The Private Delivery of Public Crop Varieties:
Rice in Andhra Pradesh

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Summary. — Although there has been a considerable growth of private seed enterprises in
developing countries, there are few examples of the private delivery of seed of public crop varieties
that are not hybrids. This paper discusses the example of rice in Andhra Pradesh, where private
enterprise is supplying an increasing proportion of the seed used by farmers. The institutional
conditions for private expansion into rice seed are examined. The paper discusses instances where low
transaction costs allow for the emergence of a wide range of seed enterprises. But despite the success
of private seed delivery, inadequate attention has been given to incentives for variety promotion, and
to the importance of consumer education. © 2000 Elsevier Science Ltd. All rights reserved.

Key words — India, seed policy, institutions, small enterprises, privatization

1. INTRODUCTION

Seed provision is a particular concern for
most governments that are taking steps to
facilitate a shift toward the privatization of
agricultural input and service supply. Although
there is considerable evidence that the private
sector is eager to provide hybrid (or other high-
value) seed, the incentives for commercial
provision of non-hybrid seed are much less
obvious. This affects the seed supply of such
self-pollinated crops as rice, wheat, and grain
legumes, as well as open-pollinated varieties of
maize, pearl millet and sorghum. The seed of
these crops is easily saved and virtually all of
the varieties offered for sale are the products
of public sector plant breeding. In most de-
veloping countries, seed of these crops is produced
by public entities, often parastatal seed
companies. Although most analysts urge the
public sector to relinquish its position in seed
production and sale (Jaffee & Srivastava, 1994),
it is not obvious how the transition to private
sector participation for these crops will take
place. This paper examines the institutional
conditions that have allowed such a transition
to be initiated in one case.

There are several institutional factors that
determine the course of seed system develop-
ment. First, because seed provision involves the
performance of a number of distinct tasks (such
as plant breeding, seed multiplication, and
marketing), there are issues regarding the
degree to which contracting or vertical inte-
gration will govern seed enterprise develop-
ment. When some of the tasks (such as plant
breeding) are in the public sector, there are
additional concerns about public–private
coordination. Finally, because many aspects of
seed quality are difficult to detect by casual
inspection, we need to know what forms of

* The authors are grateful for the collaboration of
NCAP’s director, Dayanatha Jha and the collaboration
of the Directorate of Rice Research (Hyderabad),
especially assistance from K. Krishnaiah and A. Jana-
iah. Two anonymous reviewers provided useful com-
ments on an earlier draft of the paper. The research was
supported by a grant from the UK Department for
International Development (DFID). The views ex-
pressed here are those of the authors and do not
necessarily reflect the opinions of ODI, NCAP or DFID.
Final revision accepted: 8 July 2000.
regulation and consumer information are most appropriate for private seed delivery systems. The example that will be discussed is that of rice seed in the Indian state of Andhra Pradesh. Approximately 9.6 million tons of rice are grown on about 3.5 million hectares in Andhra Pradesh. About 70% of this is grown during the kharif season of monsoon rains and most of the rest is grown in the post-monsoon rabi season. Public seed corporations still provide the majority of rice seed in Andhra Pradesh, but the private sector is playing an increasingly important role. This shift toward private sector rice seed provision is largely unappreciated, even by many local observers. Section 2 of this paper describes the various public organizations that contribute to the rice seed system. Section 3 examines the organization of the private seed sector. Section 4 reviews the institutional factors that influence the performance of private seed provision. Section 5 provides a brief review of alternative seed provision strategies, including cooperatives and community-level programs. Section 6 summarizes the policy lessons of the case. The final section provides conclusions and implications for seed enterprise development.  

2. PUBLIC SECTOR ROLES IN SEED PROVISION

(a) Plant breeding

India’s public agricultural research system is one of the most productive in the world. It has developed over 500 modern rice varieties (MVs). Almost all of the rice that is planted in Andhra Pradesh is MVs and approximately 50 rice MVs are produced for formal seed sale in the state each year. The majority of the rice breeding is done by the state agricultural university system. There is an extensive variety testing and release system at the state level, and varieties are also entered in national trials. Only when varieties are released and notified at the national level are they eligible for certification; the vast majority of the rice varieties in use in Andhra Pradesh have been notified nationally.  

There is also growing interest in hybrid rice in India (Barwale, 1993). Hybrid rice technology was pioneered in China. Although the majority of China’s rice is now hybrid, there is little hybrid rice grown elsewhere. India has directed significant attention to the subject over the past several years. There is considerable public investment in hybrid rice research, and more than a dozen private firms have also initiated research. There are several public and private rice hybrids on the market, but their performance and acceptability have been disappointing to date. Thus the amount of hybrid rice currently grown in Andhra Pradesh is insignificant and does not feature in the following discussion.

(b) Breeder seed

Seed production involves a sequence in which an initial amount of pure seed of the variety is multiplied through several stages in order to produce sufficient commercial seed. The number of stages, and their nomenclature, varies by crop and by country, but we will refer to the initial stage as breeder seed and the stage subsequent to commercial seed production as foundation seed.

Any seed production system, public or private, is dependent on a reliable source of breeder seed. In Andhra Pradesh, most breeder seed of rice is produced by the state university. Each year, public and private seed companies apply (“indent”) for breeder seed of the particular varieties they require. The companies are required to pay in advance for this seed. This open access to breeder seed of public varieties is one of the great strengths of India’s seed system. The companies use this seed to produce foundation seed, which is then multiplied for commercial seed. It takes at least two years from the time the indent for breeder seed is received until the multiplication process delivers commercial seed for sale. Hence the companies require considerable foresight and planning. In the 1997–98 season, the university system produced approximately 77 tons of breeder seed of rice.  

