DRIP –FERTIGATION FOR RICE CULTIVATION

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FUTURE SHOCK !

PROJECTED FOODGRAIN DEMAND AND IRRIGATED CROP AREA				
	unit	**2010**	**2025**	**2050**
Food grain demand	million t	**247**	**320**	**494**
Net cultivated area	m ha	**143**	**144**	**145**
Total cropped area	m ha	**193**	**204**	**232**
Total irrigated crop area	m ha	**79**	**98**	**146**

Source: National Commission on Integrated water resources development, GOI

SCENARIO -PRODUCTION

- Food production has to increase from 247 to 494 m MT (AD 2050) to feed the ever increasing Population.
- Increase in cultivated area will not add much to this requirement. (Possible increase only 2 m ha from the present 143 m ha).
- Converting rain-fed crops to irrigation cover (Partial or Full) is the only way out (79 to 146 m ha).

SCENARIO- WATER

- Gross Water Requirement increases to 1200 BCM from the present 700 BMC.
- Available water remain at 1137 BCM
- Water deficit will force us to take ***extreme measures*** by 2030-2050.
- Before that happens conservation of water would help us survive better.
- Irrigation is the largest water user (+ 83%)
- Reducing water use in irrigation by increasing use efficiency will generate more water for irrigating more land area.

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STATUS OF RICE IN INDIA

- Cultivated area of Rice 43.79 m ha
- Irrigated area 25.1 m ha (57%)
- Area of dry seeded rice 12.26 m ha (28%)
- Area under irrigated DSR 6 mha.

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PRODUCTIVITY IN RESEARCH TRIALS
ELAYAMUTHUR, JAIN R&D FARM,TAMIL NADU

Method	Yield (t/ac)	Water use (million liter/ac)	Power Use (units/ac)
Flood	3.1	9.5	467
Drip	3.8	3.2	226
Difference%	**22.5**	**66.3**	**52**

PRODUCTIVITY IN RESEARCH TRIALS

RICE YIELD IN A TRIAL , JALGAON, MS
(t/ha)

Variety	Flood	Drip + Poly Mulch	Drip + Husk Mulch
SBH-999	6.0	8.3	8.0
25P25	4.5	6.0	6.8
25P31	7.0	9.3	8.0
MAS- 946-1	6.3	6.8	6.3
Try (R)-2	7.0	7.8	7.3
BPT	4.8	6.3	5.5
Pusa Sugandha	5.8	7.8	8.5

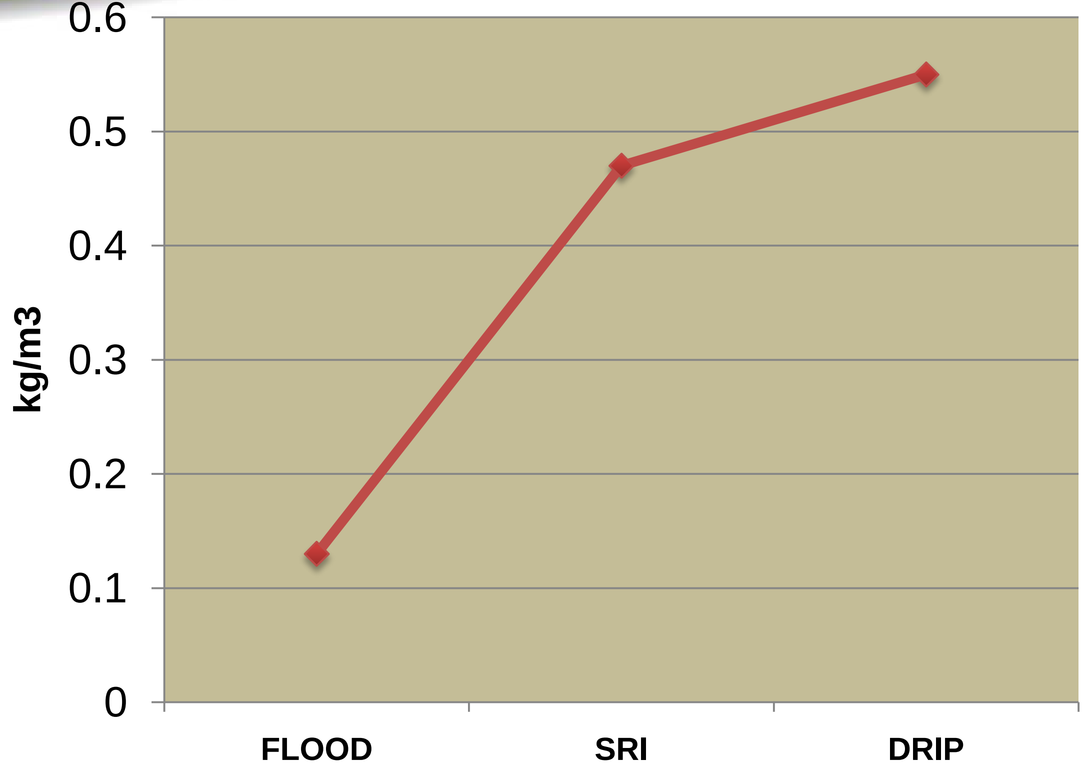
YIELD UNDER DRIP FROM DIFFERENT STATES
Modified Farmer's management

States	Rice (x 000 ha)	Average Yield in Conventional (t/ha)	Yield under drip-fertigation in trials (t/ha)
Andhra Pradesh	3982	3.1	9.38 t/ha (variety US 311)
Maharashtra	1513	1.5	6.0-9.3 t/ha (several varieties)
Punjab	2649	4.0	8.2 t/ha (Arize 6129)
Rajasthan	107	1.5	9.2 t/ha (Pusa -2)
Tamil Nadu	2050	3.1	7.5 -9.5 t/ha (ADT -45)
Uttar Pradesh	5578	2.1	5.5 t/ha (Arize 6129)

