breeder seed or through the commercial market for foundation seed. Seed conditioning is facilitated by a rental market in cleaning and storage facilities, at least in the major areas of seed production. A large number of knowledgeable dealers provide a ready outlet for good quality seed. Finally, many farmers in AP are keen observers of the public plant breeding system and are aware of the varieties that are available. This contributes to a clear demand that can be transmitted to the seed companies.

3.3 Co-operatives (The discussion in this section is based on the co-operatives interviewed for the study (see Appendix II)

There are many agricultural co-operative societies in AP established under the nationwide co-operative movement. These co-operatives were primarily established to cater for the input and credit needs of member farmers. A fairly large number of them began the sale of rice seed produced by the public seed agencies and continued to do so for a long time; but

relatively few (about a dozen) diversified into production of seed themselves. The method of entry into rice seed production and the size of the seed business broadly characterise the typologies of seed co-operatives. A very few have a long history of seed production. These are relatively advanced and large societies in terms of rice seed business. For example, one co-operative in the Telangana region had been in seed production since 1968 as a contract producer for the NSC and some private companies; it started its own seed production and sale later on. Most of the co-operatives have entered the rice seed business since 1989 following political intervention, and most of them are located in the delta region. These societies were expected to produce rice seed for the APSSDC with the aim of decentralising its seed production. The National Co-operative Development Council, the top co-operative body, helped to acquire seed processing units for these societies. However, the societies found it more attractive to organise their rice seed business independently, rather than acting as satellite seed production centres for the APSSDC. Now rice seed is their most important activity in terms of contribution to the total turnover. The societies in the third category are large in size and rice seed represents a relatively small proportion of their activities. For example, the HACA undertakes statewide operations and helps arrange seed production for affiliated co-operatives, and KRIBHCO has a nationwide presence in chemical fertilisers.

As regards seed the co-operatives deal only with rice, which is not connected with any of the other activities they undertake. Entire seed activities from placing indents for breeder seed to seed sale are often managed by a technical consultant, such as a former DoA official. One society in the Telangana region employed about three officers to supervise its seed activities. Most of the seed co-operatives acquire breeder seed by placing indents with public research programmes, and produce their own foundation seed. Foundation and commercial seed are multiplied through contract growers, who are not necessarily members of the societies. These growers are chosen according to the suitability of their land for seed production, the availability of irrigation facilities and the farmers' willingness and experience in seed production. In fact, some of the growers were previously growing seed for the APSSDC, and have now shifted to the co-operatives because they find it easier to deal with the society located close to their village.

The rice seed produced by co-operatives is usually certified, and TLS seed is produced for varieties at the advanced stage of testing like MTU 1010. However, one society produces mostly TLS, preferring to rely on its reputation as a guarantee of seed quality. The average quantity of seed produced and sold by a society in 1998/99 ranged from 700 to 3,000 tonnes, and the total rice seed produced by our sample of 9 co-operatives (Appendix II) accounted to about 8,000 tonnes. Popular varieties form the bulk of the production and the seed of new varieties is produced in small quantities. This pattern is more or less uniform across the co-operatives located in a particular production region. None of the societies reported any problems either in the acquisition of breeder seed or the certification of commercial seed.

Table 3.2
Elements of rice seed provision by co-operatives

Elements	Main characteristics	Remarks
Acquisition of source seed	Indent to ANGRAU and NSP	Some co-operatives buy foundation seed
Seed multiplication	Foundation and certified seed with contract seed growers	Some contract growers previously produced for APSSDC
Quality control	in-house: Seed germination test by society Formal: seed certification	Greater emphasis on seed germination and moisture content
Conditioning Storage	Own seed processing plant Use existing facilities, some societies are acquiring new facilities	Adequate capacity Needs improvement in some cases
Marketing	Direct seed sale to farmers, sale through PACS and private seed dealers	No preference for members, less emphasis on variety information and brand image

All the co-operatives interviewed, except the HACA, have their own seed processing plants. In fact, a few of them have more than one processing plant located in distant places. In some years the processing facility is made available to the APSSDC and private seed companies on a custom hiring basis. If required, some small co-operatives hire the processing facility from the APSSDC, private companies or large co-operatives. Since most seed production takes place in Man/and seed is stored till the next *kharif* season, existing storage facilities (for the storage of fertilisers and other inputs) are renovated to provide sufficient ventilation and used for seed storage. Some societies have acquired new seed storage facilities and improved processing units. The stacks of seed bags are moved frequently to keep the moisture content within limits, and the quality is regularly monitored (often fortnightly) by carrying out a seed germination test.

Seed sale is mostly confined to the district where the society is located and in some cases to neighbouring districts. The seed is largely sold through the PACS, but some is also sold through private dealers and the society's sales counter on its premises. The Mulkanoor Co-operative in northern Telangana is an exception, relying heavily on a network of private dealers for its seed marketing. One month's credit is allowed to the PACS on the sale of seed. The seed is sold to all farmers, irrespective of their membership of the society. None of the societies so far had any problem with seed inspection so far at the point of sale.

The co-operatives are good examples of the decentralisation of rice seed provision. However, this activity is an addition to their business and is not directed to their members. The technical consultants appear to be overburdened, as they are responsible for the acquisition of information and source seed, and the supervision of production, processing and marketing of seed. The co-operatives have adequate incentives to be in the rice seed business, but there seems to be little scope for further expansion of their seed business.

3.4 Farmers

In addition to farmer-to-farmer exchange of seed, there are many large and progressive farmers who regularly produce and sell rice seed. Some of them are contract seed growers for the APSSDC, private companies or cooperatives. A part of the seed produced, which is not acquired by the seed agency, is sold to other farmers. There are a number of other cases where farmers buy the foundation seed either from the APSSDC or a research station, and produce second-generation seed. It is important to note that these seed farmers are not registered, and their seed is therefore sold without a brand name. But neighbouring farmers

regard them as an important source of reliable seed, thus indicating that some quality standards are maintained.

There are two major preconditions for the sustainability of seed production by farmers. First, there should be easy access to good quality source seed, and secondly, there should be sufficient demand for seed. At present these conditions appear to exist, particularly in the delta region, and there is reason to believe that a significant number of farmers will continue to produce and sell rice seed.

3.5 Attempts at Decentralisation

In an attempt to decentralise the rice seed system in AP, the Seed Village Programme was started by the DoA in the early 1990s. The main objective of this programme is to involve farmers in seed production, and thereby make quality seed available at a reasonable price within the village. The programme is implemented jointly by the DoA, the APSSDC and ANGRAU. The APSSDC and the research stations of ANGRAU are asked to provide an adequate quantity of foundation seed for the programme(APSSDC made 558 tonnes of foundation seed available for the programme in kharif 1998.). The DoA is responsible for: (i) identifying farmers willing to participate in the programme, (ii) arranging the supply of foundation seed, (iii) providing technical guidance to farmers regarding seed production by visiting seed plots during the period of crop growth, and (iv) disseminating information to other farmers regarding the availability of seed. The farmers are free to sell their seed to fellow farmers within or outside the village. The programme is more vigorously implemented in the delta region where the seed turnover rate is very high.