(c) Seed quality control

There are several state entities that contribute to seed quality control. These include the seed certification agency, the Department of Agriculture seed inspectors, and (most recently) the availability of consumer courts to hear complaints about seed quality.

Seed certification involves the monitoring of foundation seed sources and field visits (two per season in the case of rice) to seed multiplication plots to ensure that the seed is of acceptable genetic purity. A certification tag is provided
after the completion of tests for physical seed quality (such as germination and moisture content). These duties are the responsibility of the Andhra Pradesh State Seed Certification Agency (APSSCA). The seed companies pay APSSCA for these services, and the agency is self-supporting. In 1998–99 APSSCA certified a total of about 44,000 tons of rice seed.

Not all seed is certified, however. Indian seed law allows for the sale of “truthfully labeled” seed; this is seed sold with a label provided by the seed producer that states minimum guaranteed standards of purity and germination. There are several reasons why a seed producer may choose to sell truthfully labeled seed. Most seed companies do their own quality control, and they may feel that certification is not necessary. Newly released varieties that are not yet notified cannot be certified, so sale of their seed is necessarily under a truthful label. For rice in Andhra Pradesh, probably the most common reason to forgo certification is the time required for the final seed quality tests after the seed is harvested. A considerable amount of seed is produced in one season (kharif or rabi) for sale in the subsequent season, and the results from the tests are often not ready in time to meet this marketing schedule. Roughly 60% of the rice seed produced by the Andhra Pradesh State Seed Development Corporation (APSSDC), the major public seed producer, is certified. We estimate that about 45% of private sector seed was certified in 1998.

Seed is sold by registered dealers; in Andhra Pradesh there are more than 8000 licensed seed dealers (although not all of them sell rice seed). The state Department of Agriculture (DOA) regularly visits these dealers, collects sales statistics, and inspects the seed and other inputs on sale. The inspectors draw seed samples for testing. If the tested seed is found to be unacceptable, there are several sanctions that can be applied, including warning letters, closure of the shop and closure of the seed company. Approximately 15,000 seed samples (of all crops) are drawn for testing each year.

If a farmer has a complaint about the quality of seed, it is also possible to bring a case before the district-level consumer court. This option has been available to farmers for only a few years. The number of cases involving seed now heard in these courts is not large, but they do provide another option for regulating seed quality.

(d) **Seed production**

APSSDC was established in 1976. It produces and markets seed of more than 15 crops, but rice accounts for over 80% of its seed production. In 1998 APSSDC sold 32,400 tons of rice seed in Andhra Pradesh.

Because it is a public agency, APSSDC is obliged to maintain a presence throughout the state. It produces and processes rice seed at 17 centers in the state. One objective of the decentralization is to produce seed for local requirements, but for various logistical and agronomic reasons much of the seed produced in one center may be sold elsewhere in the state. The seed is multiplied by individual farmers, who are provided with foundation seed and who agree to deliver seed to the APSSDC processing plant. About two-thirds of these farmers are shareholders of APSSDC; a farmer can become a shareholder for a nominal investment and is then eligible to receive dividends from APSSDC.

APSSDC sells its seed through private seed dealers and through its own seed counters. About 75% of the sale is through private dealers (including cooperative societies that market agricultural inputs). The APSSDC sells seed to dealers on a cash-and-carry basis. The dealer gets a 9% commission on seed sale. Until recently most of the seed of APSSDC was sold through the DOA, but the department now arranges for seed sale only in remote areas that are not served by dealers or cooperatives.

The National Seeds Corporation (NSC), which was established in 1963, also operates in Andhra Pradesh, but its participation in the rice seed market is modest. In 1998 it sold 1,476 tons of rice seed in Andhra Pradesh.

### 3. THE PRIVATE SEED SECTOR IN ANDHRA PRADHESH

The private seed sector in Andhra Pradesh is large, heterogeneous and difficult to characterize in statistical terms. We shall concentrate only on rice seed, but even here the players range from small farm-level operations to some of the largest seed companies in India. Interviews and a postal questionnaire carried out as part of this study provided evidence from 23 companies that sold a total of 19,370 tons of rice seed in Andhra Pradesh in 1998. Estimates from the DOA’s seed supply planning process indicate 28 companies proposing to supply
about 21,000 tons of rice seed in the \textit{kharif}
season of 1999.

Neither the results of our study nor the DOA
figures are complete, as some companies prefer
not to provide data, and there are a number
of small, unregistered companies that also partic-
ipate in the rice seed business. Another way of
estimating the importance and growth of the
private rice seed market is to look at figures for
certified seed production. Figure 1 shows
certified rice seed production in Andhra
Pradesh over the past five years. It is important
to remember that only about half of rice seed is
certified. On the other hand, some of the
certified rice seed produced in Andhra Pradesh
by the public and private companies is sold in
other states, but this accounts for no more than
20\% of the total. Bearing these reservations in
mind, there is a clear trend toward increasing
private participation; indeed, in 1999 private
certified rice seed production passed that of the
public sector, which may indicate that in the
year 2000 private rice seed sales will exceed
public sales.

