

NAAS Foundation Day Lecture
on
**Can India's Success in Agriculture
Benefit Africa?**

by

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5th June, 2019



National Academy of Agricultural Sciences
NASC, DPS Marg, New Delhi - 110 012, India

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How to portray global agriculture in the first quarter of the 21st Century? An outstanding success in continuing to feed the world and adapting for the future through innovation, in bred varieties and modern agronomic practices, driven by dedicated and innovative agricultural science and practitioners? Or a source of social and environmental concern, beset with forewarned challenges requiring transformative action, as alerted by broad science and societal influences? Are continuous adaptations or transformative disruptions essential in agriculture as we look to the future?

With the honour of presenting the 2019 Foundation Day Lecture of the National Academy of Agricultural Sciences (NAAS), I wish to applaud the contribution of agricultural science to the success of agriculture and society in India and globally. Significant agricultural productivity growth, diverse and nutritious food value chains and active rural community development have contributed greatly to India's broader society and to its global reputation for innovation. Continued, targeted development has seen a significant reduction in the number of people living in extreme poverty in India, with this number likely falling below 3% of the population by 2021¹.

In 1971, Dr MS Swaminathan, Director of the Indian Agricultural Research Institute and later Director General of the Indian Council of Agricultural Research (ICAR), proposed that India host an international institute for semi-arid crops to conduct research on grain legumes as well as sorghum and millets. The International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) was established in 1972 at Patancheru, India, with a

¹ <https://worldpoverty.io/blog/index.php?r=14>.

mission to improve prosperity, nutrition and the environment of the semi-arid tropical drylands of south Asia and sub-Saharan Africa. Almost 50 years later, a key challenge and agenda for ICRISAT is to address the question of my lecture – can India’s real successes in agriculture be transferred to Africa?

In specifically addressing the lecture’s title question, I briefly tackle the broader narrative for agriculture, as raised in my first sentence, with India the case in point for notable success in agriculture’s contribution to society. Disappointingly, I find the typical articulation on agriculture today, and into the future, consistent with a largely negative narrative; where it is all challenge and little acknowledgement of success. In the introduction to so many research papers, lectures or populous news items, the narrative choice is to highlight what is wrong or forewarned with agriculture today and tomorrow. Negative climate change impacts, environmental degradation and farmer distress are common entry points. Regularly, ‘business as usual’ is typecast as inadequate, despite the decadal contributions of R&D and the continual innovations that have enabled the world to largely feed itself today.

Added to this negativity is how often I see science used to propagate a desired agenda without science’s (Karl Popper’s) primacy for critique. In this regard, I note a tendency for today’s researchers to start with an overriding narrative of downside context, often cited without full appraisal. As one example, I recently noted an introduction which asserted that “*By 2030, 40% of the land growing corn in sub Saharan Africa will no longer be suitable for corn due to climate change*”, attributed to the head of the International Monetary Fund. I went looking for the source, as I thought this was as alarming as presumably it was intended. Multiple press reports pointed to a commissioned study² which reported this potentially disastrous impact. I tracked the cited source³ on which these statements were based and found no such data nor conclusions were made. As a former maize physiologist, I’d suggest that current maize varieties will grow and yield in current localities even under extreme climate change, although with grain yields likely reduced⁴. Poorly argued and attributed assertions must be challenged.

Closer to India, a concern is the current promotion of Zero Budget Natural Farming (ZBNF) which, according to FAO “*the phrase ‘Zero Budget’ means*

*without using any credit, and without spending any money on purchased inputs*⁵. I'd suggest that one doesn't need years of evaluation to do *ex-ante* assessment of the proposed practices. For example, the recommendation of 10kg/acre/month of manure⁶, roughly equating to 10kg N/ha pa, is clearly inadequate for crop production. However, even more concerning, is the anti-science stance of this movement against "*Agriculture University and their technology*" and the support for this approach for political reasons. Despite the politics, scientists must portray the successes of society and articulate the associated challenges, balanced by our current knowledge, imperative to critique and continued exploration of how the world works.

The national innovation system in India, most notably through the contributions of ICAR which coordinates one of the largest, and certainly among the best, agricultural research systems in the world, has demonstrated that the productivity of rainfed agriculture can be enhanced significantly through adoption of technologies with support of appropriate policies. ICRISAT is a proud contributor to this innovation system and, here, I point to three innovations and associated learnings that can be possibly transferred to Africa.

First, the success story of pearl millet production in India can provide a pathway for the identification and upscaling of pearl millet hybrids in sub-Saharan Africa. In the 1960s, about 11M ha of pearl millet in India was under OPVs with average grain yields of 0.2 t/ha. In 1965, the first pearl millet hybrid (HB-1) was released in India, followed by a few hybrids in the 1960-70s. During the 1970s, private sector seed companies entered pearl millet hybrid breeding and, supported by the public system, had transformed 50% area in India under hybrids by the 1990s. By 2000 over 60% area, 4-5M ha, was under hybrids and grain yields average 1.2 t/ha. Today, the Hybrid Parent Research Consortium (HPRC)⁷ is an innovative and successful approach to public-private partnerships between ICRISAT,

² <http://www.worldbank.org/en/news/press-release/2013/06/19/warmer-world-will-keep-millions-of-people-trapped-in-poverty-says-new-report>

³ Burke et al., 2009. Shifts in African crop climates by 2050, and the implications for crop improvement and genetic resources conservation. *Global Environmental Change*, 19(3), 317-325.