The concept is innovative, but it ignores certain basic realities. Consequently, the programme has failed to make the desired impact because of problems encountered in its implementation. The first concern is that the programme does not always ensure that farmers obtain seed of the variety of their choice. The farmers participating in the programme therefore only have an incentive to get hold of quality foundation seed which is expected to give a slightly higher yield. Secondly, it is unlikely that the participant farmers will store the seed until the next season due to lack of funds. Even if some farmers do, there is no guarantee that most of the stock will be sold as seed. What is happening is that most of the produce is sold as grain immediately after harvesting. In the years of high demand for seed, local moneylenders or traders purchase the produce for sale later on as seed. The DoA is aware of these limitations and may be planning to address them. But the hard fact is that this programme is attempting to do what the farmers are already doing. Any attempt to go beyond this requires substantial resources, and the farmers who have the resources are successfully venturing into formal rice seed business on their own behalf.

Another form of decentralisation could be through the participation of private voluntary groups or non-governmental organisations (NGOs) in the provision of seed at local/community level. However, there is not much NGO activity in rice seed in AP. The MANAGE and DRR made some efforts to train one NGO {running a *Krishi Vigyan Kendra* or farmers' training centre) in hybrid rice seed production technology; the NGO would, in turn, train farmers. But the momentum was lost because of the limited adoption of hybrid rice. One offshoot of this activity was that the farmers found that a mate restorer line (IR 40750) they were taught to use performed well in both seasons and had good grain quality. The line was popularly known as *moga* or 'male', and some farmers specialised in its seed production and selling it locally. This example underscores the niche that exists for decentralised variety testing and seed production, which can be facilitated by local NGOs.

3.6 The Public-Private Interface

The foregoing discussion clearly highlights a greater degree of public-private interface in the provision of rice seed. This section outlines the conditions facilitating such an interface, and examines its sustainability. Table 3.3 indicates the existence of a number of conditions pertaining to incentives, comparative advantage and regulatory framework reinforcing the public-private interface. All the elements or functions of seed provision involve some degree

of interface between the public and private sectors. This is particularly noteworthy in the provision of source seed, where the main facilitating factors are open access to public varieties and a transparent mechanism for acquiring the seed. The ICAR has taken further initiatives to foster the interface by developing mechanisms for sharing resources, improving private sector access to the products of public research institutions, encouraging public-private joint programmes and involving the private sector's participation in policy-making (Pal and Joshi, 1999).

Since both sectors have incentives (the public sector to make a wider research impact and the private sector to commercialise public varieties), such an interface is likely to be sustainable.

The interface is also seen in seed conditioning and quality control. The contract sharing of processing facilities is certainly an encouraging feature. But the seed agencies argue for some liberalised form of seed certification. Seed companies have the incentive to maintain seed quality and improve brand reputation, although (as we show in the next chapter) they still have much work to do. The government has the responsibility of enforcing seed quality standards. It is important that these elements of quality control are embedded in a regulatory framework without affecting the system's efficiency adversely.

A major weakness in the interface is the inadequate attention paid by private seed companies to promote new rice varieties. In fact, as is seen in the next chapter, the formal seed system is less effective in delivering the seed of new varieties and information about them. As of now, private seed companies do not have commercial incentives to invest in the promotion of new varieties. As and when hybrid rice is widely adopted, there will be an increasing participation on the part of private seed companies in the delivery of seed and information on rice hybrids because of the higher incentives in proprietary hybrids. In the case of non-hybrid rice, there could be two options, (i) The protection of plant varieties, to be enacted and implemented shortly in India, may provide some incentives to the private sector, leading to private investment in variety development. This will be largely influenced by the companies' perception of the potential seed demand, even if farmers are allowed to use farm-saved seed and to exchange seed with fellow farmers, (ii) Another possibility could be to assign exclusive marketing rights of public varieties to private seed companies, which would then presumably invest more in variety promotion. But the second option could lead to some kind of monopoly situation in the seed market, and therefore may not be a reality in the near future. Irrespective of how events unfold, the public sector has to assume greater responsibility for the dissemination of seed information by strengthening its on-going programmes such as seed minikits. Another possibility could be to involve private seed companies, NGOs, farmers and extension agencies in variety testing.

Table 3.3
Public-private Interface in the provision of rice seed

Elements	Nature of interface	Sustainability
Acquisition of source seed	• Open access to public varieties • Supply of source seed by the public sector • Commercial sale of foundation seed by public seed agencies	• The public sector has the incentive of wider technology impact • Resource generation by the public sector • Provision under seed law • Transparent mechanism to acquire source seed
Seed multiplication	Training of private sector personnel in seed production techniques by public research institutions	Increasing understanding of private sector as potential client of public research products
Quality control	Extending public seed certification and testing services to private seed agencies	• Provision under seed law, but seed agencies argue for liberal procedure • Incentive of subsidy on certified seed of 'new' variety
Conditioning and storage	Private processing of public agency's seed on contract basis and wee versa	• Incentive of increasing market share in seed sale • Utilise excess seed processing capacity
Marketing	• Private sale (by seed dealers) of public agency's seed • Trade in commercial seed between public and private seed agencies	• Commercial incentive for the private sector • Public sector to bridge seed demand-supply gap
Seed information	Private delivery of information of varieties through television and farm magazine	• Private media to cover programmes/ information of public (including farmers) interest • Private sector unlikely to promote new varieties

Note: Rice variety development is exclusively in the public domain. However, there is a public-private joint research programme on hybrid rice, and there are several private seed companies using public lines in their research programme on hybrid rice.

4 Farm-Level Rice Seed Management

INFORMATION on the acquisition and management of seed by farmers indicates how effectively they are being served by the formal seed system, and gives an idea of what can be done to improve the performance of the system. This chapter first provides a brief profile of the study area and then discusses sources of rice seed, farmers' seed management practices and information flow about seed. These findings are based on a survey of 286 farmers carried out during the rabi season in early 1999.

The state of AP is endowed with diverse agro-climatic conditions, making it possible to grow rice in different seasons with varying management practices. To capture this diversity the farm survey was conducted in three districts representing different production environments: namely, East Godavari, Mahboobnagar and Srikakulum, East Godavari is located in the fertile delta region of the Krishna and Godavari rivers, and rice is grown here in both the *kharif* and *rabi* seasons under canal irrigation and with an intensive use of inputs. Long-duration varieties are grown in the *kharif* 'season, whereas short-duration varieties are suitable for the rabi season. This delta region Is considered to be the rice bowl of AP, and all seed agencies, including private companies, are therefore very active in this area. Mahboobnagar is comparatively dry and rice is grown in the *kharif* and, to a lesser extent, in the *rabi* seasons under tank or tubewell irrigation. Rice accounts for only about 10% of the cropped area in the district. Mahboobnagar is very close to the commercial seed-producing areas of AP, and many private seed companies are therefore active in this area. Srikakulum is the northernmost coastal district in AP and is rather isolated from the private seed companies. Rice is grown only in the *kharif* season under various types of tank, tubewell and occasionally canal irrigation, and the growing conditions tend to be more varied than in the other two districts.

