# SEED PRODUCTION SYSTEMS FOR SMALL FARMERS: A NONCONVENTIONAL PERSPECTIVE



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## I. INTRODUCTION

The conditions in Latin America, the Caribbean, Africa, and other developing regions show us that both the personnel in charge of transferring new technologies--including seed producers and entrepreneurs--and the beneficiaries of new technologies generated by research centers, belong to different economic and social strata. On the one hand are the seed production and marketing enterprises and their most frequent clients: agricultural entrepreneurs. On the other hand are the Third World farmers. The latter, due to their economic, social, and cultural characteristics do not benefit, in most cases, from good quality seed in spite of the fact that, in global terms, they significantly contribute to food production in their respective regions.

In the case of cassava, beans, maize, rice, yam, potatoes, sweet potatoes, and other socially important commodities, transference of new technologies encounters very complex barriers. These barriers include an inadequate agrarian structure, subsistence cropping, lack of access to technical assistance and financial resources, and other important variables. Furthermore, in most cases existing production systems are inadequate for small farmers' needs.

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## II. SEED PRODUCTION SYSTEMS

The principal objective in plant breeding research is to develop new and more productive cultivars with agronomic and morphological characteristics potentially apt to have impact in agricultural production. To achieve this objective, seed of new cultivars must be transferred from researchers to farmers at the proper time, place, volume, amount, and price, in a manner compatible with farmer's socioeconomic and cultural conditions, and with their level of development. In this scheme, seeds play an irreplaceable role in technology transfer.

The quest for alternative systems to improve seed production and marketing, seeks to maintain the characteristics incorporated by research in new varieties throughout the multiplication process, and to meet small, medium, and large farmers' needs more equitably. The alternatives described herein are based on the principle that seed availability is achieved through institutional organization (public and/or private) and quality control.

The institutional organization for producing and distributing seed in the Third World is very heterogeneous. On the one hand, certain regions, crops, private enterprises, and government institutions are primarily oriented towards conventional production and marketing systems. On the other hand, in some of the same regions, traditional systems are used by small farmers to grow different crops, and year after year farmers sow grain or vegetative parts from their own harvest or that of neighboring farmers. Between the first system and the second, there is a lack of intermediate-level organizations, and this has hindered the improvement of the quality of planting materials used by farmers.

The need to apply the quality control principle is obvious and limiting. Without effective quality control, a seed program cannot have tangible effects in terms of increasing productivity. In addition to other advantages, quality control seeks to minimize the effect of qualitative dilution, i.e., the speed at which a stock of breeder seed

loses its physical, physiologic, genetic, and sanitary characteristics from generation to generation, when the multiplication process is not adequately handled. In addition to the loss of desired qualities, qualitative dilution means that new varieties lose the opportunity to express their genetic potential and to satisfy the breeder's expectations of contributing to agricultural productivity. To illustrate this idea, assuming the delivery of 50 kg of breeder seed of a new rice variety to five farmers located on farms where this crop is traditionally planted, without an effective quality control follow-up, the 50 kg of genetic seed would produce 1000 kg, probably infested with weeds and diseases and with undesirable physiological qualities. In this case, qualitative dilution of 50 kg of genetic material would have occurred. An organized seed production system represents an activity that optimizes both the expression of the new varieties' genetic potential as well as their diffusion among possible users.

To minimize these risks, it is important to become aware of the mechanisms through which farmers obtain their planting material. Conditions in Latin America, the Caribbean, Africa, and other developing regions, indicate that seed production and distribution systems can be classified in three large categories:

1. Traditional
2. Conventional
3. Nonconventional

## 1. TRADITIONAL SYSTEMS

Farmers in this system produce their own planting material or obtain it from neighboring farmers or close-by zones, through mechanisms which usually to not imply cash exchanges. An example would be the exchange of seed for other goods or community labor.

Within these traditional systems, it is possible to substantially improve the quality of material planted by farmers through simple cultural practices. Studies conducted of these systems indicate that farmers rarely completely substitute their varieties and traditional

practices for the recommended varieties and practices. Frequently, the farmer simultaneously applies both types of technologies in his production system, with the apparent intention of satisfying multiple objectives with relatively equivalent value. The farmers' objectives include: family consumption, production for sale, and quality preservation of natural resources.

Due to the large number of farmers involved in traditional systems and to their geographic dispersion, special technology transfer programs are required to reach them. This is, in itself, a main area of research for the future; the last few decades' experience clearly demonstrates that technical assistance strategies developed for specialized seed producers in conventional systems are extremely sophisticated and expensive for traditional farmers. Furthermore, the usual rural extension programs have been inefficient in identifying the needs, limitations, and potential technological solutions which could help these farmers.