It is important to acknowledge some of the
factors that make rice seed production partic-
ularly attractive to companies in Andhra
Pradesh. One strong inducement is the size of
the market. With 3.5 million hectares of rice,
even a relatively modest seed turnover implies
large potential sales. Although farmers can save
their seed, there is a growing tendency to
purchase rice seed. Our farmer surveys showed
that, depending on the season and the area,
only 20–40\% of rice seed is farm-saved. In some
areas, particularly on the coast, climatic
conditions make it difficult to save seed. Sixty-
four percent of the farmers said that they notice
a yield decline in farm-saved seed after only one
season. The growing availability of rice seed is a
further inducement, and seed represents only a
small proportion of total cash outlay for inputs
that include fertilizers and pesticides.

Although a company gets a lower margin for
rice seed than for a hybrid, the seed is not
treated with chemicals, so unsold seed can be
brought to the grain market in order to recover
at least part of the investment. In addition, seed
production and processing are more straight-
forward for rice than for many other seed
crops. Finally, Andhra Pradesh is the home of
many seed companies. (The Andhra Pradesh
Seedsman Association has 147 member
companies.) Companies that are already
producing seed of other crops find it fairly easy
to move into rice. Many of the larger compa-
nies have begun to produce rice seed as a way
of expanding their product range, and several

![Figure 1. Certified rice seed production, Andhra Pradesh. (Source: APSSCA.)](image-url)
are positioning themselves for the potential hybrid rice seed market. Of the 23 companies that we contacted, only three did not also produce other types of seed. Eleven were involved in hybrid seed production for at least one crop, including four companies that were producing hybrid rice.

One way to discuss the complexity of the private seed sector is to examine the various functions that it must perform. Seed provision involves the performance of a set of tasks, including plant breeding, source seed production, seed multiplication, seed conditioning, and marketing. These functions may be integrated in a single firm, or they may be carried out by separate entities that contract among themselves.

(a) Plant breeding

All of the rice varieties are the products of public research, and there is no private investment in breeding for rice varieties. The exception, as noted earlier, is the case of hybrid rice. But hybrid rice is in its infancy, and in any case the majority of the companies selling rice seed have no capacity for independent plant breeding.

(b) Foundation seed

Most seed enterprises indent for breeder seed of the varieties they require and produce their own foundation seed. But some enterprises, even a few fairly large ones, purchase their foundation seed from other companies. This lowers their flexibility, because they may find foundation seed of a particular variety to be in short supply. But if an enterprise is able to find sufficient foundation seed on the market, it can tailor its production to those varieties that are in immediate demand, rather than having to plan ahead.

(c) Seed multiplication

All commercial seed multiplication is done by individual contract growers. The logistics of supervision and transportation dictate that the contract growers be located in a concentrated area. Seed production also requires adequate growing conditions. Much of the rice seed produced in Andhra Pradesh is grown in the area of northern Telangana. Not only is the climate excellent for a good rice seed crop, but many farmers have borewells that ensure adequate irrigation facilities. In addition, this is one of the first areas where the private seed industry began its operations in the 1980s, concentrating on hybrid pearl millet and sorghum (Pray, Ribeiro, Mueller, & Rao, 1991). Northern Telangana thus offers a concentration of experienced seed growers as well as processing and storage facilities.

Although northern Telangana is also an area of rice production, the major rice growing areas of Andhra Pradesh are on the coast, in the deltas of the Krishna and Godavari Rivers. This area is 400 km away, and many thousands of tons of rice seed are transported to the coast. There is also some rice seed production in the coastal area, particularly by smaller enterprises. Some commercial rice seed production can also be found in other areas of the state, often associated with seed production for other crops.

Because seed multiplication is done by independent farmers, all seed enterprises must make decisions about how to establish contracts. In some cases, company staff take charge of identifying farmers, arranging contracts, delivering foundation seed and supervising production. In other cases, the enterprise may contract a person ("organizer") who agrees to perform these functions and deliver the raw seed. In many cases the organizer is someone with strong local political connections who has ready access to farmers in a village.

The contracting of seed growers shares many of the problems of enforcement and opportunism common to contract farming (Glover, 1987). The farmers run the risk that the company will not buy all of their production, or will impose quality or other restrictions that effectively lower the farmers' returns. The companies, on the other hand, are concerned that the farmers will not produce acceptable seed, or that they will be tempted to sell their production to another bidder. Although the use of organizers may often be more convenient, the risks remain for both parties, and the organizer may try to seek added advantage either from the companies or from the farmers. Companies attempt to establish various types of incentives for their organizers in order to ensure the production of the required quantity and quality of seed.

(d) Seed conditioning and storage

Once seed is collected from the farmers it must be dried, cleaned, graded, and bagged.
Rice seed conditioning is fairly straightforward. The seed is sun dried, rather than using expensive artificial dryers. Simple seed cleaning machinery is also required. Because rice seed is bulky, adequate storage facilities are necessary. If the rice seed is produced in an area where considerable seed production is taking place, it is often possible to rent conditioning and storage facilities.

(c) Marketing

Seed is usually sold through a network of distributors and dealers. Large seed companies have extensive marketing networks throughout the state. Smaller companies usually market through local dealers. Because of the concentration of seed production in northern Telangana, the market sometimes comes to the producers; dealers from other parts of the state arrive (or make telephone enquiries) seeking seed from small local producers, especially if there is a shortage with the bigger companies.