For the selection of farmers for the sample, a three-stage random sampling procedure was followed. In the first stage, five revenue *mandate* (group of revenue villages) were selected at random from each district. In the second stage, two villages were selected at random from each *mandal.* A list of farmers was obtained from the *mandal* revenue office, and ten farmers were selected at random so as to represent various categories of size of holding in the sample. The list of sample farmers was further discussed with the relevant village revenue officer to ascertain the representativeness of the sample. The data were collected with the help of a pre-tested questionnaire by means of personal interviews with the head of farm household or the person actually managing farm operations. The data relate to the seasons of *kharif* 1998 and *rabi* 1999. The district results are discussed in three subsections, namely, sources of seed, choice of variety and seed quality.

4.1 Sources of Rice Seed

The source of rice seed for the varieties currently grown by the sample farmers was recorded. As seen from Table 4.1, most of them in East Godavari and Mahboobnagar districts acquired seed from commercial shops (or co-operatives or the APSSDC sales counter). However, in Srikakulum fellow farmers were the major source of seed procured off-farm. Quite a few farmers, particularly in East Godavari and Mahboobnagar distil .s, also purchased seed from research stations or the extension department. If given a choice, the majority of farmers say they would prefer to buy rice seed from a shop, except in Srikakulum where they rely more on other farmers for seed. They believe that the quality of fresh seed acquired from commercial sources is much better than farm-saved seed. Farmers also buy fresh seed when they want to change to another variety, whether old or new, particularly in Srikakulum and East Godavari districts.

Table 4.1 further shows that the proportion of farm-saved seed is very low and only 20-40 % of the seed used in 1998/99 was saved from the previous harvest. A further analysis of seed age indicates that very little seed is recycled for more than 2 years. In fact, three-quarters or

more of the seed used in *kharif* 1998 in East Godavari and Mahboobnagar districts was fresh seed. There are several reasons for this high seed turnover rate. As mentioned above, varieties grown in the *kharif* season cannot be grown in the *rabi* in the delta region, and farmers therefore have to store seed for a year, which is very difficult because of the high humidity which affects seed germination adversely. Also, a frequent recycling of seed requires careful field management and access to a clean threshing area in order to avoid significant yield loss due to problems of off-types and mixtures. Farmers also believe that the yield declines significantly when seed is recycled because of deterioration in its quality. As shown in Table 4.2, many fanners estimate that rice yield declines by 13-17% if the seed is saved for one season and planted in the same field. The decline in yield is more drastic (21-28%) for every subsequent seed recycling. However, the proportion of farmers indicating a decline in rice yield is comparatively smaller in East Godavari. The most frequently cited reasons for a decline in yield are problems of off-types, loss of seed vigour, loss of pest tolerance, poor conditioning of farm-saved seed and a decrease in the response to soil conditions.

Seed turnover rate is high also because of attractive commercial incentives. The seed price is marginally higher than the grain price at sowing time and the share of seed cost in operational costs of rice production is only 5%(Depending upon the variety, the seed price (including subsidy) varied from Rs 9.5 to Rs13 per kg in 1998/99. The seed cost is for the state as a whole (source: Reports of the CACP, 1998/99).).It can be shown that even if we take seed prices as twice grain price, farmers can earn a marginal rate of return of £ 30%, assuming an average paddy yield of 3 tonnes/ha, 15% yield advantage of fresh seed and 50 kg/ha seeding rate. The marginal rate of return will be 200% if the price ratio is increased to

4. Thus, the seed agencies make a profit by supplying fresh seed and farmers get additional returns by using fresh seed every year.

Table 4.1
Source of rice seed

	Srikakulum	East Godavari	Mahboobnagar
(i) Original source of seed (% of cases)			
Other farmers	61	34	37
Shops	31	56	59
Research station or extension dept.	8	8	2
Other	<1	2	3
(N)	(234)	(248)	(192)
(ii) Farmers' preference for seed source (% of farmers)			
Shop	47	72	69
Farmer	53	28	31
(iii) % of seed acquired in			
1998	45	85	74
1996-97	27	13	23
1995 or earlier	27	2	3
(iv) % of farm-saved seed			
Kharif 98	40	20	29
Rabi 98/99	-	33	31
(y) Reasons for acquiring fresh seed (% of cases)			
Consumed/sold all stocks	11	4	7
Seed quality	28	58	85
New variety	61	36	8

N is number of cases of seed acquisition.

All rice seed acquired from commercial sources is purchased for cash. However, there is some variation in the methods of acquiring seed from other farmers {Table 4.3). In East Godavari the seed acquired from another farmer is also purchased for cash, but other methods of acquisition like seed exchange and seed loans are common in the other two districts. The traditional method of seed-grain exchange is quite reasonable, although it is followed in only a few cases in Srikakulum district. A farmer can exchange seed from another farmer with an equal quantity of grain at sowing time. Under the loan method the farmer borrowing seed repays at the time of harvest with 150 % of the seed quantity, and this method is followed in about half the seed transactions in Mahboobnagar district. These results indicate that traditional methods of seed acquisition by farmers are rapidly being replaced by cash transactions.

Table 4.2
Farmers' perceptions of yield decline in farm saved seed

	Srikakulum	East Godavari	Mahboolbnagar
If seed saved one season			
No. of farmers who say no yield decline	29(35%}	64(65%)	9(17%)
For farmers who say yield declines, average % decline	13	13	17
If seed saved two seasons			
No. of farmers who say no yield decline	25(30%)	32(33%)	2(3%)
For farmers who say yield declines, average % decline	23	21	28

Table 4.3
Method of seed acquisition from other farmers

	Srikakulum	East Godavari	Mahboobnagar
Proportion of seed that is purchased	66	94	54
Other important methods	Seed exchange (often for ensuring higher yield)		Seed loans (usually repay at harvest with 150% of loan)

4.2 Choice of Variety

Farmers' choice of variety is governed by a number of factors relating to agro-ecology, grain quality, pest tolerance and the economic characteristics of a variety. As noted earlier, farmers in general prefer long-duration varieties in the *kharif* season and short-duration varieties in the *rabi* season. A very few varieties, like IR 64 and MTU 1001, are grown in both seasons. Farmers have a strong preference for superior grain quality and therefore some of the very old varieties like BPT 5204 (Samba Masuri) are still very popular in the Telangana region. In fact, the low acceptance of hybrid rice, in spite of its significant yield advantage, is attributed to its inferior grain quality. In the coastal areas where heavy rains and strong winds are common, farmers prefer lodging-resistant varieties. The success of Swarna (MTU 7029) in coastal areas is because of its better grain quality and lodging resistance. As shown in Table 4.4, Swarna occupies about half of the *kharif rice* area in East Godavari and 40 % in Srikakulum. In Mahboobnagar crop lodging is not a major problem and therefore taller varieties, particularly BPT 5204 (with fine grain quality) and Tella Hamsa (RNR 10754) (preferred for its yield and fodder quality), are the leading varieties in the *kharif (64 %* area) and *rabi* (84 % area) seasons, respectively.

Earlier IR 64 was the dominant variety for the *rabi* season in much of AP. It is now almost completely replaced by MTU 1001 and MTU 1010 and- the spread of these two varieties is very fast in the coastal delta area. To be more precise, MTU 1010 is still under minikit testing but it has covered almost one-quarter of the *rabi* rice area in East Godavari district (Table 4.4).

