

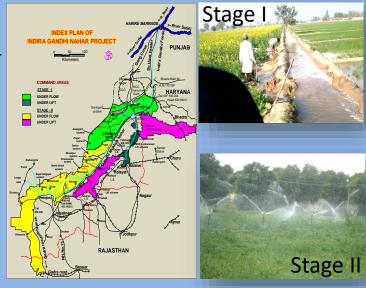
Improving Land and Water Productivity in IGNP Command Area

(ICAR - ICARDA Collaborative Project #8)



PROBLEM

- Stage—I of command area has even topography, intensively cropped, surface irrigation (flood, check basin). Water logging, soil salinization, low crop water and nutrient use efficiency are major problems.
- Stage—II of command area has light soils, uneven topography, low and irregular availability of water. Low land- as well as water-productivity, higher interannual yield variability, low water and nutrient capacity of soil, wind erosion are major problems in this area.
- Decreasing water availability for crop production and land degradation caused by poor crop water management warrants identification of management strategies to sustainably utilize water in agriculture in the IGNP command area.



OBJECTIVES

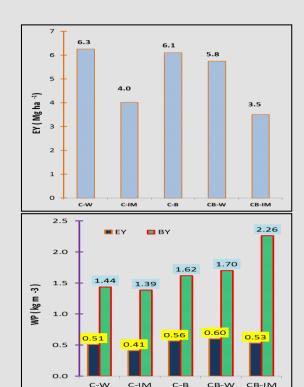
- To assess yields, profits and water productivity of different crops and cropping systems under existing crop management practices in the IGNP command area
- To quantify yield and water productivity of crops under different application rates of irrigation and fertilization;
- To validate and evaluate performance of CropSyst crop simulation model for different selected crops;
- To build capacity of stkaeholders

RESEARCH RESULTS



Assessing yield, profit and water productivity of crops and cropping systems

- ❖ In IGNP stage—I, the EY varied from 3.5 to 6.3 Mg ha⁻¹. Cotton—wheat cropping system had highest EY followed by clusterbean—wheat, cotton—mustard and clusterbean—mustard. Averaged across two years, clusterbean-based cropping systems had 2X higher profit than cotton-based cropping systems.
- ❖ The WP of cropping systems measured in terms of EY ranged from 0.36–0.66 kg m⁻³; highest being for clusterbean—wheat and lowest for cotton—mustard cropping system. Clusterbean-based cropping systems were more water productive in terms of yield and monetary return than wheat-based cropping systems.
- ❖ In stage—II, groundnut-wheat cropping system had 62 and 66.2 and 63.5, 23.5 and 100.2 percent higher seed yield over groundnut—cumin, groundnut—isabgol, groundnut-mustard and clusterbean-chickpea systems, respectively.



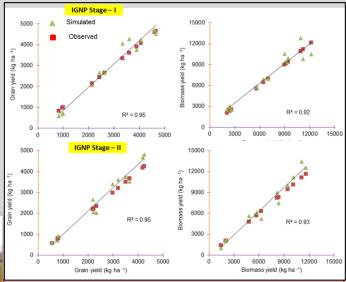
*EY: Economic yield; BY: Biomass yield; WP: Water productivity



Yield and productivity of crops under variable rates of irrigation and N

Effects of irrigation and N application rates on yields and WP of wheat

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Simulated and observed yield of wheat in IGNP



CropSyst model validation and performance evaluation

Wheat	I1 = 200mm				I2 = 400 mm			I3 = 600mm					
(Stage I) 2016-17	N0	N50	N100	N150	N0	N50	N100	N150	N0	N50	N100	N150	Mean
Grain Yield													
RMSE	1062.5	528.5	307.9	388.8	303.3	220.0	287.9	482.4	790.5	342.8	592.9	879.4	515.6
RRMSE %	39.2	16.0	8.5	10.8	10.0	5.7	6.7	10.2	30.0	9.5	13.3	17.0	14.7
IOA Yield	0.97	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.98	0.99	0.99	0.99	0.98
AGB													
RMSE	3841.1	808.8	518.0	704.7	1562.1	556.8	373.0	1094.2	1816.5	1214.5	2370.2	2236.1	1424.7
RRMSE %	43.3	6.7	3.9	5.2	16.0	4.2	2.6	7.2	19.9	9.8	15.6	13.6	12.3
IOA AGB	0.96	0.99	0.99	0.99	0.99	1.00	1.00	0.99	0.99	0.99	0.99	0.99	0.99

- Irrigation at 400 and 600mm had 21 and 46% higher grain yield than 200 mm irrigation. WP was 20% higher at 400 mm than at 600 mm irrigation.
- In stage-II, the highest wheat yield (4565 kg/ha) was recorded at N = 150kg N/ha with 600mm irrigation level which was 25 and 60% higher over 400 mm and 200 mm irrigation level, respectively.
- RRMSE ranged from 2.6 to 31% and the model predicted yield well at moderate levels of irrigation.

CAPACITY BUILDING

- ❖ Five post-graduate students of SKRAU completed theses work
- Two workshops, one brainstorming session and one international training on CropSyst modeling were organized at CAZRI
- Three scientists from ICAR attended International Training at ICARDA, Jordan.

PUBLICATIONS

- Published a Special Issue of Annals of Arid Zone Research Journal on improving water productivity in dry areas
- Five research papers published in peer reviewed international journals
- One Ph.D. and four M.S. theses published
- Media coverage by Rajasthan Patrika newspaper

