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IN THE FIELD

Liberalization of Peru's formal seed sector

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Abstract. During the 1990s, the Government of Peru began to aggressively privatize agriculture. The government stopped loaning money to farmers' cooperatives and closed the government rice-buying company. The government even rented out most of its research stations and many senior scientists lost their jobs. As part of this trend, the government eliminated its seed certification agency. Instead, private seed certification committees were set up with USAID funding and technical advise from a US university. The committees were supposed to become self-financing (by certifying seed grown by small seed producers) and each committee was supposed to encourage the development of a group of small seed-producing firms, clustered around the seed certification agency. The amazing thing is that many of the seed committees actually accomplished these goals. The agronomists who staffed the committees stood by their jobs, even after US funding ended, even though the committees' income was (at best) modest, and occasionally under the threat of violence from the extreme left. Some seed certification committees failed and others did not. Some of the problems with Peruvian agricultural liberalization can be seen in regard to the seed programs of maize, rice, potatoes, and beans. For example, the government abandoned most research, yet could not resist creating certain distortions in the seed market (e.g., buying large amounts of seed and distributing them for political ends).

Key words: Certification of formal seed, Peru, Seed systems, USAID-funded projects

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Introduction

The liberalization policies that swept developing countries at the end of the twentieth century have caused significant changes in national agricultural sectors. The impact of those changes is a subject of active debate. On the one hand, many argue that the efficiency of agriculture in developing countries can only be improved if there is more private initiative in the provision of agricultural inputs and services. On the other hand, critics of agricultural liberalization see the decline of state participation as an abandonment of the rural poor and an invitation to foreign multinationals to dominate local agriculture.

These questions are particularly relevant for seed provision. Until recently, many national seed systems have been dominated by public seed production and distribution. Parastatal seed enterprises and special government programs have been supported by mandatory government seed regulations and restrictions on seed import. It is now recognized that there are strong arguments for transferring many seed

production, marketing, and regulatory functions to the private sector (Jaffee and Srivastava, 1994; Pray and Ramaswami, 1991). But there are also many voices of concern; some observers worry about the trend toward corporate control of seed supply (Kloppenburg, 1988). What are the policies and incentives that must be in place to encourage the emergence of a strong private seed sector and what are the continuing roles of the public sector in supporting seed provision?

In order to identify principles that can guide seed policy reform, it is important to study situations in which seed sector transition is taking place. This paper examines the experience of a seed sector reform that is very much "in progress." Peru has a long history of pervasive state participation in agriculture, but significant changes have been made in the past decade to encourage the entry of the private sector. Efforts at seed policy reform have been particularly notable. In any system in which the state has played such a dominant role in agriculture, the transition to private participation will be difficult. But the Peru case has featured several innovations to promote private seed activity that are worthy of discussion.

This study is not a comprehensive review of Peru's entire seed sector, but rather a snapshot of a seed system in transition. The study concentrates on institutional rather than technical issues. It follows the decline in support to state seed production, and analyzes the type of private initiative that was mobilized to organize alternative seed provision. It looks at the incentives that are available to support private seed activity and identifies gaps and problems. The study also examines the changes in Peru's seed regulations and analyzes the conduct of a unique, voluntary seed certification strategy. The study describes the effects of continuing government participation in the seed sector. The level of this participation means that Peru's seed sector reform is far from complete.

The study focuses on a small number of field crops (rice, maize, and potatoes) that are of particular importance for the majority of Peru's farmers. The study is based on more than one month of fieldwork carried out by two of the authors (JB and RDF) in 1999. The fieldwork included visits to 9 of Peru's 24 departments (political-administrative units). The authors interviewed representatives of certification agencies, experiment stations, seed companies, seed retailers, Ministry of Agriculture officials, and various smallholder farmers.

The next section of the paper outlines the nature of Peru's seed system before the reforms of the late 1980s. The following section describes the nature of the reforms that took place. The majority of the paper is devoted to describing the impacts of these reforms on seed production, seed regulation, and government agricultural agencies. The final section of the paper draws some conclusions regarding the impacts of seed sector liberalization.

The Peruvian seed sector before reform

Peruvian agriculture

Peruvians speak of their country as having 3 main physiographic provinces: *Costa, Sierra*, and *Selva* (the Pacific Coast, the Andean Highlands, and the Lowland Amazonian Basin). On the Coast, ex-hacienda workers, heirs to the 1970s land reform, and highlanders who bought or rent land, farm 2–4 ha parcels carved from the former, large commercial farms. Today the farms are small, but commercial. In the Highlands, fragmented smallholdings are farmed for subsistence and cash. Many of the farmers speak native languages (Quechua and Aymara). The Amazonian lowlands have some larger holdings of several dozen hectares, and small farms. The farmers include local Hispanics, Amerindian colonists from the highlands, and local, indigenous people.

Peru's 3 geophysical provinces include many of the world's major ecozones, from tropical rainforests to glaciers. Peru's agriculture reflects its diverse physical and human geography. Most of the world's important crops can be seen somewhere in Peru. This paper looks at only 3 crops (rice, potatoes, and maize) that are important in Peru's formal seed system.

Rice is farmed on 140,000 ha in the Selva and on the Coast (with about two-thirds of the production coming from the Coast). Potatoes occupy a total of 250,000 ha on the Coast (irrigated) and in the Highlands (rain-fed), with about two-thirds of the production in the highlands. Maize is planted in all three areas totaling 450,000 ha, including 250,000 ha of floury maize in the Highlands, and the rest in hard yellow maize (HYM) on the Coast and Selva.

Seed production

During the Agrarian Reform of 1972, the government of General Velasco transformed haciendas on the Coast into cooperative farms run by the former workers. Demand for formal seed was initially modest, but during the 1980s the Ministry of Agriculture induced cooperatives to buy agricultural inputs (including seed) on credit (from the Banco Agrario, now defunct). The Ministry insisted that this seed be certified.