We must also mention another important (and often overlooked) example of private seed trade, conducted between farmers themselves. This goes beyond the occasional instances of providing seed to a neighbor who has run short. Some farmers reserve a part of their field specifically for seed production and they establish reputations for being reliable sources of seed. The more successful are usually larger farmers who have the facilities (such as a well-maintained threshing floor) and storage capacity that allow them to offer high quality seed. Table 1 summarizes farmers’ responses to a question about the original source of seed for all varieties they planted, showing the importance of other farmers as off-farm seed sources. Even though these transactions take place at the village level, most are for cash. When selling seed, farmers usually charge a premium above grain price of approximately 30%. (Formal sector rice seed is sold for approximately 100% above grain price.) In some areas it is also common for farmers to obtain seed on loan, repaid in kind (usually with 50% interest) at the end of the season.

In farm-level seed sale, quality control is managed through familiarity with the producer and, in cases of doubt, germination tests done by the farmers. We recorded 140 instances of this type of seed purchase in our survey, and in only 8% of the cases was at least one of the following not present: seed grown in the village of the purchaser; seed field visited by the purchaser; germination test conducted.

In some cases, farmers can exploit particular conditions to enhance seed sale. In the delta region, certain villages have access to upland fields that are better for seed production, and these villages are recognized as good sources of seed. Some farmers who live near university experiment stations have access to seed of new varieties and they multiply this for sale to farmers from other areas.

4. INSTITUTIONAL ISSUES: CONTRACTING, INCENTIVES AND QUALITY

(a) Contracting

We are interested in understanding the conditions that allow for the private production of seed of public rice varieties. One pathway is for larger companies that are already involved in more profitable seed production to expand into rice seed. This might be described as the “top–down” strategy and there are many examples in Andhra Pradesh. But in order to understand seed enterprise development, we must also look at “bottom–up” strategies as well.

Despite the fact that there are many farmers who sell seed informally at the village level, we came across no examples where this type of experience alone was sufficient for expansion into a formal seed enterprise. “Bottom–up” entry into the seed business tends to follow other pathways. In some cases, a farmer who

<table>
<thead>
<tr>
<th>District</th>
<th>N</th>
<th>Source of seed obtained off-farm</th>
<th>Another farmer (%)</th>
<th>Commercial (public or private) (%)</th>
<th>Other (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Srikakulam</td>
<td>234</td>
<td>61</td>
<td>31</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>East Godavari</td>
<td>248</td>
<td>34</td>
<td>56</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Mahboobnagar</td>
<td>192</td>
<td>37</td>
<td>59</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

*a Source: Survey data.*
has been a contract seed grower for a public or private seed company establishes his own business. Experience as a contract grower provides grounding in the techniques and requirements of seed production (and in many cases offers an opportunity to sell some “extra” seed on the side). In these cases the farmer usually begins by growing seed on his own land and renting conditioning facilities. The seed may be sold from the farmer’s home or through a few local dealers.

Another pathway to establishing a seed enterprise is the expansion of organizers. In several cases, men who started by simply organizing growers for a seed company (often for hybrids of other crops) have entered into rice seed production themselves. Again, the experience with the seed company provides training and contacts. There are also organizers who offer a seed conditioning service; seed companies deliver foundation seed to the organizer and contract for cleaned, bagged seed.

A further possibility for entry into the seed business is expansion by seed dealers. Our sample included several such cases, including one of the largest private producers of rice seed in Andhra Pradesh, which started as a seed distributorship for APSSDC. The firm acquired a loan to buy a seed cleaner and storage facilities, purchased foundation seed from other companies, and used its marketing contacts to sell its seed.

Table 2 illustrates the major options for establishing a rice seed enterprise. Because there are independent organizers and seed processors (and because it is possible to buy foundation seed from other companies) there are a number of possible combinations. Our study uncovered examples of all the possibili-

<table>
<thead>
<tr>
<th>Function</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Produce foundation seed</td>
<td>Local organizers are contracted by seed companies to identify and supervise seed growers</td>
</tr>
<tr>
<td>Organize seed growers</td>
<td>Individuals who own seed cleaning and storage facilities rent them to seed companies</td>
</tr>
<tr>
<td>Process and store seed</td>
<td>An established seed company that wishes to begin marketing rice seed can buy foundation seed, hire organizers, and rent processing facilities</td>
</tr>
<tr>
<td>Market seed</td>
<td>Some organizers own seed cleaning and storage facilities. They may be contracted to deliver processed seed to a company</td>
</tr>
<tr>
<td></td>
<td>Small operators can buy foundation seed and rent processing and storage facilities</td>
</tr>
<tr>
<td></td>
<td>Owners of processing equipment may buy foundation seed and hire an organizer</td>
</tr>
<tr>
<td></td>
<td>Some large companies may contract organizers, although company staff also supervise seed multiplication</td>
</tr>
<tr>
<td></td>
<td>Some small operations find it more convenient to purchase foundation seed from other companies</td>
</tr>
<tr>
<td></td>
<td>Companies that have facilities and staff in the area where seed is multiplied perform all functions</td>
</tr>
</tbody>
</table>
ties shown in the table. Although the very largest companies tend to be integrated operations, there is still a significant amount of contracting for many of these functions.

Vertical integration takes precedence over contracting if there are opportunities to lower transaction costs (Williamson, 1985). Factors that help determine the advantages of integration include the frequency of a transaction, uncertainty, and asset specificity (Williamson, 1979). In the case of rice seed, the transactions (e.g., contracting for processing facilities) are frequent and repeated, but are not characterized by particular uncertainty. Asset specificity is also relatively low. There are many farmers’ fields that may be used for seed multiplication, and no firm can own this asset in any case. In areas where there is a concentration of seed production, the physical assets (such as storage facilities and equipment) and human assets (organizers and technicians) are in fairly abundant supply. The rice seed example would seem to confirm the observation “that intermediate product market transactions are much more numerous than the conventional wisdom would suggest” (Williamson, 1985, p. 87).