In addition to a few dominant varieties, several other varieties occupy quite a large area. The RGL varieties (developed by Ragolu research station) are commonly adopted in Srikakulum, whereas MTU varieties (developed by Morteru research station) are common in East Godavari, and MTU and WGL varieties (developed by Warangal research station) in Mahboobnagar. A majority of the sample farmers were able to recall the varieties by name, but a few only knew the name of the research station that developed the variety, or could only describe the characteristics of the variety. For example, MTU 7029 is also known as 'short masuri' and BPT 5204 as 'tall masuri'. In Mahboobnagar, the majority of farmers growing BPT 5204 know it only as 'BPT' (Bapatla research station). Similarly, RGL 2537 and RGL 2538 are called *'Podugu* or long CR' and 'Potti or short CR', respectively. The farmers use the term 'CR' because these varieties appear similar to earlier varieties they grew from the Central Rice Research Institute.

Variety concentration

Table 4.5 gives the proportion of the rice area accounted for by the number of varieties in the *kharif* and *rabi* seasons separately. It clearly shows that there is considerable concentration on a few varieties, despite the large number of varieties available to farmers. Except for *kharif* rice in Srikakulum and East Godavari districts, almost the entire rice area is covered by three varieties in both seasons. The concentration is even stronger in Mahboobnagar having about 90 % of the area under two varieties in both seasons. A comparison between the seasons reveals that variety concentration is much stronger in the *rabi* season. A single variety occupied 64 % and 84 % of the *rabi* rice area in East Godavari and Mahboobnagar districts, respectively. Thus, there appears to be a significant concentration on a few varieties, which may indicates that farmers have insufficient information to take full advantage of the wide range of MVs available.

Table 4.4
Rice variety use by district and season*(in acres)*

	Srikakulum[$]		East Godavari				Mahboobnagar			
	Kharif		Kharif		Rabi		Kharif		Rabi	
MTU 1001*	115.7	(23.6)	100.1	(20.0)	326.9	(64.0)	9.0	(1.8)	-	
MTU 1008*	-		90.6	(18.1)	0.5	(0.1)	-		-	
MTU 1010*	-		14.3	(2.9)	119.2	(23.3)	-		-	
MTU 2077	-		16.9	(3.4)	-		-		-	
MTU 7029 (Swarna)	196.7	(40.2)	238.6	(47.7)	-		-		-	
BPT	-		-		-		320.0	(63.8)	-	
BPT3291 (Sona Masuri)	14.5	(3.0)	-		-		-		-	
'Masuri'	43.3	(8.8)	-		-			-		-
IR64	-		0.4	(0.0)	40.8	(8.0)	11.0	(2.2)	14.0	(3.7)
RGL (unknown)*	10.9	(2.2)	-		-		-		-	
RGL 2537*	62.4	(12.7)	-		-		-			
RGL 2538*	14.5	(3.0)	-		-		-		-	
RGL1746(Vamshi)	14.8	(3.0)	-		-		-		-	
Telia Hamsa	-		-		-		145.0	(28.9)	317.8	(84.2)
WGL 48684 (Kavya)*	-		-		-		6.0	(1.2)	18.5	(4.9)
Other new varieties*	2.0	(0.4)	-		-		2.0	(0.4)	11.0	(2.9)
Other old varieties	-		-		-		18.8	(1.8)	16.1	(4.3)
Other old or unknown	15.0	(3.1)	39.3	(7-9)	23.2	(4.5)	-		-	
varieties			'•.							
Total	489.8	(100)	500.2	(100)	510.6	(100)	501.8	(100)	377.4	(100)

$ Rice is grown only in Kharif season;
* New varieties, released after 1990; Figures in parentheses are percentage or the total nee area in the season.

Table 4.5
Variety concentration

Proportion of area accounted for by	Srikakulum	East Godavari		Mahboobnagar	
	Kharif	Rabi	Kharif	Kharif	*Rabi*
One variety	40	48	64	64	&4
Two varieties	64	68	87	93	89
Three varieties	77	86	95	S5	93

Use of new varieties

There is no standard definition of a new variety. Considering the time-lag in the dissemination of information and the fanners' response, we have somewhat arbitrarily taken varieties released after 1990 as new varieties. Here the focus of analysis is on the proportion of the rice area under new varieties, the source of their seed and the organisations having incentives for the promotion of new varieties. As shown in Fig. 4.1, about 40 % of the rice area in *kharif* is under new varieties in Srikakulum and East Godavari districts. The corresponding area in *rabi* is remarkably high (87 %) in East Godavari. However, farmers still prefer to grow old varieties in both seasons in Mahboobnagar district. Telia Hamsa was released in 1971 and Samba Masuri in 1982. Here it may be noted that the state government provides a subsidy of Rs 2/kg on the seed of 'recently' released varieties to promote their adoption. This scheme does not have any impact at least in Mahboobnagar. Even in East Godavari the adoption of new varieties is mainly because of their desirable characteristics rather than price incentives.

The data on the production and sale of seed of new varieties by commercial seed agencies are quite revealing. The proportion of new varieties in indents of breeder seed placed by commercial agencies ranged from 15 to 33 % during the years 1997-99. Among the seed agencies, the lowest indent was placed by private seed companies {Fig. 4.2a). In terms of seed sales, 'new' varieties formed about one-quarter of the total sales by private and co-operative seed agencies, The share was-as low as 11 % for the APSSDC (Fig. 4.2b). These figures are much lower than the actual area under new varieties in farmers' fields. On the other hand, the proportion of new varieties in farmer-to-farmer seed sales was 59%. Furthermore, the principal reason put forward by the survey farmers for obtaining seed from their fellow farmers was to obtain a new variety, while commercial sources were preferred for the seed of old varieties mainly because of its better quality (Table 4.6).

