Agronomy, rice production and India's agricultural policy: do knowledge and evidence matter?

Recent changes in Rice Production and Rural Livelihoods: New Insights on the Systems of Rice Intensification as a Socio-Technical Movement in India

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The key messages

- 1. The capacity to demand and access knowledge and evidence is lacking in India's agricultural policy making and administration domain.
- 2. Formal centralized and consolidated S&T is denied the expertise – decentralized location specific ways of knowing and governing rice production.

Rice in Karnataka (2000-01)
(Source: drd.dacnet.in – Table 10)

SL	Productivity Groups	Number of Districts	Area (Million Ha.)	Percent of State's Rice Area	Production in Lakh Tonnes	Percent of State's Rice Production	Productivity (Kg/Ha.)
1.	High Productivity (> 2,500 Kg/Ha)	14	7.86	54.1	23.73	64.9	3,019
2.	Medium Productivity (> 2,000-2,500 Kg/Ha)	5	2.48	17.1	5.73	15.7	2,310
3.	Medium-Low Productivity (> 1,500-2,000 Kg/Ha)	6	3.68	25.4	6.60	18.0	1,793
4.	Low Productivity (1,000-1,500 Kg/Ha)	1	0.39	02.7	0.452	1.2	1,156
5.	Very-Low Productivity (< 1,000 Kg/Ha)	1	0.10	00.7	0.065	0.2	637
	TOTAL	**27**	**14.51**	**100.0%**	**36.58**	**100.0%**	**2,521**

Number of Rice Growing Districts : **27**

KARNATAKA STATE

Source: Drd.dacnet.in (Table 11)

High Productivity Districts (> 2,500 Kg/Ha.)		Medium Productivity Districts (2,000-2,500 Kg/Ha		Medium-Low Productivity Districts (1,500-2,000 Kg/Ha.		Low Productivity Districts (1,000-1,500 Kg/ha.)		Very Low Productivity Districts (< 1,000 Kg/Ha.)	
SLDistrict	Yield	SLDistrict	Yield	SLDistrict	Yield	SLDistrict	Yield	SLDistrict	Yield
1. Koppal	3,462	1. Chikmaglur	2,420	1. Dakshina Kannada	1,979	1. Dharwad	1,156	1. Bidar	637
2. Davangere	3,379	2. Bagalkot	2,353	2. Uttara Kannada	1,798				
3. Bellary	3,247	3. Bijapur	2,351	3. Udupi	1,765				
4. Chamaraj Nagar	3,097	4. Kodagu	2,313	4. Gulbarga	1,750				
5. Mandya	3,052	**5. Shimoga**	**2,278**	5. Haveri	1,748				
6. Mysore	2,993			6. Belgaum	1,679				
7. Raichur	2,851								
8. Bangalore (R)	2,749								
9. Bangalore (U)	2,732								
10. Tumkur	2,722								
11. Kolar	2,715								
12. Gadag	2,545								
13. Chitradurga	2,563								

SHIVAMOGA District:
Table 4: Actual Annual Rainfall from 2001 to 2011(mms)

Sl No	Taluks	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
1	Bhadravathi	**452.6**	676.3	689.6	749.1	774.2	580.2	1293	952.4	1427.4	1193.5	**925.4**
2	Hosanagara	**3157.1**	2387	1983.1	2635	3506.1	3765.6	4847.9	3262.6	4219.6	3149.3	3782.5
3	Sagara	1288.7	1672.9	1579.6	1723.6	2173.1	2141.1	2678	1843.4	2244	2159.6	2062.9
4	Shikaripura	553.1	866.1	699.8	937.6	1056.2	734.9	1195.5	1126.2	1137.4	1208.7	888.5
5	Shimoga	566.2	782	824.7	945.2	1257.4	856.8	1404.6	1066.8	1506	1527	844.6
6	Soraba	406.2	1192.1	1181.1	1221.6	1633.6	1404.6	2018.8	1489	1821.7	1657.3	1500.6
7	Thirthahalli	2351.1	2096	2109.8	2985.2	3283.5	3446.3	3868.8	3052.7	3412.7	3042.5	**3397.2**
	District Average	**1253.6**	**1381.8**	**1295.4**	**1599.6**	**1954.9**	**1847.1**	**2472.4**	**1827.6**	**2252.7**	**1991.1**	**1914.5**

SHIVAMOGA District, Area Under Principal Crops, 2011-12

No	Taluks	Rice(Paddy)	Maize	Ragi	Other Minor Millets	Total Cereals and Minor millets	Total Pulses	Total Foodgrains
1	Bhadravathi	16227	1990	302	0	18522	358	18880
2	Hosanagara	11191	338	0	0	11529	10	11539
3	Sagara	15156	1977	12	0	17145	52	17197
4	Shikaripura	22585	22537	86	0	45371	874	46245
5	Shimoga	19068	12117	578	0	31792	311	32103
6	Soraba	27542	9590	51	0	37244	746	37990
7	Thirthahalli	13721	0	0	0	13721	0	13721
	District Total	**125490**	**48549**	**1029**	**0**	**175324**	**2351**	**177675**