The variety of seed enterprises illustrated in Table 2 is similar to the results of Harriss-White’s 1996 study of agricultural marketing in Tamil Nadu. She identified nine distinct activities in which marketing firms could engage, and expected to find a few dominant patterns. Instead, the 149 firms she studied exhibited 51 different activity combinations. One of the factors that allows for this diversity and flexibility is the existence of “networks of relational contracting based on acquired characteristics such as reputation, experience and loyalty…” (p. 334). This supports Granovetter’s attempt to stand Williamson’s transaction cost interpretation of vertical integration on its head. He holds that “other things being equal … we should expect pressures toward vertical integration in a market where transacting firms lack a network of personal relations that connects them or where such a network eventuates in conflict, disorder, opportunism or malfeasance” (Granovetter, 1985, p. 503).

Because seed production is often concentrated at specific sites, the organization of the industry displays many of the characteristics discussed in the analysis of industrial clusters (Schmitz & Nadvi, 1999). The development of private rice seed production in Andhra Pradesh has certainly been aided by the fact that various types and sizes of seed enterprise all operate in the same area, allowing for access to technical skills and specialized facilities. The seed business offers few economies of scale, but considerable economies of scope, and firms can start with one seed crop and expand into others. Perhaps most important for our perspective, the clustering of seed production activity helps “small enterprises to grow in riskable steps” (Schmitz & Nadvi, 1999, p. 1503).

(b) The public–private interface

Although private activity in rice seed provision is becoming increasingly important, all of the plant breeding is still done by public research. How effective is the private system at promoting the public varieties? One way of addressing this question is to examine the movement of new rice varieties. The agricultural university and the DOA include information about new varieties in various extension activities, and they are featured in newspaper and magazine articles and in agricultural programs on radio and television. But it is difficult to identify who has strong incentives for promoting the new varieties. It is always a risk to switch to the production of a new product, and seed companies (public or private) would prefer to keep producing the older varieties, providing there is sufficient demand. The private firms have little incentive to advertise new public varieties, because farmers may just as easily buy the same seed from a competitor.

Table 3 summarizes indent records for breeder seed over three years. It focuses on new varieties (which we arbitrarily defined as those released since 1990). The indent records do not give a precise estimation of the amount of commercial seed available (two years hence) because of various types of flexibility in the

<table>
<thead>
<tr>
<th>Year</th>
<th>APSS-DC (%)</th>
<th>Cooperatives (%)</th>
<th>Private companies (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1997</td>
<td>22</td>
<td>21</td>
<td>13</td>
</tr>
<tr>
<td>1998</td>
<td>23</td>
<td>28</td>
<td>15</td>
</tr>
<tr>
<td>1999</td>
<td>26</td>
<td>33</td>
<td>24</td>
</tr>
</tbody>
</table>

a “New rice varieties” are those released after 1990.
b Source: Unpublished records, Acharya N. G. Ranga Agricultural University.
management of source seed, but there is no evidence that the private enterprises are more active in the production of new varieties.

The farmer survey showed that, for the most part, the proportion of new varieties in farmers’ fields is higher than the proportion sold by seed dealers. Table 4 compares data for the three surveyed districts with district-wise sales data from APSSDC. How do farmers seem to stay ahead of the formal seed system? We must recall that a significant quantity of seed is acquired from other farmers, and Table 5 shows that a disproportionate amount of this seed consists of new varieties. Although the majority of farmers agree that the quality of formal sector seed is superior to farm-produced seed, the formal system tends to be the source of older varieties while farmer seed producers supply the newer varieties.

Besides informal village-level seed trade, there is another element of the private seed sector that is crucial for the movement of new varieties, although it is difficult to quantify. There are some large farmers and small seed “companies” (often unregistered) that specialize in selling seed of new rice varieties. Many of these have close personal ties with local experiment stations and are able to obtain breeder seed or foundation seed of the newest varieties. If the varieties have not yet been officially notified they are ineligible for certification, and so the small companies sell them as truthfully labeled seed. These small operations would not be able to compete with larger firms in the general seed market, but they are able to exploit a niche that addresses farmers’ interest in new varieties. They seem to represent the only part of the commercial seed system that has a clear incentive to promote new public varieties.

(c) Quality

One frequently heard concern about the expansion of the private seed sector is that quality will be affected, as commercial firms attempt to cut corners or deceive farmers. There is little evidence for this, however. Table 6 summarizes two years of data from DOA seed inspections. Although it is not disaggregated by crop type, there is no indication that privately produced seed is of lower quality. In addition, there is little evidence that certified seed is necessarily superior to truthfully labeled seed. The ability of the government certification service to safeguard farmers’ interests is hampered by a lack of farmer knowledge. In the survey, 78% of the farmers had no understanding of the blue certification tag attached to seed bags, and most farmers are unable to distinguish between truthfully labeled and certified seed.