Fig. 4.1 Percentage of area under 'new' varieties

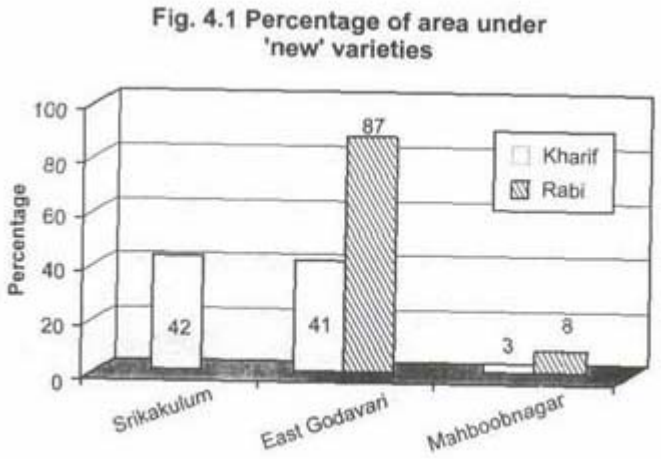


Fig. 4.2a Share of 'new' varieties in breeder seed indents

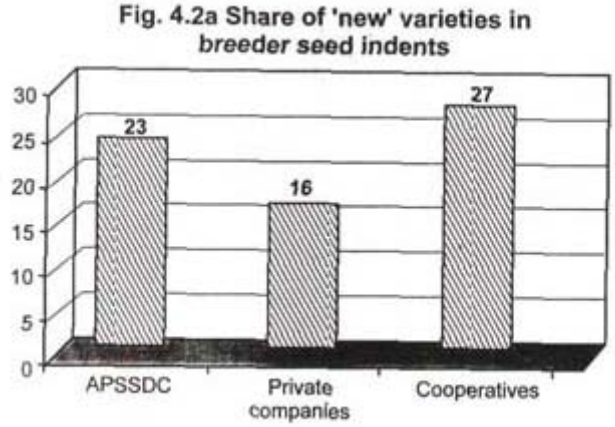
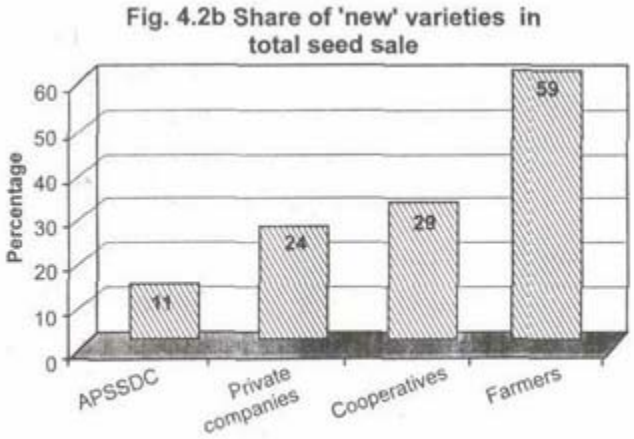


Fig. 4.2b Share of 'new' varieties in total seed sale



Note : (i) APSSDE average seed sales in 1997 and 98 in the three sample districts
(ii) data for private companies and cooperatives are for both the seasons in 1998-99
Source: APSSDC records and survey data

Table 4.6
Source and reason for acquiring seed of old and new varieties

(% of cases)

	Srikakulum	East Godavari	Mahboobnagar
(i) Source of seed			
New varieties			
Another Farmer	73	41	64
	21	48	36
Shop			
Old varieties			
Another Farmer	48	25	34
	41	68	61
Shop			
(ii) Reasons for acquiring seed (by source of seed)			
To get a new variety			
Farmer	70	46	56
Shop	25	40	38
To get a better quality seed			
Farmers	42	27	32
Shop	43	64	63

During the survey of small seed enterprises, we found some large progressive farmers producing and selling the seed of new varieties. These farmers have a good rapport with the research station and there was no problem in acquiring the foundation seed. These results therefore demonstrate that the dissemination of new varieties takes place more through farmer-to-farmer spread of seed, while the commercial agencies are less likely to risk production of new varieties until demand is well established. This is a deficiency in the formal seed system, which needs appropriate intervention to avoid a substantial loss to society through delay in the adoption of a new promising variety.

Sources of information

One of the indicators of a competitive seed system is the quality of information flow, and it is therefore important to know how farmers learn about varieties, and how their responses feed back to plant breeders. The latter is the responsibility of the government's line department which is expected to implement the minikit programme and provide feedback to plant breeders. Unfortunately, interviews with several leading researchers indicated that performance on this count is far from satisfactory. Whatever feedback researchers get comes via direct distribution of seed to farmers or field days organised by research institutions.

As regards information on varieties, the most important source of information about the varieties currently grown by farmers was another farmer (72 to 86 % of cases). Extension is responsible for delivering the information in less than one-quarter of cases. Farmers are more likely to see a new variety in another farmer's field, and in a significant number of cases (22-33 %) a new variety was planted without its having been seen growing (Table 4.7). Farmers were also asked about sources of information on rice varieties they knew (irrespective of whether they are currently grown or not). Less than half recalled hearing or reading about a rice variety in the mass media (television, radio or the press), and these were often older varieties, except in East Godavari where 63 % of the varieties that farmers recalled were new. A small proportion of the farmers (17 % or less) had attended a demonstration or grown a minikit, indicating a limited flow of information through these two programmes, even taking account of the fact that it is not possible for them to cover every village because of lack of resources.

An important source of information could be seed dealers, particularly when private agencies are very active in the seed business. As discussed in Chapter 3, dealers did not pass on information about rice varieties to farmers and private companies did not encourage them to promote varieties. Furthermore, farmers do not regard seed dealers as a potential source of reliable formation (Fig. 4.3). This is in contrast to the hybrid seed market in pearl millet in Rajasthan where dealers are a fairly important source of information (Tripp and Pal, 1998). Here it is important to note that, in the case of pearl millet hybrids, there are strong incentives for private seed companies to promote proprietary hybrids. These incentives are completely missing in the rice seed system because the promotion of a public variety by a private company will benefit all its competitors as they are all selling seed of the same variety. Provision of information on varieties is therefore an activity of the public sector, which needs to be strengthened.

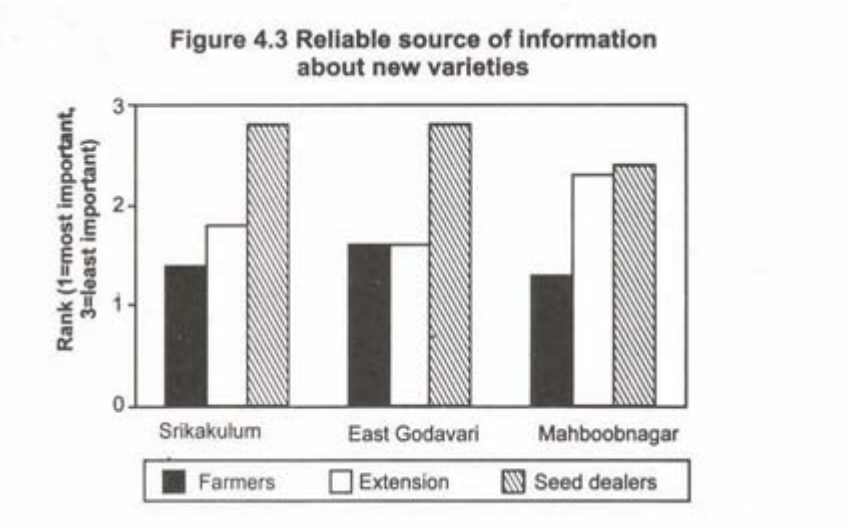
Table 4.7
Source of information of varieties

(in %)

	Srikakulum	East Godavari	Mahboobnagar
(i) Source of information of current varieties			
Another farmer	72	74	86
Extension	26	21	6
Other	2	5	8
(N)	(226)	(245)	(170)
(it) Where farmers first saw their current varieties			
In another farmer's field	77	64	77
Did not see before planting	22 1	33 3	23 0
Demonstration	1	3	0
(N)	(226)	(244)	(168)
(iii) Sources of information about varieties			
Farmers who have heard of a variety through newspaper, radio or TV	27	34	41
Proportion of varieties recalled from media that are new	11	63	36
Farmers attending a variety demonstration since 1993	6	17	0
Farmers receiving a minikit since 1990	6	11	5
(iv) Farmer complaints about lack of seed availability			
Proportion of farmers who report being unable to find seed	26	8	12
Most frequent varieties	Swarna, RGLs	Swarna, MTU 1001	Tella
Hamsa sought			

N is number of cases (varieties)

Figure 4.3 Reliable source of Information about new varieties



4.3 Seed Quality

The participants in the seed quality control process are shown in Fig. 4.4. According to the traditional view of seed system regulation, the main responsibility for ensuring the quality of seed lies with the government or the public seed certification agency. But as the seed system becomes more competitive and mature, other processes like the quality control measures of seed producers and dealers gain increasing importance. Both public and private seed agencies have incentives to ensure the quality of their seed in order to maintain their reputation and increase sales. A well-functioning regulatory system also requires that farmers should be able to identify actors in the seed system and make assessments about the quality of seed supplied by them. The public sector adopts a facilitating role and enforces regulations to deal with unscrupulous firms or dealers supplying spurious seed. This section assesses farmers' knowledge about the seed system and formal quality control mechanisms in this framework.