Rice seed was produced and sold by ECASA (Empresa Comercializadora de Arroz S.A. – Rice Marketing Company, Inc.) a government monopoly. Maize seed was produced by the Maize Program at Universidad Agraria La Molina, a public agricultural

university that also bred maize. Seed potatoes were grown on large (about 100 ha) commercial farms in the highlands. The Ministry of Agriculture would fix a price for seed potatoes, based on growers' costs of production, and so seed potato became a lucrative crop, with a captive market and an automatic profit margin tacked above production costs.

Seed regulation

All of these seeds were certified by agronomists from the SDCCS (Subdirección de Certificación y Control de Semillas – Sub-direction of Seed Certification and Control), a branch of the Ministry of Agriculture. Seed certification was handled by agronomists from SDCCS, who had a reputation for toughness, and for rejecting sub-standard seed. There were enough agronomists to inspect even widely dispersed potato fields.

Agricultural research

In the late 1960s, the government of Peru had a research-extension branch called Servicio de Investigación y Promoción Agraria (SIPA – Agricultural Research and Extension Service). With the 1970s military government of Velasco, all agricultural agencies were placed in the Ministry of Agriculture. A rivalry erupted within Ministry of Agriculture between the production people and research. In the 1970s, there were two programs for each crop; for example, there was the National Potato Program and the National Seed Potato Program that bred the best potato varieties. In 1981, the government created a separate research and extension institute, the Instituto Nacional de Investigación y Promoción Agropecuaria (INIPA – National Institute for Agricultural Research and Extension).

The reforms

During the late 1980s, Shining Path violence, rampant inflation, chronic budget deficits, and drought combined to drive the country to the brink of fiscal insolvency. However, in 1990 the government imposed an austerity program that removed price controls and ended subsidies on many basic items and allowed the Inti, the national currency at that time, to float against the US dollar. At the same time, some of the old government-sponsored seed programs were closed, although other mechanisms arose to partially take their place. Private seed enterprises became more important, seed imports increased, and Peru replaced its mandatory seed certification with a voluntary program.

Rice

During the 1970s and 1980s, ECASA, the state monopoly, bought and sold rice, eventually losing money. Imports increased and so did Peru's per capita rice consumption. Rice production doubled between 1980 and 1993 and per capita rice consumption climbed from 27 kg to 45 kg. By 1989, the government could no longer afford ECASA, which had gone from 500 employees to 5,000. President Alan García declared an open market for rice. ECASA could not compete with private companies, and in 1991, President Alberto Fujimori broke it up. Imports kept increasing and prices dropped. By 1991, international rice prices were lower than the costs of producing rice in Peru.

By 1992, government support ended for the agricultural cooperatives (former haciendas) and they were divided in equal shares of about 2–4 ha (depending on the size of the ex-hacienda and the number of former workers). The government also closed all rice research centers on the Coast of Peru.

Potatoes

The end of government support for cooperatives meant that former members no longer had formal credit for seed, but were free to buy informal seed. Many did so, and many others rented their land to highland farmers, who trucked in their own seed potatoes from their farms in the Andes. The break-up of the seed potato oligarchy in the early 1990s cleared the way for smallholders to enter the seed business.

The government still provides some support for seed potato production. One major group of players is the CODIPAPAs (Comité Distrital de Productores de Papa – District Potato Growers' Committee), which are local farmers' organizations. They receive aid from the Government of Peru, through CONAPAPA (Comité Nacional de Productores de Papa – National Potato Growers' Committee), which was formed in the mid 1980s.

CONAPAPA functions almost like a parastatal. In 1992, President Fujimori's minister of agriculture promoted the creation of about 100 greenhouses and about 30 seed potato laboratories. These were given to groups of farmers, including CODIPAPAs. The greenhouses and labs were supposed to promote formal seed potato production, but nearly all of them are now abandoned.

Maize

Before the seed sector reforms, the government's Maize Program (housed at the Universidad Agraria La Molina) was in charge of seed production. During the

1970s, 65–70% of the maize on the Coast was planted with certified seed. During the 1970s, there may have been 130,000 ha planted to HYM on the Coast; now it may be as low as 60–90,000 ha, because land has been planted to cotton, and because maize production is moving to the Amazon Basin. The Maize Program sold 1,500 tons of certified HYM seed per year through the 1970s and 1980s, but by the 1990s the nation as a whole bought only about 1,000 tons of certified HYM seed. Since 1989, much of the HYM seed has been produced by local companies or imported.

Agricultural research

In 1987, extension and research were separated and the Instituto Nacional de Investigación Agraria (INIA – National Institute for Agricultural Research) was created. During the 1990s, some INIA stations were closed, and budgets were cut at the others, so that government funding paid for little more than core salaries. In 1999, INIA maintained nine research stations, one on the Coast, five in the Highlands, and three in the Amazon Basin.

By the late 1990s, the government of Peru encouraged the INIA stations to move to seed production – both certified seed and the higher quality basic seed used to produce certified seed.[1] A notable example is the Santa Ana Station, in the warm Andean valley of Mantaro, wear the city of Huancayo. For the 1997–1998 year, the National Potato Program on the station earned a profit of about $12,000, mostly from seed sales. This is used to pay salaries of laborers, secretaries, and technicians, and to offer bonuses to scientists and agronomists. All biochemical inputs are paid for by seed sales, as are new vehicles and capital investment.

Research stations responded in different ways to the policy changes. Santa Ana produces seed potato and some maize seed, and does some breeding and research in potatoes and maize. Donoso (on the Coast) grows maize and bean seed and does some research and production of fresh fruits and vegetables. El Porvenir (in the Selva) sells some maize and rice seed, while struggling to maintain national research programs for rice and maize.

Reforms affected not only public research; there is no longer a public-sector extension service in Peru. Liberalization in Peru meant that the government abandoned some services, such as research and extension, while retaining some profitable seed production activities. Some NGOs provide extension services, especially near attractive cities like Cusco, in the Sierra. On the Coast, there are private extensionists, who make a living selling counsel to farmers on a per-hectare charge.

