Innovation Systems for the Drylands

India

Digital Agriculture and Youth

An agri-tech incubator, ihub, was launched on 13 February 2017, by two Telangana State Ministers (Minister of Information Technology, Municipal Administration and Urban Development; and Minister for Agriculture).

- **9 start-ups incubated** (as of 2017)

Impact of apps developed by ihub partners

- **>1,000,000 downloads for Plantix**, an image recognition app for diagnosing plant disease and nutritional deficiencies. It was used widely by farmers across 4 states of India;
- **>500,000 farmers registered for Kalgudi**, a farmer networking platform, launched by a start-up.
Impact assessment of pearl millet hybrids (from ICRISAT bred lines)

- 60% of pearl millet area covered in three states during 2013-14;
- 20% higher grain and fodder than varieties/other hybrids which they replaced;
- US$ 133.7 million annual benefits accrued due to HPRC hybrids in the three states;
- >US$ 150 million annual benefits projected at country level where other states of India were included.

[This was an independent impact assessment of ICRISAT’s Pearl Millet Hybrid Parents Research Consortium (PMHPRC)]

New Geographic Information System (GIS) and Remote Sensing methodology used in India

>22 m ha areas of rice-based cropping systems identified across India for intensification.

Systems analysis for Climate Smart Agriculture

- Co-developed a framework for upsaling climate smart agriculture (CSA) in Telangana State;
- This includes mandal*-level climate analysis, prioritization of CSA practices, identifying barriers to CSA, actors’ roles and incentives and ex-ante assessment for returns on investment for each CSA practice;
- These findings have influenced Telangana State policy through development of the State Action Plan on Climate Change for agriculture sector, unifying the state-level approach to implementing climate-smart agriculture;
- National Bank for Agriculture and Rural Development (NABARD) now allocates state-wide credit for scaling up CSA in Telangana https://cgspace.cgiar.org/handle/10568/90627.

*block level

Nutrition: First of its kind study on adolescent tribal girls in India, especially in Telangana

Testing for acceptability of the Nutri-Food Basket of Smart Food products in Anganwadis (mother and child care centers). Photo: M Harshvardhan, ICRISAT
In the tribal districts of Adilabad, Komaram-Bheem Asifabad and Mancherial, Telangana, a baseline survey on socio-economic, nutrition and health indicators for 1,448 adolescent girls of ages 11-18 years was completed for three mandals. Of this sample, the descriptive analysis reveals that:

a. 68% of adolescent girls are underweight having a BMI of less than 18.5;
b. 47% are anemic having hemoglobin level of less than 12 gs/dl;
c. 23% consume a diet which has low diversity, meaning that on an average they consume a diet comprising of only three food groups (out of 9 food groups as per FAO guidelines).

An intervention was then designed:

- A nutri-food basket comprising of nutrient-rich porridge mix, upma mix/ kichadi mix, cookies and Energy and Nutrient Dense Food (ENDF)-spread packed in 1 kg unit packs was formulated using locally available ingredients to provide additional energy, protein, fat and micronutrients.
- Value-added nutritious food products were introduced in tribal households (n=4800) to improve overall nutritional status of the target population as evidenced by baseline and end-line surveys.
- 50 tribals and Integrated Tribal Development Agency (ITDA)/Health department staff trained in nutrition, food processing and food safety.

Raising income of tribal farmers

Partnered with the Integrated Tribal Development Agency (ITDA), Utnoor of Telangana State for implementing two pilot projects aimed at reducing poverty, ensuring access to nutritious food and better livelihoods for tribal farmers in the region.

- 20% increase in yield was reported by tribal farmers who gained access to good quality seed;
- 10 youth employed (includes two women) at processing units;
- 9,600 kg of pigeonpea processed at the mini dal unit at Wankidi during the project period;
- 15,000 kg of sorghum processed at the unit at Tiryani during the project period;

Demonstration of pigeonpea inter-cultivation. Photo: H Mane, ICRISAT
• **31% increase in price realized by farmer.** Market facilitation of processed product was done at a premium pricing of Rp 80/kg instead of farm gate price of Rp 42/kg realized by the farmers in the last season;

• **Direct linkages with retail and corporate players:** The project eliminated 2-4 intermediaries from the value chain and helped farmers establish direct contact with marketers.

