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ASIAN SEED AND PLANTING MATERIAL

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(Photo: Carlos De Leon)

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Small-scale farmers throughout Asia, who grow maize mainly for home consumption, are switching to hybrid varieties. Many of these varieties have been developed by private companies that are accurately identifying potential markets and developing superior products. *(See page 3).*

Asia's public and private maize seed industries changing

Michael Morris

Over the next 25 years, maize production in Asia will have to grow at an unprecedented rate if supplies are to keep pace with projected rapid increases in demand, especially for feed. In most Asian countries, prospects for further expansion of maize-producing areas are limited, so the main engine of future production growth will have to be yield increases. Although a number of avenues are open for increasing maize yields, the fact that most farmers in Asia continue to plant unimproved local varieties suggests that expanded use of improved germplasm offers one of the most effective and inexpensive opportunities.

Improved maize germplasm comes principally from public breeding programs and private seed companies. In the past, these sources often produced different types of materials. Most public breeding programs concentrated on developing open-pollinated varieties, which were thought to be appropriate for small-scale farmers lacking the resources and management skills needed to grow hybrids. In contrast, most private seed companies concentrated on developing hybrids, which are preferred by many large-scale commercial producers because they respond well to high levels of management.

To keep pace with predicted demand increases, maize production in Asia will have to grow at an unprecedented rate. (Photo: Carlos De Leon)

Division of labor

The traditional "division of labor" between public breeding programs and private companies seems to be disappearing, as many public breeding programs have shifted their focus toward hybrids. This change has been motivated by recent studies that have cast doubt on the widely held view that the yield advantage of hybrids will be expressed only in the presence of favorable agro-climatic conditions and good management. Research carried out by scientists from the International Maize and Wheat Improvement Center (CIMMYT), working with colleagues from national agricultural research programs, has shown that hybrids can be profitable even in marginal production environments and when use of purchased inputs is modest.

At the farm level, the profitability of adopting hybrid maize seed is determined by a number of technical and economic factors, including the price of seed, the seed rate, the yield gain, the cost of capital, and the farmer's risk preference. Contrary to conventional wisdom, it is not necessarily true that hybrids must be grown with high levels of management to be profitable. When hybrid seed is relatively expensive, the yield increase generated must be very large for adoption to be attractive. But when hybrid seed is relatively inexpensive, the yield increase

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Area planted to improved maize seed in Asia (1990/92 average)

Country *Region*	Area ('000 ha)	Improved OPVs (%)	Hybrids (%)	Local varieties (%)
India	5 980	25	11	64
Nepal	747	4	1	95
Pakistan	860	28	3	69
South Asia	*7 803*	*23*	*9*	*68*
Indonesia	3 230	52	4	56
Philippines	3 600	10	10	80
Thailand	1 453	75	25	0
Vietnam	437	50	10	40
Southeast Asia	8 818	45	10	55
China*	21 405	7	90	3
East Asia	*22 138*	*7*	*90*	*3*

** Reflects extensive use of hybrids in temperate production zones.*
Source: 1993/94 CIMMYT Maize World Facts and Trends.

can be much smaller for adoption to be profitable. In considering these relationships, it should be noted that the cost of producing hybrid seed is usually related to the size of the expected yield gain (e.g., single cross hybrids, whose seed is expensive to produce, often deliver large yield gains, whereas double cross hybrids, whose seed is relatively inexpensive to produce, generally deliver more modest yield gains).

Farmers' experiences

These research findings are supported by what has been happening in farmers' fields: throughout Asia, adoption of hybrids has been increasing, not only among large-scale commercial producers, but also among small-scale farmers who grow maize mostly for home consumption. In India, Indonesia, Philippines, Thailand, and Vietnam, private companies have played a leading role in encouraging the use of hybrids by accurately identifying potential markets, rapidly developing superior products targeted at those markets, and effectively promoting and distributing high-quality seed. In several of these countries, policy reforms have been instrumental in fostering the rise of the private seed industry by removing obsolete regulations that imposed unnecessary barriers to trade.