Other government organizations

UOPE (Unidad Operativa de Proyectos Especiales – Operative Unit for Special Projects) was created by the Fujimori government to support initiatives for farmers, and is managed by the Ministry of Agriculture, accounting for almost 35% of the Ministry's budget. UOPE has a vague name, reflecting its flexibility: research, extension, marketing, and other activities as needed to respond to changes in policies of the executive branch of the Peruvian government. For example, UOPE has a small maize research program that is managed more or less in isolation from INIA's maize breeding effort. UOPE also produces maize and rice seed in San Martín. UOPE agronomists work with farmers' groups, training farmers in seed potato production. UOPE also has a loan portfolio of about US$10 million to loan seeds and chemicals to farmers of 1–3 hectares.

Because of these seed loans, UOPE is the largest buyer of formal sector seeds in Peru. UOPE has power to distort the seed market. UOPE buys almost all of the formal bean seed in Peru. Although reliable data are difficult to obtain, UOPE buys perhaps half of the formal maize seed and several hundred tons of rice seed (both certified and uncertified). UOPE also buys seed potato from commercial producers for use in some of its programs.

Seed regulation

Seed regulation is traditionally an area of strong government involvement in national seed sectors. Seed regulation includes two distinct areas, variety registration and seed quality control (Tripp, 1997). Variety registration involves the testing and approval of any variety sold as seed. Many countries have mandatory registration procedures, although other countries (such as the US and India) do not require official approval of varieties. Seed quality control includes two elements. One is the assurance that the seed is in fact the stated variety; this is the strict definition of seed certification, which involves inspection of source seed and field visits to seed multiplication plots. In addition, most certified seed also is inspected for physical qualities, such as germination percentage and cleanliness.

As in many countries, variety registration in Peru has been traditionally linked to the process of approving the release of public crop varieties. Any foreign or private varieties also had to pass through the same field-testing and approval procedures. Seed sector reforms did not affect the variety registration regulations that were in place.

On the other hand, major attention was directed towards Peru's seed certification process. In 1988–1989, a USAID project, TTA (Transferencia de

Tecnología Agrícola – Transfer of Agricultural Technology), began to express interest in creating a system of private voluntary seed certification, with the help of FUNDEAGRO (Fundación para el Desarrollo Agrario – Foundation for Agricultural Development). FUNDEAGRO was a foundation that used USAID funding to support CONASE (Comisión Nacional de Semillas – National Seed Commission) and other agricultural activities. Using USAID funds, in 1990 FUNDEAGRO began establishing private seed committees called CODESEs (Comité Departamental de Semillas – Departmental Seed Committee). Iowa State University served as an external advisor. The former certification agency, SDCCS, was disbanded in 1992 and CONASE began to supervise the CODESEs.

The CODESEs were to be private, voluntary, certification agencies that would be financially self-sustaining. They were also meant to stimulate the emergence of a private seed sector. Education was a large part of their mandate. Their personnel were to train seed growers and help them learn to improve their own quality control. The CODESEs were also to manage seed conditioning facilities that could be rented by small companies. The CODESEs were supposed to remit 10% of their gross receipts to the regional Ministry of Agriculture and 30% was supposed to go to CONASE.

The seed growers, whether INIA stations or private firms, contact the CODESE in their department to arrange for inspections of seed fields. The CODESE charges 2 percent of the value of the seed for the certification service. Each CODESE has a manager and a technical assistant. Both are agronomists. The formal head of the CODESE is an assembly of representatives from public and private institutions, including farmers, seed merchants, seed producers, the Ministry of Agriculture, INIA, and universities. Every two years, the assembly elects a Steering Council (*Consejo Directivo*) that serves without pay. The Council lends moral support to the CODESE, but most day-to-day operations are left in the hands of the manager and his assistant.

Seed producers must be registered with SENASA (Servicio Nacional de Sanidad Agraria – National Agricultural Health Service), a branch of the Ministry of Agriculture. Although 1,244 seed growers have registered with SENASA since 1982, the current SENASA register lists only 35 seed growers (SENASA, 1998). The number of formal seed producers plummeted between the 1980s and 1999. Almost all of the formal seed producers who left the market were smallholder potato farmers in the Andes. Their initial interest was usually stimulated by NGO or government projects that were willing to pay for certified seed. These farmers often had problems contracting seed certification or marketing their seed after the projects ended, and so they stopped rearing formal seed.

The current seed system

Rice

About 20% of the area planted to rice in Peru uses certified seed. Rice is produced by smallholder farmers, often heirs of the land reform. They grow 1–3 ha of rice as a cash crop. Little rice is processed or eaten on-farm. Rice is hand-transplanted, but (at least on the Coast), is harvested by combines and is trucked directly to large mills. The millers not only buy rice, but also finance the next year's crop. A miller may bankroll hundreds of rice farmers. Some millers encourage their client farmers to plant certified seed, and seed growers work with millers to promote and deliver seed to smallholder farmers. All rice on the Coast, and most rice in the Amazon Basin is irrigated.

Rice seed is produced by newly formed private companies, NGOs, and government entities. Boxes 1 and 2 contain examples of some of these enterprises.

Maize

According to De Córdova et al. (1998), 24% of hard yellow maize (HYM) in Peru is planted with certified seed. HYM is grown mostly on the Coast for animal feed, especially for poultry. Peru imports about half its HYM supply, so farmers are assured ready buyers for their maize. HYM seed is grown on the coast and in the Selva, by both government agencies and private companies (including some multinationals). Some of the hybrid seed is imported (largely from Brazil and Argentina). Besides hybrid seed, there is one major open pollinated variety (OPV), called Marginal-28-Tropical, which is produced by Peruvian seed companies and by INIA, and to a lesser extent by multinationals. Much of the hybrid and OPV HYM is purchased by smallholder commercial farmers (many of the same smallholders who grow rice).

