An Old Technique – A Bucket of Water - Increases Crop Yields

Seeing is believing - the contrast is striking between a primed crop and a non-primed crop.

Seeds to Food Crops

Each year, mankind relies on the miraculous transformation of seeds into plants and back into seeds again. Most cereals and pulses are grown from seed each year, producing more than 2.3 billion tonnes of grain. This transition from seed to seedling can be a fragile process. Seeds must germinate and seedlings emerge, quickly and uniformly throughout the field so that light, water and soil nutrients can be used with maximum efficiency. If crops emerge and grow slowly after germination, they often become stunted and sickly, are more susceptible to damage by pests and diseases, and produce less grain and straw.

Poor Crop Establishment

Poor crop establishment is common in many farming systems throughout the world. In the semi-arid tropics, for example, unpredictable and erratic rainfall, poor soils, low quality seed and limited access to reliable draught power all contribute to good uniform crop establishment being the exception rather than the rule.

Soaking Seeds - Seed Priming

Once sown, seeds spend a great deal of time just absorbing water from the soil. If this time is minimised by soaking seeds in water before sowing (seed priming), seed germination and seedling emergence is more rapid. Farmers from Nepal to Botswana have used this technique for generations to “catch up” on time lost in a drought year. Yet curiously, soaking was never carried out on a regular basis and the duration of soaking was highly variable.

Safe Limits for Soaking

Researchers from the Centre for Arid Zone Studies, at the University of Wales, funded by the Plant Sciences Research Programme of the Department for International Development, initially studied on-farm seed priming in the marginal areas of western India, but then expanded their studies to twenty five countries as shown in Figure 1. Safe limits to soaking times, which if exceeded, could lead to seed or seedling damage - have been calculated for a wide range of tropical and sub-tropical crops (Table 1). In most cases seed can be primed overnight and then surface-dried and sown the same day. Occasionally, sowing may be unavoidably delayed - by heavy rain for example. If primed seed is surface-dried and kept dry it can be stored for several days then sown as usual and still perform better than non-primed seed.

Participatory Research

Although not a new technology, farmers cannot appreciate the wide range of benefits from seed priming unless they can experiment for themselves. Farmers were encouraged to soak some of their seeds overnight within the prescribed safe limits, surface-dry them, and sow using traditional methods. The primed seeds were sown in plots adjacent to those with farmers’ usual practice of non-primed seed. Farm walks, in which groups of farmers visited each others’ fields, allowed villagers to evaluate the performance of seed priming over various soil types and levels of management. The groups then discussed the strengths and weaknesses of the technique and made constructive criticisms and improvements.

Benefits of Seed Priming

Farmers have reported that primed crops emerge faster, grow more vigorously and in some cases use less fertiliser. In many cases, crops also mature earlier and give higher yields - very important in drought-prone areas. In some cases - in chickpea and upland rice for example - less disease was reported. On-farm seed priming has become very popular with collaborating farmers, along with their friends and neighbours, because it is simple and cheap yet extremely effective. Evaluations of farmers' opinions indicate that the majority of those who try it will continue the practice (Figure 2).

More Options for Poor Farmers

Historically, farmers in the Barind Tract area of northwestern Bangladesh only planted one crop of rainfed rice each year. Once the rice is harvested, the soil surface dries rapidly and becomes very hard, despite residual water deep in the soil. Research by the Bangladesh Agricultural Research Institute (BARI) and the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) found chickpea (*Cicer arietinum*), a deep-rooted dry-land crop, could grow in these rice fallows and mature to harvest in the short time the residual water was available. To be successful, the crop must establish itself within 4-10 days before the soil surface dries out too much and seed priming helps to ensure this. On-farm trials have demonstrated that seed priming does indeed increase average chickpea yields by almost 50% to over 1.5 tonnes per hectare. Chickpea has become a more attractive crop and the task now is to encourage Barind farmers to grow the crop on the 140,000 hectares of land left fallow each year.

Complementary PSP-funded work by ICRISAT and the Indian National Remote Sensing Agency has identified and located more than 14 million hectares of rice fallows in Bangladesh, India, Nepal and Pakistan. This is almost 30% of the land used to grow rice in the preceding rainy season and represents a huge underutilized resource. Adoption by farmers of rapid establishment techniques for short duration legumes, on even a small proportion of these rice fallows, would make a significant positive impact on their livelihoods. To this end, preliminary studies are underway at a range of representative sites in India and Nepal to assess the local constraints to adoption and to refine the technology to address those constraints.

Technology Adds Value

On-farm seed priming seems to be a robust, widely applicable technology and its effects are generally independent of the crop variety used. This is important, because priming can be used to add value to the benefits achieved by using improved, modern varieties or by adoption of other improved technologies such as fertiliser or better crop protection. This low-cost, low-risk technology is good insurance for farmers by providing more options and improvements to their livelihoods.

Contact: Dave Harris, Centre for Arid Zone Studies, University of Wales, Bangor, Gwynedd, LL57 2UW. Tel: 01248 382116. Fax: 01248 371533. <www.dfid-psp.org> <d.harris@bangor.ac.uk>