

## Food Security

Early-maturing varieties have helped to revolutionize smallholder farming across the SAT.

- Reduced risk of crop failure because plants escape end-of-season drought.
- Improved yield stability and better pest and disease resistance ensure adequate food in most years, even in risky environments.
- Earlier harvests provide food during the traditional “hunger period”.
- Savings in food aid far greater than research costs.



## Spillover Effects

An important objective of international agricultural research is to determine the extent to which research undertaken in one location may impact on other regions of interest. ICRISAT has, as a policy, distributed a wide range of parental materials to breeding programs in the NARS and private seed industries throughout the SAT. This has contributed to faster and cost-effective development of useful final products, and generated technology spillover.



Examples: Sorghum variety Macia released in Mozambique was also released in Botswana, Tanzania, and Namibia. Similarly, S35 was developed in India and was adopted in Cameroon and Chad. ICSV 111 developed in India was released in Burkina Faso, Chad, and Nigeria. ICSV 1079 developed in Burkina Faso is cultivated by farmers in Benin, Ghana, and Nigeria. Pearl millet varieties ICMV 221, Okashana 1, WC-C75 were originally developed for India. ICMV 221 was also released in Kenya and Uganda, Okashana 1 was released in Malawi, Zimbabwe, Namibia, and Botswana, and WC-C75 was also released in Zambia. Groundnut variety ICG 221 developed for India spilled over into Swaziland. Improved pigeonpea cultivar ICPL 87091 (*top*) developed in India was released in Kenya, Tanzania, and Uganda.

## Returns to Research

Impact assessment studies have demonstrated the value of ICRISAT-NARS work. For example, research investments in sorghum variety SV2 and millet variety PMV2 have yielded benefits worth US\$ 8 million in Zimbabwe alone, plus spillover benefits. In Namibia, US\$ 3 million invested by ICRISAT and the national program pearl millet research has yielded benefits with a net present value of US\$ 11.7 million resulting in 50% internal rate of return (IRR). Net Present Value (NPV) of benefits from sorghum S35 is estimated at US\$ 15 million in Chad and US\$ 4.6 million in Cameroon with an IRR of 93% in Chad and 75% in Cameroon. Improved millet cultivars in Mali generated NPV of US\$ 25 million with an IRR of 50%. IRR to sorghum research in Zambia is 11-15%.