The Maize Program of the Universidad Agraria La Molina, once the giant of maize seed producers, still has a small seed program, with the nominally private APROSEM (Asociación de Productores de Semilla – Association of Seed Producers). There is also some private production, and considerable informal trade, of seed of the local floury maize varieties that are grown in the Highlands. Box 3 provides examples of the major maize seed producers.

Box 1. Formal rice seed producers on the coast.

El Cholo

El Cholo is a rice mill in the Jequetepeque Valley north of Trujillo, La Libertad. It is the largest rice mill in Peru. The personnel of El Cholo work with the local CODESE to certify their seed. The personnel of El Cholo do market studies to determine which varieties their customers will want to plant the following year. They give credit and private extension to about 1000 rice farmers, and El Cholo markets its seed directly to farmers. This company is the largest rice seed producer in La Libertad, and a significant part of the portfolio of the Trujillo CODESE.

IDAL

Vista Florida was one of the INIA experiment stations abandoned by the government. Vista Florida had been INIA's headquarters for rice research. The station was taken over by a private institution, IDAL (Instituto de Desarrollo Agrario de Lambayeque – Agricultural Development Institute of Lambayeque), founded in 1993, which trains farmers and sells seed. IDAL produces rice and maize seed, and is one of the few private suppliers of basic and registered seed (that is, the higher categories). IDAL seed is certified, by the CODESE/Lambayeque. They print some promotional literature and sell direct to farmers who come to the station. Much of their personnel is former INIA, including a rice breeder who is breeding private varieties for IDAL.

Semillas Peruanas

Semillas Peruanas is a medium-sized Peruvian seed company formed in 1980, specializing in rice (also maize and some bean seed). It has a seed plant and a cold chamber for seed collections. The company's two main partners were rice scientists at the INIA station at Vista Florida. Semillas Peruanas maintains its own source seed. They also acquire some new material from the INIA's national rice program, and from international centers. Their seed is certified by the CODESE/Lambayeque. They sell to the Ministry of Agriculture and to farmers. Their marketing strategy includes demonstration plots.

Semillas Ventura

The Ventura rice seed company is owned by a woman and her husband who both have ample experience in rice seed. For many years, she worked at the ECASA seed plant and he taught seed technology at a university. They started producing seed commercially in 1994, on 7 ha. Now they raise rice seed on 80 ha, some of it rented. They contact customers through NGOs, rice millers, irrigation commissions, and agricultural input dealers. The firm offers technical lectures on seeds as part of its sales service. The seed is certified by the CODESE/Lambayeque. The harvest is processed at the CODESE seed plant, where the seed is stored until purchase.

Arrocera del Sur

Arrocera del Sur raises rice seed at the former INIA station of "El Chira," in Sullana, Piura, 1100 km from Arrocera del Sur's Lima office. Arrocera del Sur hires a plant breeder, part time, from a local university. They continue to test new material from international centers and foreign companies. As with most of the other rice seed companies, key personnel of Arrocera del Sur are former INIA employees. The company specializes in rice seed, and sells little else. They plan to work on specialized rice varieties, e.g., a sticky rice for the Asian community in Lima, a European-type for paella and a long-grained "American" fancy rice. The company maintains its own source seed. In the past, Arrocera del Sur has not certified its rice seed, but in 1999 it made contact with The CODESE/Piura to begin certifying its seed crop. The company sells to Ministry of Agriculture (UOPE) and to farmers, primarily through retailers in Coastal towns.

Box 2. Formal rice seed producers in the Selva.

PROICAR

PROICAR is an international NGO, with national headquarters in Lima and field offices in several Peruvian cities. They provide technical assistance for smallholders who farm 10,000 ha of rice in the Amazon Basin. This technical assistance is financed as a credit package (including seed) by the Caja Rural (a type of credit organization with government support). PROICAR encourages client farmers to use certified seed, and about 30% of them do. In 1998, PROICAR bought 300 tons of seed from INIA/El Porvenir. In 1999, the PROICAR leaders decided to raise the seed themselves, and so formed a separate wing of PROICAR as a seed company. They worked closely with the manager of the CODESE/San Martín, who taught seed production to their agronomists.

Mr. Sánchez

Mr. Sánchez is an agronomist from Tarapoto, and owned land there. After working for various projects and businesses for 15 years in the Central Selva, he came home to Tarapoto to work his own land. He says that this is a typical story for a seed producer in Tarapoto. Almost all of the others are agronomists, who have had experience working with the Ministry of Agriculture, or for private companies. Since 1995 he has produced maize seed (30 ha) and since 1998 he has produced rice seed (11 ha). His source seed comes from INIA/El Porvenir and it is certified by the local CODESE. Mr. Sánchez is currently the president of the San Martín CODESE.

INIA/El Porvenir

INIA moved the National Rice Program from Vista Florida, on the Coast, to the El Porvenir Station, near Tarapoto, San Martín, in the Selva Alta. The staff of El Porvenir is struggling to maintain the National Rice Program and the National Maize Program. El Porvenir is weedy and in disrepair; there is no glass in the windows. The laboratories have almost no equipment. El Porvenir has no cold storage facilities, which means that they must continually regenerate their breeding materials. With almost no money for operations, the El Porvenir staff continues to breed rice and maize, even though they admit that they could do a lot more, with proper support. The station also produces rice and maize seed. Their sources are international centers and other INIA stations (especially for maize). Their seed is certified. They sell basic and registered source seed to other seed producers and they sell certified seed to UOPE.

Box 3. Formal maize seed producers.

Hortus

Hortus is a seed company that was started in the 1970s by several Peruvian agronomists. Hortus has been sold 3 times since 1978 and now belongs to a Chilean corporation. Hortus sells seed of maize, oats, alfalfa, various vegetables, and flowers (most of these imported from the USA), as well as agrochemicals and potting soil.