Figure 4.4
Participants in seed quality regulatory process

Farmers' knowledge of seed companies

Table 4.8 shows farmers' knowledge of rice seed agencies. It is noteworthy that the majority of farmers buying rice seed from shops do not know the name of the company (private, APSSDC or co-operative) producing the seed. In only about one-quarter of the cases in East Godavari and Mahboobnagar districts were the farmers able to identify the APSSDC. This is quite surprising as the APSSDC has been in existence since 1976, and for a long time it was the sole agency dealing in rice seed. When farmers were further asked to give the names of companies dealing in rice seed, relatively few could provide the name of one or two companies. Farmers' knowledge of company names can be positively correlated with their level of education. In this study, farmers giving the names of at least 2 companies had an average schooling of 11 years, as against 6 years for those responding negatively, and the difference was statistically significant.

In a similar study in Rajasthan on pearl millet seed (Tripp and Pal, 1998), a minority of farmers were able to identify both the hybrid and the company for the seed they purchased, but the company names were better known than the names of hybrids. To be more precise, 76 % of the farmers in the developed pearl millet-growing area (Behror) knew the company name for seed purchased. The two examples of rice and pearl millet seed markets with contrasting evidence on farmers' knowledge of company names require some further discussion. It seems that there is not much difference in the quality of rice seed sold by various seed companies. It is more likely that farmers would remember the name of a company if its seed quality was superior or inferior to others. This finding is further supported by the fact that about half or more of the farmers do not believe it is very important to buy seed from a dealer they know {Table 4.8). Had there been differences in rice seed quality supplied by the various agencies, farmers would have preferred a particular company or a dealer they knew. An alternative reason could be that seed companies are not paying much attention to promoting their brand name in rice seed.

Table 4.8
Farmers' knowledge of rice seed companies

(in %)

	Srikakulum	East Godavari	Mahboobnagar
(i) Identification of seed company for purchased seed			
APSSDC	9	23	25
Other companies	3	12	6
Does not know name	89	64	69
(N)	(70)	(137)	(113)
(ii) Knowledge of seed company names			
Proportion of farmers able to name			
At least 1 company	4	27	27
At least 2 companies	1	13	12
(iii) How important is it to buy seed from a dealer that you know			
Very important	26	22	28
Somewhat important	16	29	-
Not important	58	49	72
(iv) Knowledge of pearl millet hybrids, Rajasthan*			
	Shekhawati		**Behror**
Company and hybrid	23		10
Company only	35		76
Hybrid	18		1
Neither	24		13

N is number of farmers.
* Source: Tripp and Pal (1988)

Farmers' knowledge of formal quality control

The issues associated with farmers' knowledge of formal quality control procedures are awareness of seed certification and knowledge about institutions which redress grievances relating to poor seed quality. As evident from Table 4.9, more than 70 % of the farmers in our sample were not familiar with the blue certification tag sewn on the seed bag(Farmers' response was recorded by showing a photo of the certification tag to farmers.). Those who were able to identify the certification tag had nearly 9 years of schooling, as against 5 years for those responding negatively. The proportion of farmers able to explain the meaning of seed certification in terms of seed purity and germination was even lower.

Table 4.9 further shows that farmers often encountered quality problems in seed procured off-farm. About 15-34 % of the farmers reported having purchased bad quality rice seed (usually poor seed germination). The complaints are relatively more frequent with regard to seed purchased from shops rather than from other farmers. It is quite difficult to analyse these reported quality problems by type of seed (certified or TLS), but data on the point-of-sale inspection of seed by the DoA indicate that certified seed has no better record than TLS.

A majority of the farmers with quality complaints could not name the company that had supplied the seed, and in more than half the cases no formal complaint was made. In a relatively few cases, farmers made a complaint about poor seed quality either to a seed dealer or the DoA. To probe this issue further, farmers were asked about where they could complain about quality problems, and the majority of them, in fact three-quarters of the farmers in Srikakulum and Mahboobnagar districts, said they did not know. The most frequent positive responses concerned seed dealers and the DoA, and not a single farmer mentioned the Consumer Forum.

Quality of local seed

As noted earlier, a significant amount of seed is acquired from fellow farmers. It is important to know about the quality control measures used by farmers in this informal system {see Table 4.10). Of the total seed procured in 1998/99, 34-61 % was from other farmers. A significant number of farmers (15-39 %) reported regularly selling rice seed, and the average quantity sold by a farmer in a year ranged from 343 kg to 726 kg. About two-thirds of this seed was sold in *kharif,* and had been stored from the previous *kharif* harvest. The price premium obtained from purchases ranged from 23 to 35 %. In a majority of cases, seed was obtained within the village and farmers usually saw the crop in the field before acquiring seed.

Table 4.9 Farmers' knowledge of formal seed quality control

(in %)

	Srikakulum	East Godavari	Mahboobnagar
(i) What does the blue (certification) tag mean?			
Don't know	84	79	71
'Certified seed'	7	4	15
A guarantee of seed quality, germination, or both	9	14	14
(ii) If you purchased poor quality seed, to whom did you complain?			
No one	67	50	54
Dealer	6	40	26
Company	-	7	6
DOA	27	3	14
(N)	(18)	(30)	(35)
Proportion of farmers with at least one complaint	15	31	34
(iii) To whom can you complain about seed quality?			
Don't know	78	46	76
Dealers	6	32	13
Company	1	3	4
DOA	13	13	7
Other	-	5	-
(N)	(99)	(90)	(85)

N is number of farmers.

Furthermore, in 70 % of cases in East Godavari district the farmers conducted a seed germination test. This test was not particularly common in the other two districts. Only in a very few cases (9 % or less) did farmers acquire seed without having seen the crop in the field and/or having tested its germination, indicating that seed selection and quality parameters are well embedded in the informal seed system.

The results of the farm survey discussed above give some clear indications about the performance of the rice seed system, The system is quite diversified, competitive and effective in delivering seed to farmers, and the seed turnover rate is exceptionally high. But it has not been so effective in the promotion of new varieties and the provision of information about seed. In particular, there is a need to improve the information flow and provide consumer education. The next chapter is devoted to suggesting appropriate interventions to address these deficiencies.

Table 4.10
Farmers seed exchange and quality control

	Srikakulum	East Godavari	Mahboobnagar
(i) Farmer seed sellers			
Proportion of farmers who report selling seed	21	39	15
Average quantity reported (kg)	382	726	343
(ii) Quality problems with farmers-acquired seed			
Proportion of seed quality problems where farmer is seed source	38	11	13
Proportion of total seed acquisition from other farmers	61	34	37
(iii) Seed acquisition from another farmer			
Proportion of cases in which:			
Seed from same village	72	69	63
Saw field before acquire seed	78	49	84
Conduct germination test	20	70	11
None of these	7	9	5
(N)	(54)	(67)	(19)

N is number of cases of seed acquisition from other farmers.