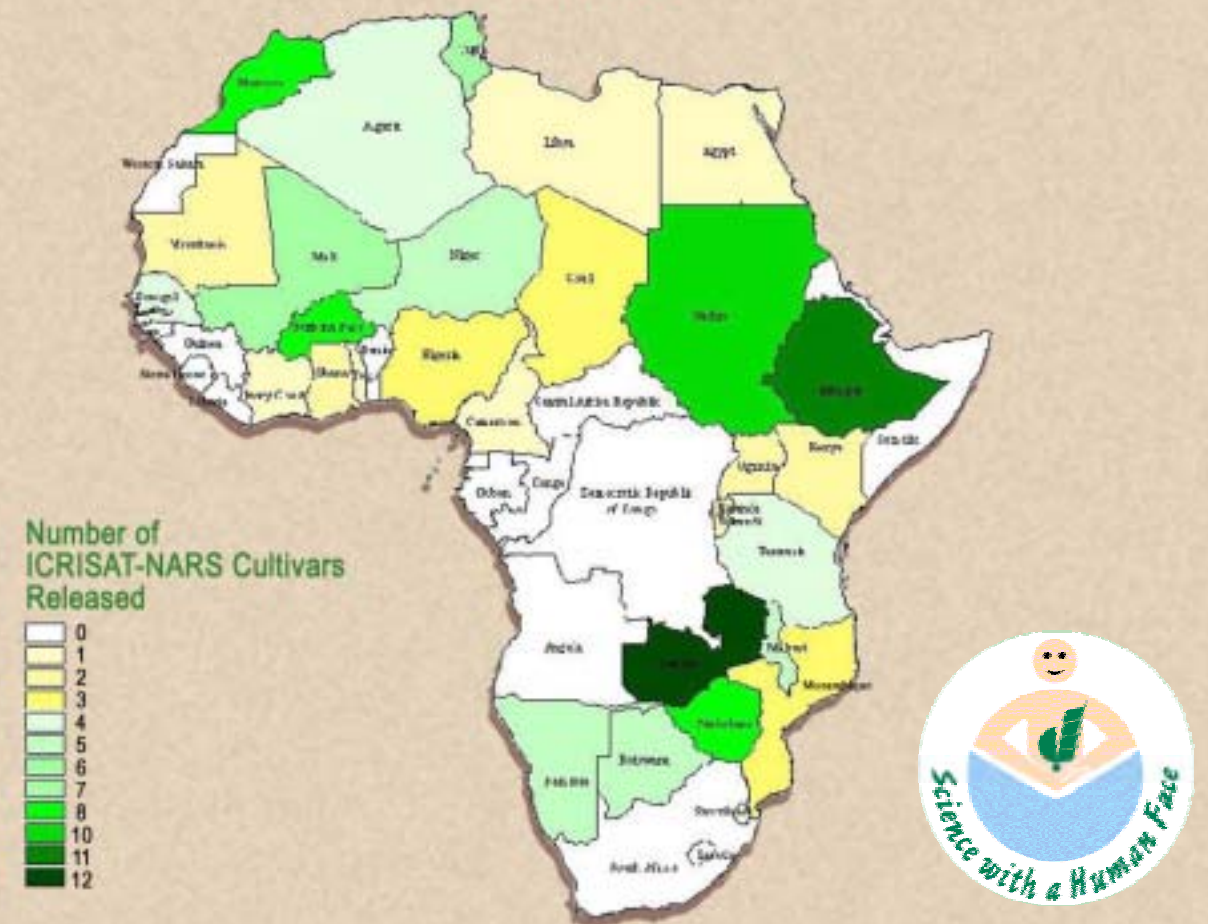
## The Future

ICRISAT is working vigorously to enhance prosperity, create diversified opportunities, protect the fragile environment, and promote inclusiveness. The focus continues towards a production systems-based approach that will integrate variety development, technology exchange, seed systems development, and crop and resource management. We believe that the path to achieve our goals is ‘Science with a Human Face’. Therefore, ICRISAT will strengthen partnerships, networks, and information exchange, and continue to develop suitable cultivars, techniques, and policy guidelines that will foster development in the SAT including Africa.



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## Impacts of ICRISAT-NARS Research in Africa



The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, apolitical, international organization for science-based agricultural development. Established in 1972, it is one of 16 Future Harvest Centers, and is supported by more than 50 governments, foundations, and development banks called the Consultative Group on International Agricultural Research (CGIAR).

ICRISAT focuses on the semi-arid tropics, home to one-sixth of the world's population. Persistent drought, unpredictable weather, limited and erratic rainfall, and nutrient-poor soils are the farmer's challenges.

**ICRISAT's Mission** is to help developing countries in the SAT increase crop productivity and food security, reduce poverty, protect the environment through partnership-based research with National Agricultural Research Systems (NARS), Advanced Research Institutes (ARIs), Non-Governmental Organizations (NGOs), the private sector, regional organizations and networks (SACCAR, SMINET, WCAMRN, ROCAFREMI, WCASRN, INTSORMIL), and other CGIAR centers.

Among the major Development Investors who provide funds to assist ICRISAT's mission in the African continent are USAID, BMZ/GTZ, IDRC, CIDA, and the African Development Bank.

## RESEARCH ACHIEVEMENTS AND IMPACTS

About 80 million poor people live in the semi-arid tropics of sub-Saharan Africa, and are unable to meet their most basic food needs. ICRISAT's partnership in Africa resulted in the following specific outputs:

### Improved Varieties

- By 1998, ICRISAT released 137 improved varieties and hybrids in 31 countries of Africa (63 sorghum, 32 pearl millet, 27 chickpea, 3 pigeonpea, and 12 groundnut)
- The benefits from investment in the SV2 (sorghum) (*right*) and PMV2 (pearl millet) varieties in Zimbabwe are expected to grow from US \$ 7.8 to \$28.9 million.