Hortus no longer certifies any seed, because it relies on its reputation for quality. Hortus also has concerns about the fact that certification can be falsified, which lowers consumer trust. In addition, they complain about CODESE's certification charge of 2% of seed value, which means that hybrid maize is much more costly to certify than an OPV.

Hortus maintains its own source seed of HYM (Marginal-28-Tropical) and white floury maize varieties. Hortus sells about 100 tons per year of hybrid maize seed, imported from Argentina and about 100 tons of Marginal-28-Tropical, which it produces with contract farmers in Peru. Hortus used to sell through retail seed stores, but is phasing that out, and is opening a chain of its own retail stores in major cities.

Multinationals

Multinational companies sell hybrid HYM seed in Peru. Some of it is grown in Peru, but much of it is imported. The market has a lot of competition. Cargill used to sell 800 tons annually, but that amount has dropped, as other hybrids have entered the market. Many buyers have more confidence in imported seed, because the bags are more difficult to counterfeit.

Seed for floury maize

The local floury maize varieties (purple ones for soft-drinks, yellow ones for toasted maize, and large white ones for fresh maize) are produced by smallholder farmers, and sold on the informal market. There is also a small, formal trade in seed of these varieties. Hortus produces 20 kg paper bags of large-grained white maize seed and has maintained 2 white maize varieties since the 1970s. Agroseed in Virú, La Libertad, produces a large-gained white variety. Apparently only one seed company deals in certified, purple maize, and it is all produced by a single farmer. The National Maize Program (La Molina) also produces some seed of white floury maize.

The white maize variety Urubamba, also called the giant Cusco maize, was once grown formally for seed on as much as 50 ha. However, this is declining rapidly. One of the larger remaining producers manages 12 hectares, but he does not certify the seed. His seed is semi-formal (sold in burlap bags, with a label). His clients are familiar with his product and its quality, and he does not need to certify it in order to sell it. A number of other highland maize farmers grow informal seed for sale.

APROSEM

APROSEM (Asociación de Productores de Semilla – Seed Producers' Association) is a maize seed producers' union, with close ties to the national Maize Program, housed at the Universidad Agraria La Molina. The Maize Program produces source seed of Marginal-28-Tropical that it sells to APROSEM for multiplication. APROSEM pays the Maize Program a royalty for the source seed, and pays the Maize Program a fee for using its seed plant to clean, sort, and bag the seed, which is certified by the CODESE/Lima. They also sell about 80 tons of seed of public hybrids. APROSEM is nominally private, but is practically a dependency of the Maize Program.

INIA/Donoso

INIA's Donoso station has the advantage of being the only INIA experimental station left on the Coast, and it is within an hour and a half's drive of Lima. The Donoso station has a seed plant in good condition. In 1998, INIA/Donoso expanded its operation and produced a large quantity of HYM Marginal-28-Tropical seed with contract farmers. There is some confusion about the fate of this seed, but it appears that sufficient funds were not available to pay all of the farmers. INIA did not grow seed with contract farmers in 1999. INIA/Donoso's seed is certified by the CODESE/Lima. Sales are to UOPE (80–90%) and the rest directly to farmers, who come to the station to buy it.

Potatoes

Since the early 1990s, there has been a massive movement in informal seed potatoes between the Highlands and the Coast. Because potatoes build up a virus load in the lowlands, there is a great demand every year for seed from the Highlands. The old seed potato farms were split up, as large owners became increasingly threatened by attacks from Shining Path, and smallholders bought their land.

There is little demand for certified seed potato. Official figures are not always comparable, but most experts suggest that about 2% of Peru's potatoes are grown from certified seed. Even UOPE buys little certified potato seed. Most of the demand for certified seed potato comes from NGOs, for distribution to smallholder farmers. There is also some demand from commercial growers. In the Highlands, INIA has a competent seed potato program at Santa Ana (near the city of Huancayo, in the Mantaro Valley in the Department of Junín), which has help from the neighboring CIP (International Potato Center) station. INIA/Santa Ana sells some seed potato to some CODIPAPAs. There are some family firms selling seed, largely for the NGO market. Some of those firms appear to be profitable, and others have large bank debts. Boxes 4 and 5 contain descriptions of formal and semi-formal potato seed enterprises.

There are two main differences between potato and grain seeds. Potato is (usually) reproduced vegetatively, through tubers. Because it is not true seed, it is bulky. Second, potato acquires various kinds of native and exotic viruses, which are transmitted across generations. These viruses can be eliminated by various laboratory techniques. Technicians grow cuttings of young potato plants in jars on gel mediums. This *in*

Figure 1. Regions visited during the study of seeds in Peru.

vitro procedure produces virus-free tubers the size of marbles. Those micro-tubers can be planted in greenhouses. Normal-sized tubers from the greenhouses can then be grown in fields.

Commercial demand

One of the principal explanations for the low use of certified seed potato is the nature of demand for commercial potatoes. Unlike maize and rice, which comfortably entered Peru's agroindustrial market (corn chips, poultry-feed, polished rice), potatoes are still sold loose, in traditional markets, with little processing. Although potatoes grown on the Coast are cash crops, perhaps half of the potato crop in the Highlands is consumed on-farm (Fano, 1999).

Peru is missing the opportunity to grow potatoes for agroindustry. The major markets for agro-industrial potatoes are potato chips and French fries for Peruvian-owned hamburger restaurants and for multinationals like Burger King and McDonald's. The Tomasa variety is good for potato chips, if grown on the Coast. But it only grows on the Coast from August to December. In the Highlands, the cold causes the variety to produce too much sugar, and the chip burns when fried. When Tomasa is not available from the Coast, the industry tries other varieties, with uneven results. A company has a plant in Lima for making pre-cooked French fries (for sale in supermarkets and restaurants) and they also process the Coastal Tomasa variety.