One way to change this course of events is to implement training programs, oriented towards improving the quality of planting materials used by traditional farmers through simple cultural practices. This training could be carried out by extensionists well-trained in the nonconventional technology transfer schemes discussed further on. Examples of the practices to be recommended:

a. Roguing diseased and/or off-type plants (negative selection) and/or separate harvesting of healthy and vigorous plants (positive selection).
b. Selection of characteristic variety panicles to prevent red rice dissemination.
c. Elimination of corn cob ends.
d. Utilization of cassava vegetative material obtained from the medium third of the plant. vegetative material.
e. Selection of cassava stakes on the basis of plant root production.
f. Timely harvest--as close as possible to physiological maturity--of seed to avoid field deterioration.
g. Natural or artificial seed drying immediately after harvest.

h. Seed storage in fresh, ventilated sites, protected against insects, birds, and rodents.
i. Utilization of diffuse light to favor formation of short and vigorous sprouts in potato seed.

Application of these and other recommendations in traditional production systems would enable farmers to more efficiently take advantage of the genetic potential of both native genotypes, commonly grown by them, and the new varieties generated by research centers.

Even on the assumption that during the initial stages of the transfer process farmers in traditional systems do not specialize, or specialize only partially, in production of planting material, the spread out effect (i.e., the multiplying effect of the system) would take place through the demonstrative influence that the successful practices of the more innovative farmers could have on their neighbors. When diffusion takes place and overcomes the limits of traditional communication and relationships of exchange, favorable conditions are established for integrating these farmers with the rest of the country's seed sector.

## 2. CONVENTIONAL SYSTEMS

Seed producers in conventional systems are characterized by their economic ability to make large investments in physical infrastructure, machinery, and equipment, in accordance with their needs and the requirements expressed by official seed regulations. They have qualified personnel and in many cases, are organized in trade associations. Profit is the essential objective of the production process for such producers, the sine qua non condition for their corporate survival.

Conventional systems operate supported by a complex network of public and private institutions which carry out research, technical assistance, certification, credit, and other functions, enabling them to produce and market their seed as relatively stable and self-sustained businesses. This system of institutional help is based on the premise that seed-producing enterprises play a strategic role in the

technology transfer process, contributing to increased food production, productivity, and supply.

## 3. NONCONVENTIONAL SYSTEMS

Farmers in nonconventional systems develop planting material production and distribution strategies with qualitative characteristics similar to those of the conventional systems, but follow norms, rules, and standards more pertinent to their particular conditions. Seed quality originating in these systems is always superior to that of grains or common vegetative materials used by small farmers, and can frequently reach the quality levels of seed produced in conventional systems.

More than a unique assemblage with specific characteristics, nonconventional systems include a broad range of production and distribution schemes that arise to satisfy the demand for good-quality planting material in regions ignored by certification programs or in areas where the establishment of these programs is not viable.

Nonconventional seed systems offer important advantages in small farmer areas. In the first place, the less demanding initial technical standards make possible the application of production schemes in accordance with the socioeconomic characteristics of farmers and the level of development of each region. In the second place, the small volumes of seed usually produced allow a more effective quality control, and require equipment and facility investments within the reach of the limited economic capacity of these farmers. In the third place, the more successful nonconventional systems known are based on the productive use of the innovative capacity and associative spirit of rural communities.

It is important to bear in mind the series of similarities and interactions extant between conventional and nonconventional systems, in spite of the fact that each is based upon different development premises. The similarity between the strategies many times implies that nonconventional systems make use of the institutional components originally established as part of conventional

systems. Furthermore, some nonconventional systems can gradually evolve toward certification systems in their final stages.

Nonetheless, the distinctive characteristics of nonconventional systems are their institutional flexibility and the crucial role played within their structures by associative organizations of farmers. These characteristics make them particularly appropriate for developing regions which possess a great diversity of agroclimatic conditions, production systems, cultural values and levels of technological and institutional development. With such systems and in the absence of an associative organization, even individual progressive farmers can also produce and market their seed.

### 3.1. Organization of Nonconventional Systems

Given the complexity of small farmer situations, there is no single scheme that can be applied in the organization of nonconventional seed production systems. The goal of these systems is to meet the specific requirements of each country, region, or community, in order to satisfy the needs of small farmers rather than the standards imagined as adequate by those unaware of either farmers' limitations or their productive capacities.

