

A hybrid pea for the drylands

A new, improved, protein-rich pea has been developed by researchers at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) for the drylands. This new variety of pigeonpea, called Pushkal, is the first commercially available hybrid legume in the world.



ICRISAT Director General William D Dar and Principal Pigeonpea Breeder K B Saxena in a Pushkal field.

Credit ICRISAT

"With 40 percent higher yields than the best local varieties, Pushkal is truly the magic pea," exclaims Dr William Dar, director general of ICRISAT.

The new hybrid thrives in drought conditions and has greater resistance to diseases than the best varieties. It also creates a strong root system which aids greater nitrogen fixation to keep soils fertile.

The new variety which is very affordable for poor farmers comes during a global pigeonpea shortage which has caused prices to soar, creating misery among millions of poor people who cannot afford them.

Pigeonpea research is also being done in other parts of the world. "Our efforts in eastern and southern Africa have established an active pigeonpea research programme that has already resulted in the release and adoption of improved varieties. African farmers are reaping the benefits from improved food security and enhanced incomes from the new varieties," says Dr Dar.

In eastern and southern Africa, ICRISAT scientists have taken an entirely different approach to

improving pigeonpea, using conventional cross breeding techniques to identify varieties that are disease resistant (*Fusarium* wilt) and specifically tailored to the temperature, altitude and soil conditions of a given area.

Breaking the yield barrier

ICRISAT scientists have been working with national programmes in India since 1974, but was not able to develop new high yielding varieties before turning to a new breeding technology leading to the development of Pushkal (ICPH 2671), the world's first cytoplasmic male sterility (CMS) based pigeonpea hybrid. The new hybrid technology provides the opportunity of achieving the long-cherished goal of breaking the yield barrier in pigeonpea.

Internationally, over a dozen legumes are cultivated by farmers but due to their self-pollinating nature, no commercial hybrids are available. At ICRISAT, scientists have used the partial natural out-crossing of pigeonpea to breeding hybrids. For this it was essential to develop a stable

CMS line. This was accomplished after 30 years of dedicated research, a great achievement from the plant breeding point of view.

Male-sterile plants are those that do not have functional male sex organs. Hybrid production requires a female plant in which no viable pollen grains are borne. The expensive and labour-intensive method is to remove the male organs (anthers) from the plants. The other simple way to establish a female line for hybrid seed production is to identify or create a line that is unable to produce viable pollen. This male-sterile line is therefore unable to self-pollinate, and seed formation is dependent upon pollen from the other male fertile line. By developing a parental line that has the trait for male-sterility in the cytoplasm (or the cell fluid) it could be ensured that all progeny from this line were male-sterile.

"This new technology helped us break the yield barrier that has plagued Indian agriculture for the past five decades," says Dr KB Saxena, ICRISAT's principal pigeonpea breeder.

After successful testing by poor farmers in India, Pravardhan Seeds and other private and public seed companies began producing large quantities of Pushkal seeds.

Hybrid due for wide planting

To date, seeds for the new pigeonpea hybrid have been planted on some 5,000 hectares (12,500 acres), but Dr. Saxena predicts that the hybrid will be widely planted in the next few years as the low cost seed becomes more readily available.

"Because India has many private seed companies, we went through the private sector for production and marketing," explains Dr Saxena. "That's how we distribute the new seeds quickly."

Plants and seeds developed by ICRISAT are not patented and remain in the public domain for use by public and private institutions.

The new hybrid technology has generated interest from a number of other countries, including Myanmar, Brazil, the Philippines and China. In southern China, pigeonpea hybrids,

October when the country faces a
are timed for export between May and
varieties favoured in India, where crops
early. Other varieties include bean
pea is resistant to wilt; and matures
favoured by the local population; the
fast and have the taste and aroma
finding high yield varieties that cook
In Tanzania, for instance, this meant
Sillim points out.

"We developed niche varieties,
had white grain and was wilt resistant.
temperature, climate and light. The pea
African pigeonpea adaptation to
farmers, were able to incorporate in the
Thus, researchers, working with local
find plants which were wilt resistant.
varieties were planted in local fields to
problem for African pigeonpea, various
Since wilt disease is a significant

Africa.
150 days in cooler, high altitudes in
180 days in warmer temperatures and
They discovered that plants mature in
duplicated conditions experimentally.
sensitivity at different altitudes, then
effects of temperature and day-length
The ICRISAT researchers charted the
altitude from sea level to 5000 meters.
equator, has a natural increase in
For example, Kenya, near the
For eastern and southern Africa.

Said Sillim, ICRISAT's regional director
and rainfall are quite different," says Dr
where altitude, climate, soil condition
adapt well to conditions in Africa,
"Indian pigeonpea hybrids don't
whole seeds are cooked.

pigeonpeas are white, larger and the
preferred; in Africa, the preferred
small brown, quick-cooking beans are
research had been done in India, where
not carefully studied. Most of the
pigeonpeas which were until recently
different approach on African
ICRISAT researchers have taken a
A different approach for Africa

ICRISAT are under final testing.
has received the most attention, three
Although the new Pushkal hybrid
areas.

erosion, a huge problem in the hilly
will be useful to preventing soil
because they have strong root systems,

Spreading the word

two crops a year.

varieties that mature early give farmers
boosted income for local farmers and
pigeonpea shortage. This work has

In addition to continuing its active
research programme, ICRISAT wants
to spread the word about pigeonpeas, to
target areas with mono-culture crops by
showing that by intercropping with
pigeonpeas, both crops are more
productive.