Certain entrepreneurs travel to farmers' fields, fry chips, buy potatoes if they fry right, and then re-sell them to the chip processors. Even though few farmers grow potatoes specifically for chips, and there are a wide variety of potatoes grown under many different

Box 4. Formal seed potato producers.

Semillas Agrigan

Semillas Agrigan specializes in selling basic seed. The company owns 81 ha, all of it irrigated with high-power sprayers. The company also has 2,400 m^2 of greenhouses with drip irrigation and temperature regulation. The owner has secondary school training in agronomy and has worked in seeds since 1978. He built the greenhouses from 1991–1995 and stocked them with plantlets from INIA and the Universidad San Marcos (Cusco). He has a bank loan for the greenhouses and the irrigation system. This is common for seed potato producers. High bank interest rates and fluctuating prices have forced many into debt and some have lost their property to the banks. The company has its seed tested for virus by INIA and receives 3–4 inspections by the local CODESE. They sell their basic seed to commercial seed growers. They plant demonstration plots on the Coast, and participate in all the national potato fairs to promote their seed.

The Garcías

The Garcías produce basic, registered, and certified seed potatoes. The Garcías started their seed business in 1996, as seed merchants, buying improved seed in Andahuaylas and bringing it to Huasahuasi to sell to seed growers. Then they started growing seed themselves in fields. Their source seed still comes from Andahuaylas, from Semillas Agrigan and others, and they grow it out in Huasahuasi on 12 ha of rented land. The Garcías plant 4–5 of the most popular commercial varieties. They certify their seed to make sales, because much of their demand is from government agencies or projects that request certified seed.

Semilla Jaujina

This small seed company near Jauja, Junín, has 2 operating greenhouses, a tissue-culture laboratory and 80 ha of seed potato. The business started in 1994. They sell certified seed, mostly to growers on the Coast. Client farmers seek them out, because the business has a good reputation. They advertise on an agricultural program on a television station that donates airtime for such commercials. Besides certified seed potatoes, the company sells pre-basic mini-tubers, produced in greenhouses.

Arariwa

SEMAR (Semillas Arariwa) is a private, non-profit organization, intended to be self-sustaining. It was started as a seed project of Arariwa, an NGO in Urubamba, Cusco. The project ended in 1997, but Arariwa has managed to survive on seeds, with some support from other foreign donors. Their main customers are other NGOs and government projects and farmers in Coastal valleys (Arequipa and Cañete). Arariwa advertises with pamphlets, and they promote seed directly with smallholder farmers. Arariwa grows seed through contract farmers.

Bioagrícola del Perú

Bioagrícola del Perú is a small family-run business that produces *in-vitro* seed potato. The husband-wife team has a small lab in their house, with the minimum of equipment. They both worked at CIP for 20 years. CIP is their source of virus-free material. Much of the demand is from NGOs. This family firm is successful because they save capital and labor costs by working at home, and because they have a good reputation. They have also innovated an ingenious way of saving on intermediate costs. *In vitro* production utilizes special glass jars. The firm buys used baby food jars from specialists who recycle Lima's garbage. They soak them in water for 2 days to remove the acid used for cleaning by the recycling firms. These jars cost only a fraction of the glass that CIP must import for its laboratory. They cover the jar mouths with Saran Wrap, fastened to the jar with the plastic sheeting used to cover suitcases in airports. This simple adaptation of locally available materials has contributed so much to the cost-effectiveness of rearing *in vitro* potatoes that CIP now finds it cheaper to buy some plantlets from the firm rather than to rear them at CIP.

Box 5. Semi-formal seed potato.

CODIPAPAs and informal seed

CONAPAPA has organized the CODIPAPAs to produce seed potatoes, but only one (at Huasahuasi) works well. One of the problems is that in some of the CODIPAPAs there is an insistence that farmers work as groups, rather than individuals. Grouping 30 farmers to run a greenhouse or a storage center means that farmers lose a lot of time in meetings, and farmers lose interest in the projects.

A considerable amount of commercial seed potato comes from the CODIPAPA in Huasahuasi. The seed is produced by individual household farms, but most are members of the Huasahuasi CODIPAPA. The success of this CODIPAPA rests on historical and geographical circumstances. Huasahuasi was a seed producing area during the heyday of distorted demand, and the community continues to produce informal seed.

The CODIPAPA has found an ingenious way to coerce people into paying an extra-legal tax on potatoes. Huasahuasi is in the end of a steep box canyon, with only one road out. During the Shining Path conflict, the Peruvian army set up a checkpoint on the only exit from town. The people who run CODIPAPA started charging a modest fee at the checkpoint. For the fee, they issue an official-looking paper that says that the potato is from Huasahuasi, which has a reputation in Peru for producing high-quality seed potato. Farmers are convinced that the payment is mandatory (which it is not, technically) and that the payment is for certification (which it is not). CODESE has little or no presence in Huasahuasi, so little of the seed potato from there is officially certified.

Most of the seed from Huasahuasi is handled by private individuals. Potatoes are brought from the field, classified as ware, seed, or discard, re-bagged, stacked, and transported to market. The storage and conditioning facilities are called "*centros de acopio*." They are simple, semi-dark barns or warehouses next to the owner's home. Some of the centers are owned by farmers, who handle their own production. Others are owned by family firms that buy potatoes from farmers in Huasahuasi.

Informal seed is run as an activity of small farms, by household members who are knowledgeable about potato growing and selling. There are also "fillers" (*llenadores*), specialized gangs of 4–5 men who travel around Peru, sorting, bagging, and stacking the ware and seed potatoes. The center owner has especially strong links with the fillers, the farmers, and the merchants. These tend to be long-term relationships built on trust that comes from working together over several years.

conditions (which affect sugar content), a clever buyer can find potatoes in the field that are acceptable for chips.