Defenders of the privatization of seed provision believe that company reputations will obviate the need for formal seed quality control. In general, it is recognized that enterprises invest in establishing their reputations through brand names, advertising, and guarantees (Klein & Leffler, 1981). Such investments are powerful incentives for maintaining internal quality control. But in the case of rice seed, company reputations are not yet well established. In only 29% of all the instances of seed purchased from a shop could the farmer give the name of the (private or public) seed company. Company reputations are well known by seed dealers, however, and at the present time this would appear to be a major factor in establishing quality control in the private seed system. Farmers complain to dealers if there are problems, and the DOA seed inspectors can order the closure of a dealer selling substandard seed.

Rice is perhaps an extreme case because farmers usually know exactly what variety they want to purchase and are generally familiar with its characteristics. In an earlier study that examined the sale of public and private pearl millet hybrids in Rajasthan, we found that

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Table 4. Proportions of new rice varieties sold by APSSDC and planted in farmers’ fields, Kharif 1998

<table>
<thead>
<tr>
<th>District</th>
<th>Sold by APSSDC (%)</th>
<th>In farmers’ fields (%)</th>
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</thead>
<tbody>
<tr>
<td>Srikakulum</td>
<td>27</td>
<td>42</td>
</tr>
<tr>
<td>East Godavari</td>
<td>20</td>
<td>41</td>
</tr>
<tr>
<td>Mahboobnagar</td>
<td>3</td>
<td>3</td>
</tr>
</tbody>
</table>

*a Unpublished APSSDC marketing data.  
*b Survey data.

Table 5. Farmers as sources of new and old varieties

<table>
<thead>
<tr>
<th>District</th>
<th>Proportion of variety type acquired from another farmer</th>
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<tbody>
<tr>
<td></td>
<td>New varieties (%)</td>
</tr>
<tr>
<td>Srikakulum</td>
<td>73</td>
</tr>
<tr>
<td>East Godavari</td>
<td>40</td>
</tr>
<tr>
<td>Mahboobnagar</td>
<td>64</td>
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</table>
farmers had somewhat more familiarity with company names, and they were also more likely to ask dealers for advice about different hybrids. But their understanding of the market was still far from adequate (Tripp & Pal, 2000).

5. ALTERNATIVE STRATEGIES FOR SEED Provision

Are there alternatives to formal public and private seed production? Two of the most common responses to this question are cooperatives and community-level seed projects. The evidence from Andhra Pradesh offers a cautionary view of these alternatives.

(a) Cooperatives

Although there are many types of cooperatives in Andhra Pradesh, there are no more than 15 that produce rice seed. One of the justifications sometimes heard for cooperative seed production is that it can respond to members’ needs, but the examples in Andhra Pradesh are all simply cases of well-established cooperatives adding another income-earning activity to their portfolios. In only two out of eight cases that we examined was the cooperative’s seed multiplication done exclusively by its own members. In most of the cases, the cooperatives were already involved in the marketing of inputs such as fertilizer, and many of them also included rice milling operations. Thus they had the storage facilities and commercial contacts for marketing their seed.

The performance of these cooperatives seems adequate, but there would appear to be little prospect for significant expansion in this sector. Cooperative activity in India is heavily politicized, and indeed several of the cooperatives had acquired their processing equipment through the intervention of government programs. Most of these cooperatives market their seed through networks of primary agricultural cooperatives (PACs), and the opportunities for product differentiation or establishing a reputation are minimal. The major exception is the few cooperatives that market seed through private dealers.

(b) Community-level seed activity

In considering possible pathways for the growth of seed enterprises, many officials have hopes for the development of community-level enterprises. The most prominent example of this strategy is the Seed Village Program, which has been run by the DOA since 1995. It has so far been confined largely to rice seed. The idea is that one or two farmers can be identified in a village who will multiply seed for their neighbors. The DOA provides them with access to foundation seed (mostly through APSSDC), training, and supervision in seed production. The farmers are then free to sell their seed to other farmers. This is seen as a way of decentralizing seed provision and lowering seed costs for farmers. APSSDC made available 558 tons

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<tr>
<td></td>
<td>Samples drawn</td>
<td>Samples with unacceptable germination</td>
</tr>
<tr>
<td>Private companies</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certified seed</td>
<td>1,399</td>
<td>12 (0.8%)</td>
</tr>
<tr>
<td>Truthfully labeled seed</td>
<td>6,630</td>
<td>226 (3.4%)</td>
</tr>
<tr>
<td>Cooperatives</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Certified seed</td>
<td>1,317</td>
<td>57 (4.3%)</td>
</tr>
<tr>
<td>Truthfully labeled seed</td>
<td>2,314</td>
<td>45 (1.9%)</td>
</tr>
<tr>
<td>Public corporations</td>
<td></td>
<td></td>
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<tr>
<td>Certified seed</td>
<td>1,406</td>
<td>18 (1.3%)</td>
</tr>
<tr>
<td>Truthfully labeled seed</td>
<td>2,533</td>
<td>59 (2.3%)</td>
</tr>
</tbody>
</table>

of foundation seed for this program in *kharif* 1998.

If we recall the brief discussion of farmer-to-farmer seed sale in Section 3 we can appreciate that this program is largely an exercise in reinventing the wheel. Our study visited farmers in a number of these “seed villages.” Many of the successful “participants” were unaware they were part of any program; they simply used their letter of introduction from the DOA to obtain good quality foundation seed. Many participants were grateful for the access to foundation seed (which is generally of higher quality), but did not necessarily dedicate much of their harvest to seed sale. Two outstanding problems with this strategy are farmers’ lack of storage facilities and marketing capacity, both of which are needed even for modest-scale operations.