5 Conclusions

THE rice seed system in AP has evolved through a number of changes over time. The most significant change has been the evolution of the private sector and its interface with the public sector. Private sector participation is particularly encouraged by the low marginal cost of getting into the rice seed business and the exceptionally high seed turnover rate. Open access to the source seed of public varieties and the low transaction costs of contracting seed growers, processing facilities and marketing agencies have facilitated the emergence of a wide range of private seed companies. These do not suffer any unfair competition from public seed agencies and all signs point to the growth of a healthy and competitive seed system. The presence of private companies by no means implies that the public agencies have a limited role in the provision of seed to farmers. Some key elements such as the development of varieties, the provision of seed information, the enforcement of regulations and even the supply of seed in marginal areas will require even greater participation of the public sector. This chapter discusses some of these issues and ways of addressing deficiencies in the seed system by mean of better co-ordination between the public and private sectors. Important areas identified for interventions are the promotion of new varieties, improving farmers' access to information, decentralisation of seed provision and seed quality control.

The delivery of new varieties

The rice seed system in AP is an example to the private delivery of public varieties. This worked well for old varieties, but there has been limited success in the delivery of seed and information with regard to new varieties. The question is how to promote new varieties and diversify the options available to farmers. Although the private sector is a valuable ally, it is unlikely to invest in the promotion of new varieties, as it has no incentives for doing so. Even strengthening intellectual property rights or protecting plant varieties may not attract the private sector in the development and promotion of varieties, since it may not find seed demand commensurate with investments in plant breeding research (unless there is an exceptionally high seed turnover rate, as observed in the delta region). It is also unlikely, at least in the near future, that public breeding programmes will assign the exclusive marketing rights of their varieties to a private seed agency for their promotion and seed sale, as this may encourage a monopoly element in the seed industry. The pragmatic approach would therefore be to allow the current trend to continue, and the public sector should focus more on the promotion of new varieties. One option currently followed by the government is to provide a subsidy for the seed of new varieties, but this has not been very effective. It would be better if efforts were made to increase the availability of source seed and minikits to various seed agencies (both public and private). It is also important to see that only superior materials possessing the characteristics desired by farmers are released so that seed agencies are not discouraged in promoting new varieties by a fear, of their non-acceptance by farmers. One way to address this problem is to involve farmers in variety testing and to strengthen the feedback of the minikit programme to plant breeders. Finally, efforts should be made to diversify the use of rice varieties in AP by testing varieties from other states.

Farmers' access to information

The performance of the rice seed system has been far from satisfactory in helping farmers to understand the system (both participants and processes) and in providing them with information on new varieties. Since information has the characteristics of a 'public good', the main responsibility for its provision lies with the public sector. The extension department of the state government should clearly identify its role in the provision of information on new rice varieties and seed. A cost-effective method of delivering information is by the use of the mass media, which seems to be under-exploited. There are also cases of private sector participation in the provision of information in AP, which should be further strengthened for the benefit of farmers. For instance, the good rapport of *Enadu TV (a* private television channel) and *Annadata* farm magazine (both in the Telugu language) with public research institutions

has been successful in delivering information to farmers. These linkages should be exploited with a greater focus on new varieties. In addition, farmers need a way of testing varieties and access to first-hand information. This would also provide feedback to both the private and public sectors, making them more responsive to the needs of farmers.

Decentralisation of seed provision

The decentralisation of the seed system has its own advantages, and an attempt has been made in this direction through the Seed Village Programme of the DoA. However, the programme has been constrained by a number of factors. One needs to recognise that there are limits to decentralisation, it is not possible to create small, viable seed enterprises at the village level, since certain basic requirements like storage and marketing facilities are not available and farmers cannot hold stocks for a year in the absence of adequate financial support. Those farmers who are able to move in this direction are already doing so. What is required is an understanding of the local seed system and ways and means of strengthening it. For instance, the local system can be used for the promotion of new varieties, namely, by some kind of scaling-up of the minikit programme for newly released varieties. We also need to understand farmers' experience of the decline in yield with farm-saved seed and ways of improving its quality.

Seed quality control

There will always be a need for the public sector to participate in the control of seed quality. However, its role should change with the stage of the seed industry's development. In a competitive and mature industry, greater responsibility for seed quality control rests with the producers and consumers, and the public sector should adopt an enabling role by enacting and implementing workable quality control regulations. The review of national seed policy currently under way is a welcome step in this direction. In addition, it would be desirable if seed producers and consumers were to assume greater responsibility for quality control. Private seed companies have incentives to ensure the quality of seed and there is scope for liberalising current certification procedures. The seed agencies should make efforts to establish their reputations, as in the case of hybrid seeds. The seed industry and the extension department should make more effort to educate farmers and help them understand the seed system and enhance their role in quality control. This again underscores the need for consumer education, which is completely lacking at this stage. The procedures, requirements and statutory bodies (such as consumer courts) protecting farmers' interests should be widely known.

Some of the conclusions and suggestions put forward in this paper may have implications for India's national seed system or the seed systems in developing countries. However, these suggestions need to be examined in the particular context of an actual seed system before they are applied. Certain conditions are specific to rice seed in AP. For instance, AP is home to many of the private seed companies in India and its agro-climatic conditions induce seed demand. These conditions facilitate the entry of private companies into the rice seed market. Similar situations may not exist elsewhere. Nevertheless, the need for greater information flow cannot be overemphasised, particularly since the use of more complex and information-intensive technologies will characterise agricultural development in the future.

References

Barwale, B. R. (ed.) (1993), Hybrid Rice: Food Security in India. Madras: Macmillan India.

CMIE (1999), Agriculture. Bombay: CMIE.

Jaffee, S. and J. Srivastava (1994), The roles of the public and private sectors in enhancing the performance of seed systems, The World Bank Research Observer, 9: 97-117.

Pal, Suresh and P. K. Joshi (eds)(1999), New Paradigms of Agricultural Research Management. New Delhi: National Centre for Agricultural Economics and Policy Research.

Pal, Suresh, R. P. Singh and M. Morris (1998), The Indian case study, in M. Morris (ed.) Maize Seed Industries in Developing Countries. Boulder and London: Lynne Rienner.

Tripp, R. and Suresh Pal (1998), Information Exchange in Commercial Seed Markets in Rajasthan. AgREN Network Paper No. 83. London: Overseas Development Institute.

Witcombe, J. R. and D. S. Virk (1997), New directions for public sector variety testing, in R. Tripp (ed.), New Seed and Old Laws. London: Intermediate Technology Publications.