The growth of the private seed industry is generally seen as a welcome development, especially at a time when many publicly funded research organizations are feeling budgetary pressures. Some concern has been expressed, however, that private companies will naturally tend to focus on meeting the needs of commercial growers, while ignoring the germplasm requirements of subsistence and semisubsistence farmers, who make up the majority of the rural population. Evidence from a number of developing countries suggests that this concern is largely unfounded, as private companies have demonstrated that they can serve the needs of a wide range of end users, including many small-scale growers.

Public breeding programs

As the private maize seed industry strengthens, public breeding programs will likely continue to play an important behind-the-scenes role. The responsibilities borne by the public sector, however, will surely change as seed markets evolve.

In *emerging seed markets* (i.e., markets in which farmers are adopting hybrid seed for the first time), public breeding programs will be expected to develop most of the source germplasm needed by private companies. Because profit opportunities will remain limited in emerging markets, private companies usually will not be able to support the cost of a full-fledged breeding program and will tend to look to public breeding programs for free access to improved populations and inbred lines.

In *mature seed markets* (i.e., markets in which most farmers already use hybrid seed and periodically replace older hybrids with newer ones), incentives will often be substantial for private companies to assume a larger role in R&D. Private companies often will be able to assume responsibility for development of materials targeted at important production environments, freeing up public breeding programs to engage in new activities. Typically, these will include development of special trait materials (e.g., materials with resistance to specific biotic and abiotic stresses), development of materials suited for marginal production zones, and dissemination of information about yields and other traits of private sector hybrids.

Role of private sector

Use of hybrid maize in Asia, which is still limited, is expected to increase dramatically in coming years. Although private seed companies will play a leading role in fostering the "hybrid revolution," the role of the private sector should not be seen in isolation. It is important not to lose sight of the fact that most proprietary hybrids released by private companies are developed using germplasm originating from public breeding programs. As markets for hybrid maize seed evolve, private companies will continue to look to the public sector for breeding materials, so it will be important to maintain viable public breeding programs for the continuing availability of germplasm for the widest possible range of potential end users.

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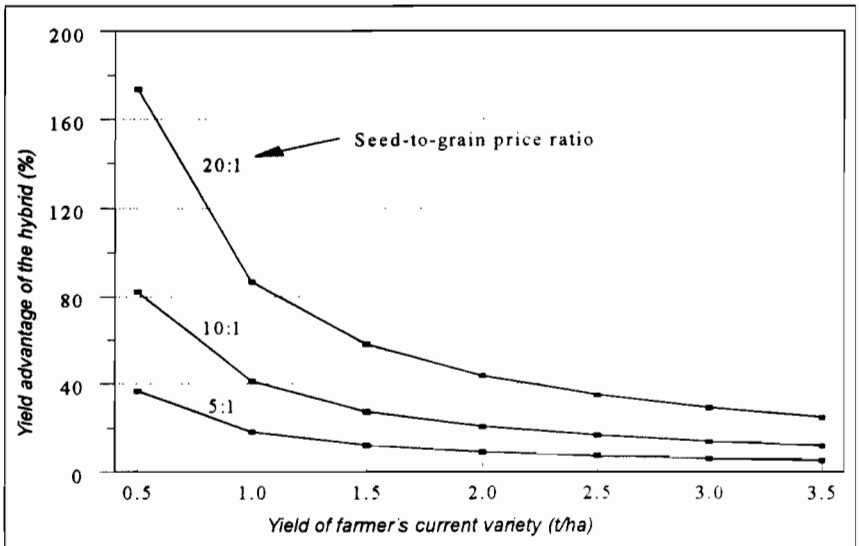

Yield advantage over farmer's current variety required to compensate additional cost of hybrid seed and generate 100% marginal return to investment