WATER PRODUCTIVITY

Variety	Water Productivity kg / m3	
	Flood	Drip + Husk Mulch
SBH-999	0.13	0.67
25P25	0.10	0.57
25P31	0.14	0.62
MAS- 946-1	0.14	0.52
Try (R)-2	0.13	0.53
BPT	0.10	0.46
Pusa Sugandha	0.12	0.70

IMPROVEMENT IN WUE



WATER USE IN DRIP IRRIGATED RICE

**WATER USE BY RICE AND ALTERNATE USE FOR SAVED WATER ** **	1 ac
Conventional Flooded (Puddled rice).	2375 mm
Drip irrigated rice	800 mm
Area extension with saved water	2.89 acre
Area that can be cultivated by an alternate crop (vegetables) after rice	3.15 acre

** ***Water use data from a field trial at Elayamuthur, Tamil Nadu, India***

Summary of cost and benefits accrued to the farmers who adopted drip irrigation for rice cultivation.

State	Punjab	Rajasthan	Chhatisgarh	Andhra Pradesh
Farmer details	Didda Singh, Mahalo, SBS Nagar Dist.,	Rajesh Vijay, Bhadana village, Kota dist.	Nanda Kumar Varma, Pirda, Durg dist.	Siva Reddy, Buddaipally,Kadapa dist.,
Rice variety	Arize, 6129	Pusa-4 (1124)	1010	MTU 4870
Crop area	0.5 acre	15 acre	1 acre	0.5 acre
Yield	3.24 t/acre	1.2 t/acre	3t/acre	3.8 t/acre
Incremental yield	0.8 t/acre	0.6 t/acre	1.0 t/acre	1.5 t/acre
Cost of Cultivation	9,260.00 /acre	11,000.00/acre	9,000.00/acre	13,300.00/acre
Cost of drip equipment	30,000 .00/acre	60,000.00/acre	28,000.00/acre	45,000.00/acre
Subsidy for equipment##	18,000.00/acre	42,000.00 /acre	nil	40,500.00/acre
Life of the equipment$$	7 years (14 seasons)	7 years (14 seasons)	3 years (6 seasons)	7 years (14 seasons)
seasonal cost of equipment	2142.9 /acre	4285.7 /acre	4667.00/acre	3214.3/acre
COP + equipment cost (seasonal)	11,402.9/acre	15285.7/acre	13667.00/acre	16514.3/acre
Gross income	35640 /acre	44,000.00/acre	34,500.00	38,000 .00 /acre
Net income	24,380.00/acre	28714.3/acre	20833	23867.00/acre
B C ratio	2.1	1.9	1.5	1.4
Pay Back period&&	1.23 seasons (= 1 year)	2.09 seasons (= 1 year)	1.3 seasons (= 1 year)	1.9 seasons (= 1 year)
water saving % **	40	40	35	45

**** As % of water applied in conventional flooded plots.**

$$ drip equipment is generally used for 7 years ; total of 14 crops on rotation.

subsidy component is not considered for B C and Payback period estimates

&& Income from rotation crop Rotation crop after rice is taken as equivalent to rice net income.

Benefits of Drip Irrigation & Fertigation

- Enhanced yield upto 50%,
- Higher and cleaner straw production.
- Higher water use efficiency.
- Conserving irrigation water up to 66%..
- Conserving energy use for pumping up to 52%.
- Reduced seed rate.
- Higher fertilizer use efficiency.
- Absence of pollution from leached and washed Nitrate.
- Maintains aerobic condition in the soil.
- Prevents Methane emission and protects environment as there is no standing water
- Reduced humidity in micro climate .

Benefits of Drip Irrigation & Fertigation

- Incidence of diseases and insects significantly low
- No need for land leveling (prerequisite for flow irrigation).
- No need for labour use for trimming bunds and plugging breaches to contain water.
- Total Labour requirement less.
- Intercropping and rotation cropping is possible. Pulse rotation crop will be beneficial.
- Soil structure is maintained (absence of puddling operation that destroys soil structure).
- Lower mosquito population in the ecosystem as there is no standing water.

BUILDING REACH

- The commercialization of the technology will not be easy.
- The attitudinal change required to accept the new method of irrigation especially for rice is huge.
- Working in collaboration with public scientific and extension institutions: national agriculture research bodies, regional research stations, Krishi vigyan Kendras, and progressive farmers.

- Working with agriculture universities in Tamil Nadu, Punjab, West Bengal and Uttarakhand. Demo plots, field days for farmers and seminars

- Regional rice research stations were keeping drip irrigated rice plots for visiting farmers.
- Work is underway for the last two years with International Institutions; both in the area of rice research and water management.
- Press and media are also brought into the scene to propagate the technology.

ISSUES FOR FURTHER ACTION

1. Identification of rice varieties most suited for Drip irrigated cultivation; varieties with of high WUE (water use efficiency).
2. Enhancement of yield and returns of such varieties. From the experience in other crops, it is fair to say that farmers do not adopt technology for the sake of water or other resource conservation alone. In India, irrigation water is not metered and power is subsidized to a large extend, both of which act as disincentives for conservation.
3. In India, as such the use of herbicides to any crop is very limited. Non-flooding is found to increase weed incidence and the role of herbicide would become critical in drip irrigated rice farming.
4. Drip technology (for host of crops) got a shot in the arm by governmental investment as subsidies to the farmers. The level of conservation of water and power in rice cultivation is enough reason for introducing governmental support in the initial years.
5. Capacity building and training should be given a very high priority; and public agencies can draw support from private partners to make the programs effective and focused.
6. Material science also should progress to eventually produce degradable plastics for drip equipment.