Appendix I
Area, production, yield and seed turnover rate of rice in major states, 1995/96 to 1997/98 (triennium average)

State	Area (million ha)	Production (million tonnes)	Yield (tonne/ha)	Seed turnover rate (%)
Andhra Pradesh	3.7	9.4	2.54	32.1
Assam	2.5	3.4	1.36	na
Bihar	5.0	6.9	1.38	1.5
Haryana	0.8	2.2	2.75	8.5
Karnataka	1.3	3.2	2.46	1.2
Madhya Pradesh	5.0	5.4	1.08	3.0
Maharashtra	1.5	2.5	1.66	na
Orissa	4.5	5.6	1.24	10.3
Punjab	2.2	7.3	3.32	4.6
Tamil Nadu	2.2	6.1	2.77	0.1
Uttar Pradesh	5.6	11.4	2.03	9.0
West Bengal	5.9	12.6	2.13	5.4
All India	43.2	80.3	1.86	14.0

Sources: Agriculture, CMIE, Sept. 1999 and DOA records.
Note: Seed turnover rate is computed taking seeding rate of 50kg/ha.

Appendix II
List of seed co-operatives interviewed for the study

1. The Mulkanoor Co-operative Rural Bank and Marketing Society Ltd., Mulkanoor, Bheemadevara Pally, Karimnagar district.
2. The Pedapadu Large Sized Co-operative Credit Society, Pedapadu, West Godavari district.
3. The Primary Agricultural Co-operative Credit Society, Bhiccavalu, East Godavari district.
4. The Pulla Co-operative Rural Bank, Pulla, West Godavari district.
5. The Tanuku Consumers Co-operative Stores Ltd., Tanuku, West Godavari district.
6. The West Godavari District Co-operative Marketing Society, Eluru, West Godavari district.
7. The Large Sized Co-operative Society, Ltd. Pothangal, Nizarnabad district.
8. The Hyderabad Agricultural Co-operative Association Ltd. (HACA), Hyderabad
9. The Krishak Bharati Co-operative Ltd., Hyderabad

Appendix III: List of private seed companies responding to the seed survey

1. Amareswara Agri-Tech Ltd., Hyderabad
2. Annapurna Seeds, Peddapadu, West Godavari
3. BN Seeds Pvt. Ltd., Choutuppal, Nalgonda
4. Dhanyalaxmi Seeds, Sreenivasanagar, Warangal
5. Goutham Seeds and Processors, Koratla, Karimnagar
6. Hindustan Lever, Hyderabad
7. IML Seeds Pvt. Ltd., Hyderabad
8. Karshak Seeds and Seed Processors, Parsa, Warangal
9. Kaveri Seed Company Pvt. Ltd., Secundrabad
10. Mahalaxmi Agro Seed Company, Nizamabad
11. Nagarjuna Fertilizers and Chemicals Ltd., Hyderabad
12. Nandi Seeds Pvt. Ltd., Mahboobnagar
13. Om Sai Seeds Company, Ramayapet
14. Raasi Seeds Company, Huzarabad, Karimnagar
15. Rallis India Ltd., Secundrabad
16. Rama Krishna Seeds, Hyderabad
17. Sai Seeds Corporation, Metpally, Karimnagar
18. Sindhu Seeds Corporation, Zirayathnagar, Nizamabad
19. Sri Rama Krishna Seeds and Pesticides, Karimnagar
20. Surya Seeds, Armoor, Nizamabad
21. Telangana Seed Company Pvt. Ltd., Nizamabad
22. Vijay Seeds, Armoor, Nizamabad
23. Vikki's Agrotech Ltd., Hyderabad

NCAP PUBLICATIONS

Policy Papers

1. Sasanka S. Pal (1995), Impact of Tenancy Reform on Production and Income Distribution- A Case Study of Operation Barga in West Bengal, Policy Paper 1.
2. S. P. Pant (1995), Production Prospects and Constraints to Higher Productivity of Pulses in Madhya Pradesh, Policy Paper 2.
3. Jha, D. P. Kumar, Mruthyunjaya, Suresh Pal, S. Selvarajan and Alka Singh (1995), Research Priorities in Indian Agriculture, Policy Paper 3.
4. Maji, C.C. and A. Bhattacharya (1995), GATT and Agricultural Exports-Hopes and Realities, Policy Paper 4.
5. Maji, C.C., T. Haque and A. Bhattacharya (1995), Small Farms, Employment and Surplus Generation- A Case of West Bengal, Policy Paper 5.
6. Chand, Ramesh (1997), Import Liberalization and Indian Agriculture: The Challenge and Strategy, Policy Paper 6.
7. Pal, Suresh and Alka Singh (1997), Agricultural Research and Extension in India: Institutional Structure and Investments, Policy Paper 7.
8. Farrington, J., Rasheed Sulaiman V. and Suresh Pal (1998), Improving the Effectiveness of Agricultural Research and Extension in India: An Analysis of Institutional and Socio-Economic Issues in Rainfed Areas, Policy Paper 8.
9. Birthal, P.S., Anjani Kumar, A. Ravishankar and U.K. Pandey (1999), Sources of Growth in the Livestock Sector, Policy Paper 9.
10. Rasheed Sulaiman V. and V.V. Sadamate (2000), Privatising Agricultural Extension in India, Policy Paper 10.
11. Ramesh Chand (2000), Emerging Trends and Regional Variations in Agricultural Investments and their Implications for Growth and Equity, Policy Paper 11.

Policy Briefs

1. Jha, D. (1995), Privatising Agricultural Research.
2. Sulaiman V., R. (1995), Privatizing Farm Extension-Need for a Cautious Approach.
3. Pal, Suresh and D. Jha (1996), Funding Agricultural Research.
4. Ravishakar, A. (1996), Intellectual Property Rights and Indian Agriculture: Some Issues.
5. Farrington,J.,Resheed Sulaiman V. and Suresh Pal (1997),Strengthening Research and Extension for Rainfed Farming: Role of Social Science and Institutional Factors.
6. Jha, D. (1999), On the New Agricultural Policy.
7. Ravishankar, A. and Pratap S.Birthal (1999), Livestock Sector in India: Agenda for the Future.
8. Chand, Ramesh and Sonia Chauhan (1999), Are Disparities in Indian Agriculture Growing?
9. Sulaiman V., Rasheed and A.W. van den Ban (2000), Agricultural Extension in India-The Next Step.
10. Ravishankar, A. and Sunil Archak (2000), IPRs and Agricultural Technology: Interplay and Implications for India.
11. Ravishankar, A. and Sunil Archak (2000), Plant Variety Protection. Lessons from a Cross Country Perspective.
12. Gill, Gerard J., Diana Carney and Suresh Pal (2000), Improving Competitive Agricultural Research Funding in India.
13. A. Hall, N. Clark, Rusheed Sulaiman V., MVS Sivamohan and B Yoganand (2000) Coping With New Policy Agendas for Agricultural Research: The Role of Institutional Innovations.

Phone: 5713628, 5819731, Fax: 5822684,
E-mail: ncap@iasri.delhi.nic.in

राष्ट्रीय कृषि आर्थिकी एवं नीति अनुसंधान केन्द्र
NATIONAL CENTRE FOR AGRICULTURAL ECONOMICS AND POLICY RESEARCH
(Indian Council of Agricultural Research)
POST BOX No. 11305, LIBRARY AVENUE, PUSA, NEW DELHI-110012.
Phone : 91-11-5713628,5819731 Fax : 91-11-5822684 E-mail : ncap@iasri.delhi.nic.in
http: // www.nic.in/icar/ncap/index.htm