In many countries nongovernmental organizations (NGOs) and other projects promote community seed production, often by organizing farmer groups (Wiggins & Cromwell, 1995). The idea is that these groups will learn the techniques of seed production and will develop a local clientele for their seed business. We came across few examples of this in Andhra Pradesh, but one case involved an NGO that trained a group of farmers in the techniques of hybrid rice seed production. This is a precise and labor-intensive process (much more so than for many other types of hybrids), and any group possessing these skills could surely attract contracts from commercial firms. Whether such a group could launch a seed enterprise on its own is open to doubt, however. In this case, the hybrid rice was not popular and there was little demand for it. But farmers found that the male restorer line they were given to use had excellent grain quality. It was soon christened with a local name (mogā, or “male”) and certain farmers set about multiplying its seed and selling it locally. When opportunities exist for local seed sale, farmers are quick to take advantage of them. Transition from such local activity to full-blown seed enterprise, however, requires adequate financing, access to processing facilities, and marketing contacts.

6. LESSONS FOR SEED SYSTEM DEVELOPMENT

Table 7 summarizes the factors contributing to the performance of the principal seed provision options: private companies, the public sector, cooperatives and farmer seed producers. At the present time each makes a significant contribution to supplying rice seed in Andhra Pradesh. The most remarkable contribution, and the one emphasized in this paper, is the growing status of the private seed sector. This section examines the implications of this trend for seed policy in India and other developing countries. It focuses on the issues of efficiency, quality, innovation and equity.

It is generally recognized that public seed companies are often inefficient and unresponsive (Jaffee & Srivastava, 1994). In India, the state seed corporations vary greatly in their performance; some are relatively efficient while others are in chronic deficit. APSSDC is certainly one of the better-managed state seed corporations. Our study did not look at the finances of APSSDC, but its annual financial reports indicate that the corporation is self-financing and is able to pay dividends to its shareholders. It is safe to say, however, that APSSDC has benefited from its connections to various state programs for technology promotion. For instance, a state subsidy on seed of recently-released rice varieties was at first only available to APSSDC. This subsidy is now applicable to private sector seed as well, although we have no evidence that the price of different varieties, or price differences between seed companies, have any influence on the purchasing decisions of Andhra Pradesh rice farmers.

An appropriate policy direction in Andhra Pradesh would be simply to let current trends run their course. The private sector is expanding its role in the rice seed market and the companies do not complain of unfair competition from APSSDC. Rice seed has not been a particularly attractive product for these companies until recently, but growing farmer appreciation of commercial seed has contributed to an expanding market. The government should of course identify and eliminate any instances of subsidy or favoritism to the state corporation. Although this advice may be of less relevance in Andhra Pradesh, in other states and other countries it addresses one of the most serious impediments to commercial seed enterprise development. With the provision of a level playing field and the growth of demand for purchased seed we can expect a gradual decline in public seed production.

Although this trend toward privatization is to be welcomed, it requires policy guidance.
One issue is seed quality control. We have seen in the Andhra Pradesh case that the private sector delivers seed of at least as good quality as that of the public sector. India has sensibly made seed certification voluntary. A more relevant focus for improving seed quality is at the level of company reputations and consumer education, rather than government regulation. Policies should encourage programs that educate farmers about the nature of the seed industry; farmers should be able to identify the companies that provide them with seed and know the appropriate mechanisms (through the legal system or the market) for registering complaints about inadequate products. In addition, policies should support the efforts of companies to establish and protect their brands, trademarks and reputations.  

Private seed provision offers possibilities for more responsiveness and innovation, but the path is not perfectly clear. This is especially true for a crop such as rice, where all plant breeding is currently in the public sector. The picture would change radically if hybrid rice in India
overcomes its present agronomic and grain quality problems. But seed policy should not let the tail wag the dog; hybrid rice should be promoted if it offers productivity advantages, not merely because it contributes to the development of the private seed sector. In the short term, the growing private rice seed industry will be marketing public varieties, and policies should be in place to make this an effective partnership. India will soon have a system of plant breeders’ rights that will, among other things, allow public plant breeding institutes to assign rights and collect royalties for their varieties. It will be most interesting to see what modalities are proposed over the next few years. The use of exclusion mechanisms, such as the assignment of exclusive rights for particular varieties, would transform these “public goods” into “quasi-toll goods” (Pray & Umali-Deininger, 1998). This would increase incentives for private promotion of the public varieties, but given the widespread use of many public varieties of crops such as rice and the limited marketing networks of individual companies, this strategy would be unlikely to guarantee sufficient access to all farmers.

The seed system will be more responsive if there is better exchange of information between seed providers and farmers. There are several indications of the need for better information provision from public plant breeding: farmers currently get a large proportion of their information about new varieties from each other; new varieties spread relatively slowly; and despite the availability of a wide range of rice MVs, farming regions tend to exhibit high concentrations of a few varieties. Innovative public extension programs may make a contribution, and increased use of private print and television media should also be pursued. Private seed companies would certainly help distribute information about the public varieties they sell, but cannot be expected to play the lead role.

Finally, the increasing presence of private seed provision raises questions about equity effects. The private seed industry will naturally go where it can make a profit and it is often accused of addressing only the needs of larger farmers. This is an oversimplification; for instance, there is significant private investment in (hybrid) sorghum and millet seed in India, which are used by many resource-poor farmers. Nevertheless, the private seed industry is more likely to address the larger and more reliable markets. One district (Srikakulum) in our farmer survey had a minimum of private seed activity. Although it is a reasonable rice-growing environment, it is relatively isolated and a few private companies are just beginning to market seed there. The problem has not been unfair government competition but the difficulty of identifying reliable distributors and establishing marketing networks. The district also has somewhat distinct growing conditions, and the local university experiment station has developed several locally adapted rice varieties. Areas such as this that are isolated or diverse are less likely to attract immediate commercial interest, and their farmers should receive attention from the public system until a critical mass of demand and market infrastructure encourages private commercial activity.