- ICRISAT's sorghum variety S35 covers 49% of the rainfed sorghum area of the Mayo Sava region in Cameroon, and is grown in 38% of the sorghum area of the Guera region in Chad. S35 provides 36% and 54% yield gain in these regions, and the per ton cost of production is 26% less than local cultivars.
- Improved sorghum varieties ICSV 400 and ICSV 111 (*left*) are grown in 30% areas of the Jigwa region in Nigeria.
- The adoption rate of sorghum variety *Phofu* in Botswana was 21% of the total sorghum area in 1997/98. This variety was

adopted for early maturity, large head, white grain, and strong stem resistant to damage.



- Pearl millet variety Okashana 1 occupies almost 50% of Namibia's millet area. Pearl millet variety Okashana 2 (*left*), a stronger stem version of Okashana 1, was recommended for use as downy millet resistant material for Sudan by the National Variety Release Committee.
- Pearl millet variety SOSAT C88 (*right*) is flourishing in Nigeria – and is grown by over 10,000 farmers.



- Central Ethiopia is saturated with ICRISAT's chickpea variety *Mariye*.
- Improved pigeonpea varieties (*left*) are “the hope for Eastern Africa” region. The region contributes 12% of the global production. Three varieties released: KAT 60/8 and ICPI 89091 in Kenya, and ICP 9145 in Malawi. The new pigeonpea production package provided 55%

higher yields in on-farm trials in Kenya.

- Rosette virus resistant groundnut variety CG 7 (*right*) is adopted in one-third the of groundnut area in Malawi. Seed multiplication and distribution was organized through NGOs.



### Natural Resource Management

- Developed by the International Livestock Research Institute (a sister center), in collaboration with ICRISAT, the Broadbed Maker (*right*), a simple, cheap, and efficient plow, allows animal power to create flat raised beds which overcome water-logging and soil hardening in heavy clay soils. The Third World Network of Scientific Organisations recognized it as “outstanding”. The BBM is used by about 30,000 farmers in Ethiopia.
- Wind breaks, ridging, and use of mulch from millet stover were found to be effective in erosion control in the Sahel.
- On-farm research in the Sahel demonstrates that small doses of phosphate can substantially increase millet productivity.
- The HATA (*right*) (Houé à traction asine – donkey-drawn hoe) developed at ICRISAT, delivers seed and fertilizer, and has been shown to double yields of millet, Niger's staple food.
- Combining modern tools, such as simulation modeling, with improved farmer participatory methods, plus more farmer-affordable technologies brings new hope to resource poor farmers in Southern Africa.



### Human Resource Development and Technology Exchange

- Capacity building has been a key element of all regional programs. National research programs were strengthened through training, sponsorships for higher education, establishment of research networks, and information exchange. Over 1300 national staff across the SADC region have benefited. Similar training activities were carried out for Eastern, Western, and Central Africa. Many scientists trained at ICRISAT are now leading agricultural research in African NARS partners. There has been a special emphasis on women from Kenya, Malawi, Tanzania, and Uganda. Also, farmers' schools were organized in Tanzania.
- For Information Exchange important publications have been translated from English into French, Portuguese, Hausa, Ki-Swahili, the local languages spoken by the African peoples.
- ICRISAT's international newsletters are distributed to 2500 partners and stakeholders.

### Assisting National Agricultural Research Systems (NARS)

- Pearl millet seed produced at Niamey helped eight West and Central African countries to fight the 1997 drought.
- Seeds of Hope Project with partners helped restore agriculture in Rwanda, as did the Seeds of Freedom Project in Angola.
- Joint sorghum effort helped rebuild agriculture in Eritrea, conserving landraces, and increasing the infrastructure and research capacity.