Successful examples of these systems demonstrate that farmers initially tend to overcome some of the following barriers:

a. Lack of seed in the region.
b. Constant crop losses, due to poor quality seed.
c. High prices for the seed available.
d. Agrarian structure of the region composed of small farmers.
e. Lack of interest by private enterprise in the region.

Working with and through associative organizations is the most effective method for solving these problems; in this arrangement, a small group of progressive farmers is selected to conduct seed multiplication. During this phase, the initiative of local leaders is the key to carrying out the following activities:

a. Preparation of the soil and planting, using individual or collective labor.
b. Construction of a small rustic infrastructure, to be used as a central storage place for all crops, facilitating internal quality control.
c. Request seed training and technical assistance, to be offered by the official entities.
d. Official approval of the association or cooperative before the Seed Service and/or Division of the country in question.
e. Adoption of a trademark for marketing the seed produced.

These and other activities can be conducted simultaneously or as the process evolves.

The most common forms of these organizations are often supported by governments or by rural development programs and projects which are able to overcome barriers in order to achieve proposed objectives.

In any case, the need for a governmental decision to establish less demanding production systems is always present; this decision must be part of a policy with more social than economic goals. To facilitate these activities, certification programs must assume a more flexible attitude adopting activities which tend to train rather than control the seed producers.

### 3.2. Operational Forms of Nonconventional Systems

Nonconventional systems follow less rigid norms that those adopted by certification programs or other more conventional systems. Using these norms and relying upon the special characteristics of quality control applied to small volumes of seed, participating farmers are able to produce high-quality planting material as good as that obtained in conventional systems. Some of the field activities characteristic of these systems are:

a. Planting basic seed of varieties recommended by research that also meet with broad farmer acceptance.
b. Elimination of crop residues from the previous season.

c. Eradication of diseased or off-type plants.
d. Utilization of irrigation and other inputs (when these are available).
e. Harvesting close to physiological maturity.
f. Drying and threshing.
g. Storage in fresh, ventilated areas.
h. Supply of seed within and outside the region.

In addition to these activities, the establishment of a nonconventional system (Pilot Project) should be accompanied by the supplementary activities summarized in Figure 1 and described below.

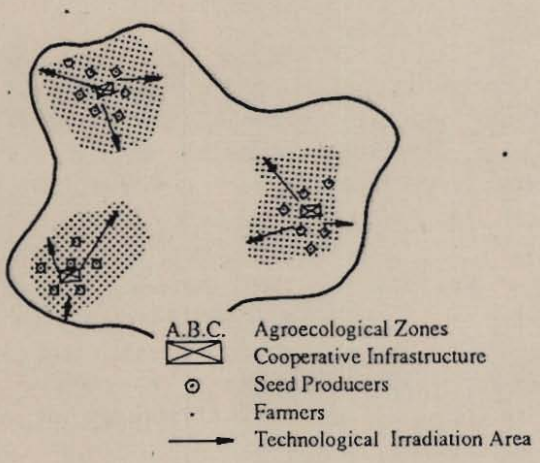


Figure 1. Hypothetic distribution of a non-conventional seed production and marketing pilot project.

a. Diagnose quality of seed planted in each agroecological zone.
b. Establish seed technology training programs focused on nonconventional systems to provide specialized technical assistance to seed producers.
c. Establish training programs for extensionists to offer basic technical assistance to farmers growing grains, roots, or tubers.

d. Establish training programs for farmers to demonstrate the advantages of using good-quality seed.
e. Seek access to adequate volumes of basic and certified seed to supply farmers selected as seed producers.
f. Conduct information activities in areas surrounding the pilot projects, to create an effective seed demand (essential part of the multiplying effect of the nonconventional system).

## III. FINAL CONSIDERATIONS

The essential elements composing the seed sector are multidisciplinary and usually range over a series of institutions with operational strategies and administrative differences that vary from the more simple to the more highly sophisticated and complex forms.

Although the above recommendations have been primarily addressed to nonconventional and traditional systems, this does not mean that the conventional system (the seed industry) does not require improvement. Many activities can be proposed to increase both its efficiency and its distributive effects.

A priority task for all three systems examined is the creation of quality awareness within the spirit of improving the efficiency achieved in the technology transfer process, with the goal of establishing an internal quality control program independent of governmental activities in this field.

The present work has not proposed absolute rules, nor does it offer definitive strategic formulations; its purpose is to offer a framework of conceptual reference for the development of innovative projects that benefit the small farmer. Criticism and suggestions for improving this proposal are welcome and will receive prompt replies from the authors.

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