

Cropdynamics: field crop monitoring & research

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Case for context: Multi-sectoral stakeholder objectives

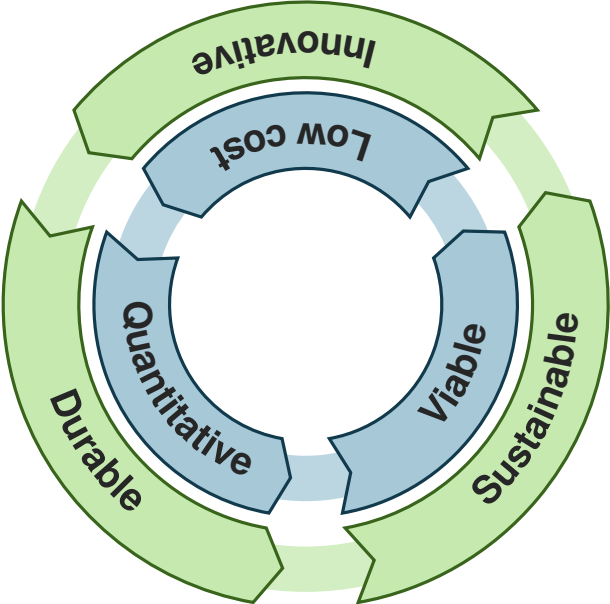
Cereal Systems Initiative for South Asia (**CSISA**): Estd. 2009
to improve cereal production in the region

Partnerships: Involves more than **300** public, civil society, and
private sector **partners**

Dissemination: Improved cropping systems, resource-
conservation, new rice, wheat & maize varieties,
hybrids, livestock feed supply chains, aquaculture,
improved policies & markets, & public-private
delivery.

Policy research: IFPRI responsible for **policy research** agenda
to remove constraints

Institute of Economic Growth (IEG): Innovation for productivity,
returns to farming, **poverty reduction**, &
improvement of rural welfare



Innovative

Low cost

Viable

Sustainable

Durable

Quantitative

Technical entry points

Conservation Agriculture: soil

Minimum disturbance

Organic cover

Crop diversity

Change-agent capacity building

Germplasm, seed systems

Intensification

Improved livestock feeding

Aquaculture

Scale-appropriate mechanization

Laser land leveling

Direct-seeding

Machine transplantation

Conservation tillage

Mechanical threshing

Agricultural Chemistry premise: soil health

1. Focus on active and not passive soil fertility; soil as *tabula rasa*, fertility from replenishment vs. microbial mediation.
2. Plants interact with soil; cover crops & rhizosphere feed microbes that enhance plant growth and pathogen defence
3. Tracer studies show less than half of the nitrogen in harvested parts came from added fertilizers. The other sources of the nutrients: biological N-fixation, microbial oxidation and natural weathering. Microbes mediate all the important nutrient-plant transactions.
4. Failure to measure potential nutrient pools result in over-fertilization, depressing farm income.
5. New methods are needed to better mimic soil-plant processes in situ.

Water constituents

- In natural water, major minerals¹ include
 - the cations, Na^+ , K^+ , Ca^{2+} , Mg^{2+} and
 - the anions HCO_3^- , SO_4^{2-} , Cl^- , NO_3^- .
- Non-metallic pollutants, N, P and S, excluding sulphates²
- Heavy metals, hexavalent Cr, Cd & Hg must be tested.
- N and P cause eutrophication of surface water.
- While nitrates and phosphates are nutrients, other forms, viz. NH_3 , organic N and P, are nutrient precursors.

concentrations from 1 mg/L to several g/L in seawater except NO_3^-
in several 100 mg/L

Nitrogen cycle

- N present in water in reduced form as organic and NH_4^+ nitrogen, and in its oxidised form, NO_2^- and NO_3^- .
- Reduced forms are present due to organic matter and as $\text{NH}_3\text{-N}$ from biological wastewater treatment plants. They increase oxygen demand on oxidation, in forming nitrates.

Surface-vehicle platform

Aerial platform

Mechanical stabilisation arm

Mechanical stabilisation steadicam