ICRISAT also wants to encourage
canning processed pigeonpeas, in the
way black-eyed peas are canned.
Farmer and women's groups have

aided with variety selection, integrated
pest management work and production
of hybrid seeds.

On ICRISAT's research anvil are
transgenic pigeonpea varieties and
hybrids resistant to the pod borer,
Helicoverpa armigera. These are
currently undergoing contained field
trials at its headquarters in Patancheru,
Hyderabad India.

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A woman farm labourer in a Pushkal field.

Credit ICRISAT

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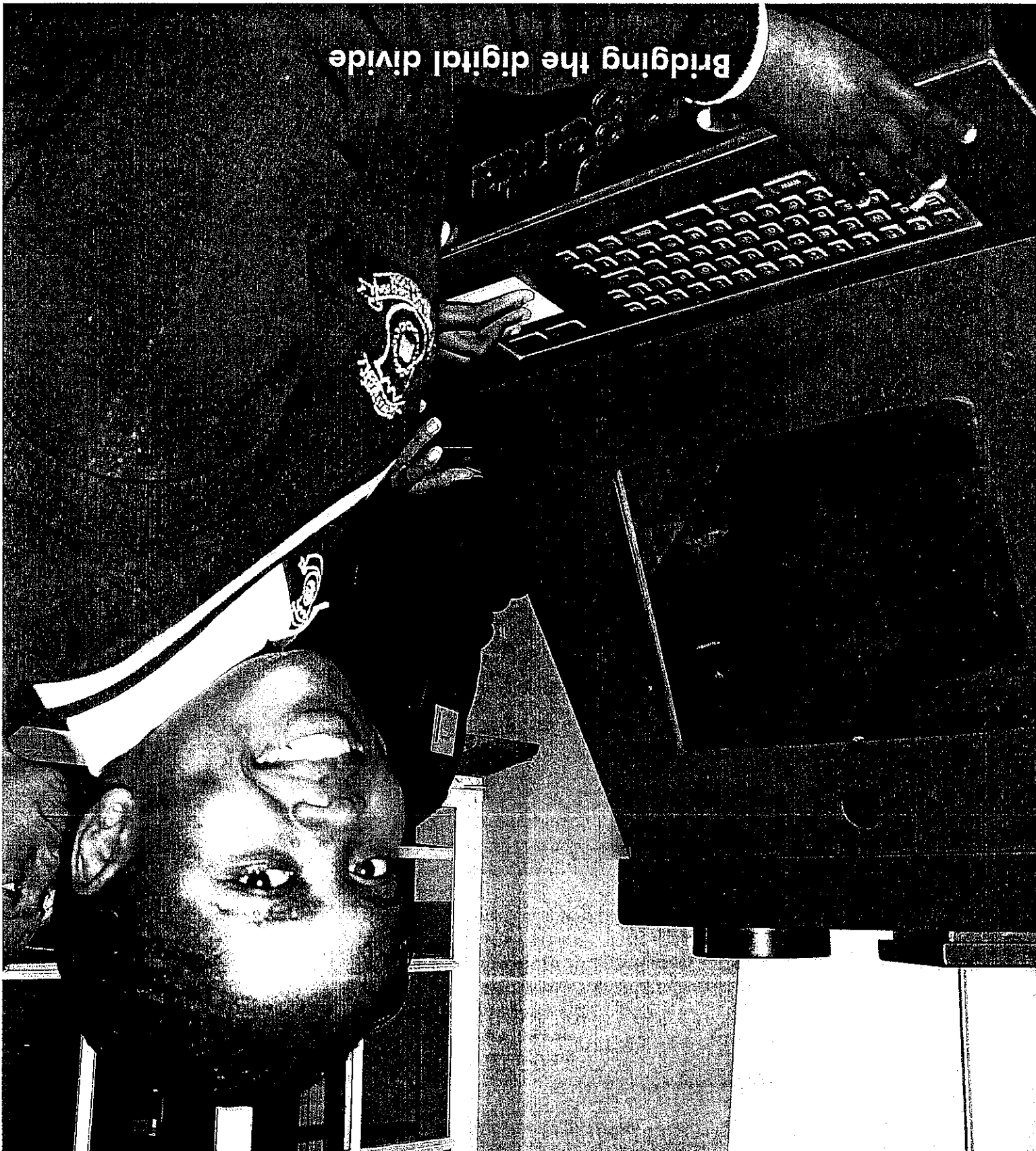
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Front Cover: The Digital Doorway, developed in South Africa, gives children the opportunity to acquire functional computer skills without any formal training.
Credit: CSIR (See page 32)

Bridging the digital divide



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Incorporating
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