

Variety choice and seed supply by smallholders

Small farmers' methods and criteria in choosing crop varieties and ensuring seed supply need to be studied so that breeders can support these efforts and produce appropriate new varieties. Anita Linnemann and Jan Siemonsma describe how this is being done in East Java.

Anita R. Linnemann and Jan S. Siemonsma

Ever since new varieties of food crops have been introduced in developing countries, at least some farmers have started to use them. However, smallholders who choose to use these new genetic materials generally do not replace them after a few years when they have lost their varietal purity. Instead, the farmers select and save seed from their own fields and exchange seeds locally. It has been estimated that at least 80% of the planted seed of the main food crops grown in developing countries is produced by the farmers themselves (Delouche, 1982).

Differing criteria

Plant breeders develop varieties according to a number of criteria, primarily yield potential but also response to fertiliser, resistance to pests and diseases, length of growth cycle, dietary value of the product etc. These varieties are generally appreciated by market-oriented, larger-scale farmers growing the crop in a pure stand and under relatively good growing conditions. Subsistence-oriented farmers require varieties with a good yield which is reliable and stable, also during bad years. For this purpose, they commonly use a mixture of varieties. They choose varieties adapted to specific characteristics of their farming system, such as intercropping, staggered harvesting, seasonal availability of labour. They also attach importance to taste and cooking qualities and to by-products that can be used, e.g., as forage or building materials.

Producing and selecting seed

Different farmers produce and select their seed in different ways. Most farmers select seed after harvest. Others make their choice before harvest, walking through the fields and marking the plants they will use for next year's crop. Some farmers grow seed plants for the next season in a separate plot at some distance from the main crop. They may give extra attention to this plot, for example, by applying manure, discarding off-types and keeping the plot free of weeds and pests. The farmers do not necessarily select for a uniform type of seed. They may choose seed so as to maintain a certain variation in earliness, shape, colour and taste of product.

Need for seed purchases

In general, farmers save enough seed to resow at least twice. However, in drought-prone areas, they often run out of seed and have to depend on seed from other sources. They also have to buy those seeds which they cannot store adequately, e.g., groundnut and soybean which soon deteriorate and lose their germinative power when stored at ambient temperatures in monsoon climates. Some crops, particularly among the vegetables, do not produce seed in certain environments. Farmers who want to grow these crops have to buy seed produced in favourable regions. Farmers may also buy seed if they are convinced that the new genetic material meets their needs better than the seed they produce themselves. However, most farmers prefer their own varieties because these are adapted to their farming system.

Farmer-based seed supply

In view of the diversity in the wishes and requirements of small-scale farmers with regard to crop characteristics, there is a need to strengthen farmer-based seed supply at the community level. First of all, researchers must acquire a thorough knowledge of the existing varieties and the existing techniques of seed production, selection and storage. Then, by conducting on-station trials as well as on-farm trials in close collaboration with the farmers, improvements could be tried out such as in seed selection in the field and in the treatment and storage of seed, and appropriate new genetic material could be incorporated into the farming system.

Case study: soybean seed supply

Since Indonesia has achieved self-sufficiency in rice, the Government has started to promote the growing of other food crops, particularly soybean. The main soybean-growing province is East Java, where 37% of the national crop is grown. The extension service recommends the use of a new soybean variety with a 100-seed weight of 10 g. However, most farmers in East Java still use local soybean varieties, which they generally call "local 29". This refers to the variety No.29 with small, green-yellow seeds (100-seed weight 5-8 g) which was introduced from Taiwan to Indonesia in 1924. Variety No.29 was maintained at Indonesian research institutes but was not multiplied and distributed by Government services after its initial introduction at the farm level. Sixty years of intensive cultivation and selection by Indonesian farmers have led to the development of a large number of local varieties which differ in terms of time to reach maturity and yield levels.

Maintaining seed supply

About 70% of the soybean production in East Java comes from dry-season cropping on wetland: one crop from April to June following a rice crop, and another from July to October, following either soybean or rice. The other 30% of soybean production comes from wet-season cropping on dryland between December and February (Soegito and Siemonsma, 1985). The farmers have difficulties in storing soybean seed so as to maintain its viability for more than about six weeks. To obtain good germination and establishment of soybean after a rice crop, they need access to fresh seed. To achieve this they developed a system called JABAL "Jalinan Arus Benih Antar Lapang", which literally means "seed flow between fields". Certain villages have specialised in soybean growing on dryland during the wet season. Yields are lower than those of dry-season soybean, but farmers can get a 50% higher price for their wet-season crop, for it provides the seed for the main soybean crops in the dry season.

Local varieties compare well

Trials at MARIF (Malang Research Institute for Food Crops) revealed that some farmers' varieties of soybean compare well with those recommended by international institutes and the Indonesian Government (Siemonsma and Soegito, 1985). In on-farm trials the most promising farmers' selections were then compared with varieties developed by Asian research institutes as well as with the stock of the original variety No.29 maintained by Indonesian research institutes. The selected local varieties performed as well as the new varieties during the main cropping season (the dry season) and generally outyielded them during the wet season. As the seed flow from dryland to wetland and back again is indispensable for sustaining soybean cultivation in East Java, varieties must yield well in both seasons. It was noteworthy that the

selected local varieties also outyielded the original variety No.29 from which the farmers had derived them. The results of the on-farm yield trials demonstrated that many locally developed varieties are well adapted to the local environmental conditions and farming systems. Large-scale introduction of a few varieties could cause the rapid loss of a valuable source of genetic diversity, especially since soybean seed soon loses its viability when stored under farmers' conditions.

What does this mean for research?

Soybean improvement programmes should start with testing local planting materials. It is not sufficient to compare introduced varieties with just one or two local controls, as this does not do justice to the diversity found in farmers' varieties. Instead, researchers should use fresh, healthy planting materials carefully chosen to reflect local diversity and potential, and should evaluate these materials according to the farmers' selection criteria. Progress may be slower than relying on easily available seed from international institutes but will be more secure in the long term.

Anita R. Linnemann and Jan S. Siemonsma

Department of Tropical Crop Science

Wageningen Agricultural University

6700 AH Wageningen

The Netherlands