⁴ Carberry et al., 1989. Testing the CERES-Maize simulation model in a semi-arid tropical environment. *Field Crop Res.*, 20:297-315.

⁵ <http://www.fao.org/agroecology/detail/en/c/443712/>

ICAR Institutes and Private Sector seed companies in India, and abroad, to deliver improved hybrids and varieties to smallholder farmers.

Pearl millet in Africa is largely grown by smallholder farmers who still rely on OPVs and informal seed channels, but with the commercial seed market accounting for only 10% of total seed use. As a proof of concept, ICRISAT has demonstrated in Africa that hybrids from India provided yield superiority of over 30-40% over local checks. Hence, the opportunity exists for Indian and African public and private sector partners to work together to transfer to Africa the materials and learning that transformed India's millet production system. A HPRC-type model could be the vehicle in Africa to strategize on how to align African public and private sectors for their support to upscale identified hybrids quickly.

As a second public-private example in India, the combination of conducive Government policies and investments by the private sector has seen strong delivery of agri-services such as seed companies, fertilizer and agri-chemical suppliers and farm machinery manufacturers. In this regard, for over 15 years, ICRISAT has supported many Start-Ups in agri-services, primary and secondary food processing and value chain operations through its Agribusiness and Innovation Platform (AIP)⁸. Such supportive underpinning of agri-value chain development can certainly benefit economies in both India and Africa. Further, in both regions, the use of mobile telephony is growing fast, with the Start-Up ecosystem in India moving rapidly to deliver ICT tools and advisories (e.g. remote sensing; drones; AI/ML/Blockchain; mobile apps; weather data; market information) to Indian farmers and service providers. The considerable youth assets of Africa could well learn from and leverage this Indian Start-Up ecosystem to create new and much-needed agri-business opportunities across sub-Saharan Africa.

Thirdly, the decades of experience in integrated watershed management (IWM) in India has resulted in accumulated lessons to guide its policies of watershed development and management at the national level benefiting millions of farmers tackling the demands of rainfed agriculture. On-station research at ICRISAT has demonstrated over several decades

⁶ <http://www.palekarzerobudgetspiritualfarming.org/zbnf.aspx>

⁷ <https://www.icrisat.org/pearl-millet/>

that the productivity of rainfed agriculture can be enhanced three to five-fold over current yields through integrated watershed management that provides for supplementary, crop-saving irrigations at critical stage in the cropping cycle. However, scaling-up adoption of IWM practices had been initially negligible, despite widespread on-farm demonstrations. With the support of the National and State Governments, non-government organisations (NGOs), national research institutions such as ICAR - Central Research Institute for Dryland Agriculture (ICAR-CRIDA), and private sector companies, the implementation and monitoring of various watershed interventions is now a substantive success in India. It has resulted in accumulated lessons to guide India in its policies of watershed development and management at the national level; lessons that are most relevant to many African ecologies.

In conclusion, India's national initiative to offer greater South-South Collaboration to support development pathways that will benefit African farmers and consumers should be readily progressed. In fact, India's investment in South-South Collaboration could be leveraged to fund support for agricultural research in Africa. The CGIAR, with its facilities and staffing in both India and Africa, could provide a bridging role in South-South Collaboration. Joint ICAR-CGIAR project-level initiatives could include:

- Joint projects in Africa, specifically funded by India – e.g. through the India-UN Development Partnership Fund;
- Indian funding for the hosting of ICAR researchers at CGIAR facilities in Africa;
- Hosting African researchers at ICAR or CGIAR institutes in India;
- Increased flow of African post-graduate students at Indian Universities.

Closer institutional arrangements between the CGIAR and ICAR can be imagined, such as:

- Establishment of new co-branded initiatives in Africa funded by India – e.g. Tata-Cornell Institute for Agriculture and Nutrition (TCI)⁹.
- Indian support for specific existing facilities in Africa with targeted agenda – e.g. co-branding an existing CGIAR research facility as an 'ICAR-CGIAR Research Station'.
- ICAR and CGIAR Centers enter formal agreements, with the

advantages to ICAR of adopting an established African footprint and research agenda in Africa, and to the CGIAR Center of receiving 'core' Indian funding.

Further brain-storming is required to consider options and the rationale for gaining Indian support for Africa. I hope that ICAR and NAAS can support this idea and see the CGIAR as a partner in helping transfer India's success in agriculture to Africa.

Finally, in returning to my thoughts on agriculture's narrative, an admission in that I had earlier misquoted ICRISAT's mission – formally phrased as overcoming negatives, i.e. "*reducing poverty, hunger, malnutrition and environmental degradation in the drylands*". For me, and my modernist leanings, I want to believe in the incredible adaptive capacity of humans and the power of science and innovation. I think this message is preferable to a largely pessimistic narrative of impending calamity.

⁸ <http://www.aipicrisat.org/>

⁹ <https://tci.cornell.edu/>