7. CONCLUSIONS

This study has described the elements responsible for the growth of the private delivery of public rice seed varieties in Andhra Pradesh. This is part of a growing trend in India that began more than a decade ago with the marketing of public hybrids of crops such as pearl millet and sorghum. Rather than being limited to high-value seed, an expanding and diverse private sector is also able to manage a growing proportion of seed supply for crops such as rice.

There are several explanations for the expansion of the private rice seed industry in Andhra Pradesh. The overwhelming importance of rice and the large potential demand for seed are crucial factors. But it should be noted that the growing availability of commercial seed in turn encourages farmers to purchase seed that they previously saved on-farm. The development of the private seed industry is linked to the growth of the larger agricultural economy.

It is also important to recognize that India’s private seed industry was launched with higher-value hybrid seeds. The success of that early experience encouraged some firms to expand to crops such as rice, and provided an infrastructure and marketing environment that allowed some small enterprises to specialize in non-hybrid seed. The significant contributions of the public seed corporations should not be overlooked, especially in helping establish experience on which the private industry could build. The remarkable diversity of the private rice seed industry in Andhra Pradesh owes much to a
series of factors that lower transaction costs for seed enterprises. First, there is a transparent and efficient system for obtaining access to source seed of public varieties. Second, the extensive public and private seed industry operating in the state means that there are many farmers available with experience as seed growers. In addition, a wide range of processing and storage facilities can be contracted by producers who are unable to own such equipment. Finally, there is an extensive input marketing system that is able to deliver seed to farmers.

The system described for Andhra Pradesh is one in transition, but it holds many lessons for less-advanced seed systems. The trend toward increasing private participation is clear, but the direction and impact will be influenced by various policy decisions. The establishment of plant breeders’ rights is an important step, but much work remains to ensure an equitable and productive relationship between public plant breeding and private seed delivery. Subsidies and other advantages that discourage private seed production must be eliminated. Policymakers must realize that the evolution of the private seed industry will likely begin with higher-value products and that experience, infrastructure, and networks will develop to allow subsequent expansion. Public activities must be targeted toward those farmers and areas less likely to benefit from initial commercial activities. Finally, the development of a responsive private seed sector requires well-informed consumers. Policies to promote the private seed industry should include attention to consumer education so that farmers are able to protect their interests and express their demands.

NOTES

1. Data for this study were collected in 1998 and 1999. Data collection involved interviews with a range of government officials in the seed sector of Andhra Pradesh, interviews and/or postal questionnaires with 23 commercial seed firms, visits to NGO and Department of Agriculture seed schemes, interviews with 15 small-scale seed producers, visits to eight seed-producing cooperatives, and a survey of 286 farmers in three districts of Andhra Pradesh. The tentative conclusions of the study were discussed in a workshop with state seed officials and companies in August 1999. For further details see Pal, Tripp, and Janaiah (forthcoming).

2. There are also two coordinating bodies for rice research in India, both of which do rice breeding with a national-level mandate. The Directorate of Rice Research (DRR) is headquartered in Hyderabad and concentrates on irrigated rice systems. The Central Rice Research Institute (CRRI) in Orissa focuses on technologies for rainfed rice and for the special environments of northeast India. The national-level testing of rice varieties is an example of one of the All Indian Co-ordinated Crop Improvement Programs (AICCIPs).

3. This state-level indenting procedure has been in place in Andhra Pradesh since 1994. Previously, indenting for breeder seed was handled at the national level, and in some states this is still the case. There is a National Seed Project that helps meet many of the national-level requests, as well as providing seed of centrally released varieties.

4. In the case of private hybrids, the company may not wish to provide the samples of the original breeding lines that are required for certification, and will sell their seed as truthfully labeled. This does not apply to rice varieties, however, which are all in the public domain.

5. To become a shareholder a farmer must purchase a minimum of five shares, at Rs 100 each. (In early 1999, US$1 ≈ approx. Rs 42).

6. Villages or cooperatives may formally organize themselves to negotiate with seed companies, but this is relatively infrequent. Because there are many potential seed growers, some type of pan-village organization would be required in order to realize significant advantages in bargaining with the companies.

7. In contrast to most hybrid seed, dealers do not have to place advance orders for rice seed unless they feel there will be a high demand for a particular variety.

8. In the market for higher-value hybrid pearl millet seed, however, it is not unusual to see banners and other promotion by private seed companies advertising public hybrids (Tripp & Pal, 2000).

9. One well-known cooperative in northern Telangana declines to have any of its seed certified and relies solely on its reputation for marketing.
10. An interesting compromise is reported from Brazil. The national maize program sells its hybrids to a consortium of about six small seed companies, who have exclusive rights to market these hybrids. Problems have occurred because some of the companies have not maintained sufficient quality control (thus damaging the reputation of the hybrid), and this has required the maize program to screen and supervise potential participants. Some of the companies are also beginning to market their own hybrids, and these tend to receive more promotion (Garcia, 1998).

11. In our survey, the top three varieties in any district and season accounted for between 77% and 95% of all rice grown.

REFERENCES