Peruvian fast food chains buy Peruvian potatoes for French fries, but some consumers complain that these are greasy and soggy, not only because of the variety, but also because the restaurants do not blanch their potatoes before frying them. The multinational restaurants reject Peruvian potatoes outright. They insist on using only Russet Burbank, which will not grow in the Andes. (The variety requires long day length, and will only grow at high latitudes.) Also, transaction costs of introducing and then buying new varieties on an industrial scale would be high in Peru because there are so many farmers growing 2–3 ha of potatoes, and very few growing larger amounts. The food companies would practically have to have a small extension program. If it were not so easy for Burger King and McDonald's to ship Russet Burbanks from North America, there might well be more incentive to develop and produce a tropical Burbank.

The potato case illustrates how market conditions affect the demand for formal seed. The lack of locally-adapted varieties for certain industrial uses and the fragmented nature of potato growing and marketing lower the incentives for certified (or carefully controlled) seed potato markets.

Regulation

Seed quality control

The CODESEs were established to provide a voluntary self-financing certification service. USAID (TTA Project) formed 8 CODESEs between 1990–1993.

- Piura (with a laboratory)
- Lambayeque (with a laboratory)
- La Libertad
- Lima
- Ica (with a laboratory)
- Arequipa (with a laboratory and a processing plant)
- Cusco
- San Martín (with a processing plant)

USAID, through its ADEX (Asociación de Exportadores – Association of Exporters) Project, formed two other committees in the Highlands, after the Shining Path movement had been destroyed.

- Apurímac 1995
- Junín in 1997–1998

Both of these were intended to certify for potatoes, and have had to struggle more than the others. In part this is because of their late start (fewer years of donor support), but another reason is that they certify potato, instead of grain crops. Because the CODESEs charge 2% of the *value of the seed*, it is more profitable to visit one large field of rice or maize or cotton than to visit the many dispersed seed potato fields. Many farmers insist that the yield from informal seed potatoes is just as good as that from certified seed, which further decreases demand for formal seed potatoes.

The CODESEs charge customers when the seed is sold, not when the CODESE performs the field inspections. This has made it hard to collect payment from some customers, and has hurt some CODESEs. (Those CODESEs with a warehouse, where clients store seed, can ask for payment for certification just as the client sells the seed.)

The future of the CODESEs is difficult to predict. As we have seen, the demand for certification varies by crop and by region. The CODESEs could be swiftly ruined by government intervention, and the only way some of them have been able to stay profitable is by not making all their payments to the government. It is not clear that the CODESEs have the resources to stay in business, but they have managed to keep the doors open for several years after being severed from donor support, which is remarkable.

The CODESEs are not only quality control agencies. They were also established to serve as a nucleus around which small seed businesses could form, providing technical advice, training, and access to seed conditioning machinery for cleaning seed, applying fungicide, and bagging seed. Seed conditioning plants bring in customers. Most rice or maize seed producers do not have their own equipment, and renting conditioning services from the CODESE brings them into contact with the certification agency. CODESEs like San Martín, in the Selva, which was given a facility by USAID, or like Lambayeque, which managed to acquire use of an old ECASA plant, are more successful than the CODESEs without conditioning or storage facilities. The laboratories and conditioning plants donated by AID were too large; if the donor had bought more appropriate equipment, each CODESE could have had a decent lab and seed conditioning plant. There are also problems regarding ownership of equipment. USAID only gave the CODESEs the use of the equipment, with ownership retained by a foundation that has since closed. INIA is starting to claim ownership of that equipment. This is a potential problem for the CODESEs, but as yet INIA has not asked to physically remove CODESE seed plants, cars, or laboratories.

Variety registration

Despite the liberalization of certification, variety registration remains mandatory in Peru. The emergence of private seed companies and their increasing use of breeding materials from international centers and other sources outside of Peru lead to problems in defining ownership and access to new varieties. These problems will not be resolved until plant variety protection legislation is in place. In the meantime, the various actors in the seed system devise novel ways to deal with the changing scenario, as the case of a "new" rice variety illustrates.

In 1993, representatives of the firm Arrocera del Sur visited IRRI in the Philippines and brought back 30 rice varieties, which they believed to have potential for Peruvian conditions. One of these, IR-43, was a non-sticky, high yielding, long-grained variety that consumers liked. Arrocera del Sur sought to register IR-43 as a private variety called "NIR-1," in 1994. The company claimed that through a selection process NIR-1 was now a different, higher-yielding variety. However, the CODESE managers were only willing to certify NIR-1 as IR-43.

In 1998, the vice-minister of agriculture allegedly ordered a junior official from the Rice Program of INIA to "certify" NIR-1. This was an entirely irregular procedure. INIA is not a certification agency. In the case of NIR-1, INIA issued a "guarantee" tag (not a certification tag), which bore a remarkable resemblance to the CODESE certification tags. The tag read that the variety was IR-43, and the brand name was NIR-1. That year UOPE bought 400 tons of this seed from Arrocera del Sur (a sale that must have been worth at least $500,000). INIA's creative solution of calling NIR a brand name cleared the way for Arrocera del Sur to come into the formal seed system. In 1999, agronomists from the CODESE/Piura are making technical visits to the Arrocera del Sur farm. The certification tags will read IR-43 (in small, black letters), but the bags of seed will read "NIR-1 is a registered brand name" (in large, red letters).

In this case, a disagreement that could have torn the system apart was resolved more or less to everyone's satisfaction. The system was sufficiently resilient to overcome misunderstandings, differences of opinion, and meddling by politicians. But such cases will likely become more common until clear regulations for variety registration and ownership are instituted.

Conclusions

This study describes some of the major effects of the liberalization of Peru's seed sector. However, we have seen that this was only a partial liberalization. Government policies have often had the effect of giving private initiative with one hand, but taking it back with the other. The state is still a significant producer and buyer of seed. In 1999, a government program (UOPE) caused a large, if fleeting, distortion in the seed market for political reasons (coinciding with President Fujimori's re-election bid). It is responsible for distributing large amounts of seed at subsidized prices. Several other government programs, and the research service itself (INIA), are also engaged in large-scale seed production to feed government agricultural programs.