## Africa

### GIS and Remote Sensing – Africa-wide

*Participants of the international course on Introduction to applications of Remote Sensing and Geographical Information Systems at Kano. Photo: ICRISAT*

• **A methodology for the automation of cropland mapping across continental Africa** using Google Earth Engine cloud computing to continuously monitor cropland changes was published in the highly ranked ISPRS* Journal of Photogrammetry and Remote Sensing.

*International Society for Photogrammetry and Remote Sensing*
Agricultural Modelling Intercomparison and Improvement Project (AgMIP)

AgMIP was a major international collaborative effort funded by the Department for International Development (DFID), United Kingdom, to assess the state of global and regional agriculture with a specific focus to understand the impacts of climate variability and climate change. The seven regional teams in Sub-Saharan Africa and South Asia have substantially elevated attention and preparation for climate change and related agricultural challenges in coming decades in regions with large and vulnerable populations:

- AgMIP regional integrated assessments have examined interactions between climate change, socioeconomic development, and agricultural adaptation in 10 countries;
- AgMIP Regional Research Teams have led intensive engagement with regional stakeholders around socioeconomic and environmental changes, vulnerabilities, and challenges that will shape the future of regional agriculture;
- AgMIP scientists are now situated and recognized within regional networks among key decision makers who are advancing climate-related policy processes.

Some key findings include:

- In the current climate, integrated interventions using management interventions, such as improved cultivars and switches in cropping systems, and market development can significantly improve smallholder farming systems in many locations;
- In the future climate, even with agricultural development, climate change generally will exert negative pressure in most locations;
- Regions with minimal fertilizer applications are often limited by soil fertility rather than climate factors;
- Future adaptations are able to overcome a portion of detrimental impacts to smallholder farmers, but do not compensate completely in many locations;
- Targeted adaptations for future climate change include improved heat and drought-tolerant crop and livestock varieties, sowing practices, and fertilizer applications.

Agricultural innovation platforms (AIPs) in Zimbabwe

Mr Marizane compares the nutrient status of his soil. Photo: M Hauser, ICRISAT
• To transition dysfunctional smallholder irrigation schemes in Southern Africa towards more profitable and sustainable systems, farmer-friendly soil and moisture monitoring tools (Chameleons and FullStops) and engagement of farmers in agricultural innovation platforms (AIPs) led to a 90% awareness amongst irrigators. This lead to improved irrigation and labor efficiency and more sustainable soil fertility management.

• The AIP process has created positive impacts that include social changes (gender awareness and change, reduced conflict), a transition from subsistence to more market-oriented production approaches, increases in the occupancy of the schemes; significant gains in water productivity, income, labor savings, changes in investment patterns and returns at the market place and a greater demand and supply of information to support these changes. [http://www.icrisat.org/innovation-platforms-effective-livelihood-options-for-drought-stricken-farmers-in-mozambique/](http://www.icrisat.org/innovation-platforms-effective-livelihood-options-for-drought-stricken-farmers-in-mozambique/)

Conservation Agriculture (CA) and climate resilience in Zimbabwe - impact study

One of the main difficulties with this analysis lies in the definition of the CA practices being adopted. This analysis identifies the use of minimum tillage (By use of either planting basins or ripped planting lines) as a basis for defining a minimum level of CA adoption.

• Only 38% of the adopters in Zambia, and 25% of the adopters in Zimbabwe, applied all three CA practices (minimum tillage, mulch, and crop rotation);
• In average rainfall periods, the use of CA has no significant impact on yields for any crop. The returns on CA during these periods are also negative, at least in the short-run;
• CA appears effective in mitigating yield loss due to deviations in rainfall;
• Examining the interactions between rainfall and CA, the study found that
  ▪ For maize, yields improved with CA practices both when rainfall was above average and during times of drought;
  ▪ For sorghum and cowpea, CA improves yields during times of drought but not surplus rainfall;
  ▪ CA has no impact in mitigating losses from either surplus or shortfalls of rain for both millet and groundnut.
• The study also concluded that CA is not an appropriate technology for regions of sub-Saharan Africa where rainfall is consistent. Rather, policy should target CA for households living in areas prone to drought or flooding.