Multifactorial Considerations in Optimizing Rice Crop Nutrition

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RICE

Feeds 4 billion People (56% of world population)
Grown by 144 million Farm families (25% of world farmers)
Annual value of $206 billion (13% of world crop value)
Home to 400 million Rural poor (40% of world poor)

Land Use 10% crop land
Fertilizer Use 15% of world total
Irrigation use 35% of world total
Breeding Isn’t The Full Picture

CORIGAP Project wet season - Adapted from Stuart et. al. (2016) Field Crops Research

Balancing Objectives

1. Enhancing Yield
2. Decreasing input costs
3. Sustainable Production
4. Optimizing Human Nutrition
5. Reducing Environmental Footprint

Global Imperatives
Local Imperatives
Rice Crop Manager: Science-based Solution

- **Site-specific nutrient management (SSNM)** principles underpin the digital ag tool
  - Plant based approach
  - Establish a yield target
  - Effectively use existing nutrients
  - Fill the deficit between total needs and endogenous supply

- **Actionable, relevant, tangible guidance for farmers**
  - Recommendation is given in terms **easily understood** by farmers
  - **Time and amount of fertilizer** (in kg) to be applied is recommended
  - Provides recommendation for **stress conditions** (submergence & drought)

- **Partnership based for effective, locally relevant dissemination channels** - combine IRRI and NARES research across disciplines for comprehensive solutions

- **Tested in multiple countries**: Customized for different countries: Bangladesh, Indonesia, Philippines and India

Rice Crop Manager takes scientific principles coupled with effective dissemination pathways to ensure that SSNM principles are accessible to smallholder farmers.
RCM: Current dissemination pathways

Agricultural extension worker interviews farmers using phone or laptop
Interview data is submitted to cloud-based server
SSNM algorithm automatically generates RCM recommendation for each farm plot
Recommendations are provided via print outs, SMS and phone calls

Each farmer receives a unique recommendation on crop and nutrient management.

RCM: Proven Results

- Deployed in Philippines, India, Bangladesh, Indonesia
- [http://webapps.irri.org/ph/rcm](http://webapps.irri.org/ph/rcm) in English, Bangla, Tagalog, Hindi and Odiya
- On-farm evaluation: Application of fertilizers using RCM [increased yield](http://webapps.irri.org/ph/rcm) and [net added benefit](http://webapps.irri.org/ph/rcm)
- **170,000** recommendations (Odisha) (2017-2018)
- **2.1 million** recommendations between 2014 to 2018 (Philippines)
- **+$USD100/ha/season** in all countries

Average yield increase of 397 kg per hectare per crop
Added net benefit of 107 USD per hectare per crop

Results from 915 on-farm trials (2014-2018)

In all countries where it has been deployed, RCM has proven to increase farmer yields and incomes.
Crop Manager for Rice-Based Systems

Application of fertilizers using CMRS increased yield and net added benefit for Rice and Wheat in Bihar & Eastern UP (On-farm trials)

- Geospatial Information Systems
- Predicting yields
- Crop Insurance
- Monitoring pests & diseases
- Overlay with soil maps, climate predictions and socio-economic data
- Real time dynamic management options

Rice area, flood area and infrastructure damage map based on Astrobotic Aquarius Radar (AAR) images processed by airmap in the day after the typhoon. A first pass processing and interpretation by DHI and AgriGenius. Soil data provided by ASTER/USGS from USGS-SCORC. Rainfall gridded by HORN, 2020. Crop classifications: Background from Google Maps Satellite Layer.
SSNM is not just a technology

- SSNM optimizes factors affecting gross margin – increasing yield and decreasing input costs
- SSNM has potential to improve non-monetized outcomes of agriculture – but needs policy support
- SSNM is the basis of a conversation with farmers
  - Understanding what is critical for the farmer
  - Increasing understanding of critical success factors
  - A gateway to adopting improved technologies
- Focus on scaling the system-based approach that SSNM underpins