These symptoms of badly conceived liberalization represent common problems in seed sector reform. Among the principal difficulties are an inadequate approach to the privatization of agricultural research, the temptation to use subsidized seed for political ends, and unclear policies regarding the use of former government assets for private seed production.

In the rush to trim government budgets, agricultural research and extension were severely curtailed. Funding is now inadequate for continuing with many public research activities, including plant breeding, that are widely recognized as being public goods that deserve government support. On the other hand, in a misguided attempt to provide what remains of the research service with a source of income, government policy has allowed INIA to continue as a major (and subsidized) seed producer. This in turn thwarts the very policies that aim to encourage more seed production in the private sector.

The use of subsidized seed is a common temptation for governments the world over (Tripp, 2000). It is relatively easy to organize programs that produce and distribute seed. But these programs act as significant disincentives to the emergence of private seed activity, and they postpone the day when seed provision will respond to farmer demands, rather than to government priorities.

Seed policy reform in Peru has tried to make good use of government assets that can be dedicated to seed production. These include conditioning equipment, storage facilities, offices, and land. In many cases, these assets are now being used by various private, or semi-private, organizations involved in seed production. But their ownership has still not been defined, and this causes considerable uncertainties for seed businesses.

Despite these problems, there has been notable progress in Peru's seed sector. One of the most important successes was the innovation of the seed committees (CODESEs) to manage seed certification and to serve as growth points to stimulate the emergence of small seed enterprises. The successful

CODESEs consist of serious, mature professionals managing small agencies in isolated cities, nurturing a community of 10–12 seed companies each, maintaining an honest public service. The agencies function well for seed quality control and education, and several of them provide seed conditioning equipment.

With respect to seed certification, there is some question over how much of the demand is real and how much is caused by government policies and by NGO preferences. Only a minority of seed is certified, and it tends to be for a few crops, principally rice, cotton, and maize. It may be argued that where there is a genuine demand from producers and consumers for seed certification, it is for crops that feature in highly commercial production systems, where variety identity and seed purity are particularly important. For other crops, seed quality control is managed by the mechanisms of trust and reputation that are part of indigenous seed trade.

One regulatory issue that is still to be addressed is the future of private plant breeding. Private companies hope to develop their own crop varieties that will be their exclusive property or that will be the source of royalties. To a certain extent, such initiatives are to be welcomed, especially if they represent the additional investment of private resources in agricultural research. But there is also an apparent tendency to raid the germplasm resources of what is left of INIA, or of international agricultural research centers, and to claim exclusive rights to what is in fact public property. If companies are allowed to claim ownership of "new" varieties by making cosmetic changes in public germplasm, it is not likely that Peruvian farmers, or public agricultural research, will be well served.

The past decade has seen the emergence of a number of small seed enterprises in Peru, and this provides some useful lessons for seed system development. First, formal seed production responds to market demands. It is crops such as rice that are part of a well-organized commercial grain processing and marketing system that will be most likely to attract private seed investment. The contrast with potatoes is instructive. Potatoes are an exceptionally important food crop in Peru, but they are not yet the subject of food processing or marketing systems that place a high premium on uniformity or purity. The bulkiness of seed potatoes limits their demand. It takes 2 tons of seed to plant 1 ha of potatoes (compared with 25 kg of maize or 40 kg of rice seed). But at prices of about $1 per kg for formal sector seed potatoes, planting one hectare of potatoes would cost $2,000, vs. $25–40 for grain crops. Local trading networks for ware potatoes have so far proven adequate to distribute seed potato as well; informal seed potato is often of good quality, and formal seed production (and certification) responds more to government and NGO projects than to market forces (Bentley and Vasques, 1998).

The emergence of private seed production capacity depends on a nation's resources and infrastructure. Some of the small companies that have begun producing rice, cotton, and maize seed are outgrowths of commercial milling firms that have the resources and capital to go into the seed business. They also have direct links with farmers that help them market their seed. A number of other small companies have been able to take advantage of processing equipment and facilities mediated by the CODESEs. In the most successful cases, small "enterprise zones" have developed where several companies share facilities. This is a common characteristic of seed enterprise development (Tripp and Pal, forthcoming).

Multinational seed companies are present in Peru, especially for products such as hybrid maize. But Peru's partially liberalized seed system has not been overwhelmed by multinational seed companies and has instead used local resources, markets, and networks of trust to strengthen Peruvian trade and to launch local enterprises. This illustrates the importance of developing local market capacity in order to cope with the pressures of globalization.

Finally, seed enterprise development requires human capital. The seed companies did not emerge overnight, as part of hastily constructed business plans. They were organized and managed by agricultural professionals who had many years of experience in seed production or plant breeding, usually as part of public research organizations and universities. It may be argued that their transition to the private sector is a legitimate outcome of past public investment in agriculture.

But there are real concerns about where future human resources will come from, as government commitment to agricultural research and training declines. Current advances in private sector seed provision build on earlier government investments in training scientists and building germplasm collections. The current private advances are notable for a relatively few crops, and only for a few topics, like breeding private varieties. Private researchers are doing little work in integrated pest management or *in situ* germplasm preservation, both of which are important, but which do not always offer the researcher a product to sell or claim royalties on. Even though many smallholders take advantage of this new seed supply, there are still many problems that face Peruvian farmers in a wide range of crops. Although we have seen that private seed production and delivery is preferable to a state-managed system, the private seed system requires strong public research partners in order to fulfill its potential.

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Note

1. Peru uses the following categories of formal seed:
   - *Pre-basic, or genetic*. Used by plant breeders. The highest level of seed, in terms of quality and purity.
   - *Basic*. The highest level of seed used by seed producers. Usually handled at research stations.
   - *Registered*. An intermediate level of seed, usually produced by specialized institutions. Used as the source seed for rearing certified seed.
   - *Certified*. Grown by formal seed producers from registered seed. Sold to farmers for producing commercial food crops.

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