SHIVAMOGA District: Area under Principal Crops in 2008-09

No	Taluks	Rice(Paddy)	Maize	Ragi	Other Minor Millets	Total Cereals and Minor millets	Total Pulses	Total Foodgrains
1	Bhadravathi	15927	2101	683	0	18725	443	19168
2	Hosanagara	11754	132	4	0	11890	7	11897
3	Sagara	15106	1717	4	0	16827	100	16927
4	Shikaripura	21724	20903	170	0	42975	595	43570
5	Shimoga	19271	10356	764	0	30444	517	30961
6	Soraba	28897	7567	96	0	36604	377	36981
7	Thirthahalli	14842	0	0	0	14842	0	14842
	District Total	127521	42776	1723	0	172307	2039	174346

SHIVAMOGA District: Fertilizer use and Irrigation (2011-12)

No	Taluks	**Nitrogen(N tonnes)**	Nitrogen(in Kg)	NIA(in ha.)	NSA(in ha.)	**Kg per ha of NSA**
1	Bhadravathi	3153	3153000	29233	30510	103.34
2	Hosanagara	2773	2773000	7286	18291	151.60
3	Sagara	4378	4378000	13346	25704	170.32
4	Shikaripura	8622	8622000	28641	43672	197.42
5	Shimoga	6477	6477000	26285	40094	161.54
6	Soraba	8375	8375000	26882	45130	185.57
7	Thirthahalli	3084	3084000	11532	24564	125.54
	District Total	**36862**	36862000	**143205**	**227965**	161.70

Some more facts – rice contexts

- Kharif and Summer rice – with a productivity increase of nearly 900 kg/ha in Summer rice
- Green manure use increasing in 3 blocks
- Chemical fertilizer use decreasing in rice and increasing in horticulture/vegetable crops
- Livestock population rapidly declining
- Groundwater -2 blocks are critical -2 semi-critical

Rice production systems – Bhadravati taluk

- Conventional, organic, SRI – in different organizational formats
- Production problems – Terminal drought (2011), Drought (2012), Flooding (2013), Pests/diseases (2013), Soil quality (---), Input prices (2013), Labour constraints, Limited storage, Limited extension, …
- “Decisions have to be made and changed every week…

Research and Administration

- UA&HS, Shimoga (2012) – with 16 research stations – 4 in the district
- KVK, Shimoga
- Departments – Agriculture -raitamitra, Horticulture, Animal Husbandry, Fisheries – VLW last recruited in 1989 – staff constraint
- ATMA, Shimoga – with Dept officers, revised programme (2010)-BTT/BFAC at the Block level
- Soil Health Centre – with micronutrient analysis

Organic Rice /Rainfed Rice

- Dr. Dev Kumar and Dr. Sharanappa C. (UAS, Hebbal) – agronomists
- Dr. Pradeep (UA&HS, Shimoga) -plant breeder
- Practices and non-appropriable knowledge capacities, **vs.** Varieties, inputs, chemicals, markets
- Farmer experimentation – to be encouraged/ discouraged?
- Farmer field schools – routine/dynamic – NGO and community roles

Agronomy

- De-skilling and unlearning
- One mainstream approach
- In ARS, Crop Sciences budget allocations – decline
- Specializations growing out and away from agronomic systems understanding (Prof Perry Holden)
- Disjuncture between food production and agro-ecosystems

Political and Social Shaping of Agronomy

- Changes in the relationship between state and science
- Need for ‘central line of authority and control’
- Consolidation and centralization of S&T
- Maintenance of customer-contractor relationship
- Science and innovation capacities tied to past production investments

Science and Policy – Two approaches

- J. D. Bernal - state and its demands on science for development

- Michael Polanyi – science and its internal demands to nurture the 'Republic of Science'

Modes of knowledge production –

Mode 1 vs Mode 2

OR

Mode 1 and Mode 2

Production investments dominate and S&T is limited

- During 1990-2009 agricultural R&D received less than 0.4 % of the Agrl GDP
- Input subsidies alone – 8-11 % of agricultural GDP
- Input subsidies account for 88 % of the total plan outlay of agriculture, irrigation and rural development (Vaidyanathan, 2010)
- Fertilizer subsidy 2012-13 - Rs. 90,000 crores
- Significant stagnation in incremental response to input use, and growth rates of rice-wheat production (ibid, Bhalla and Singh, 2010)

A Policy /Strategic Framework for R&D

Policy documents ---

- For agriculture (2000) (not yet passed and approved by Government of India)
- For science (1958), technology (1983), S&T (2003)
- For industry – Bombay Plan (1948), IDR Act (1951), Industrial policy resolution (1956) (1964,1969, 1970), Industrial Policy Statement (1973, 1977, 1980, 1991……2004, 2006)

Policy discourse and S&T

(NCAP sponsored study, 2011)

- There are givens - targets

- 4 % growth rate –
- 250 million tonnes of foodgrain -
- Programmes and technologies to achieve this -

- There are limitations –

- 40 % NSA will always remain rainfed
- More than 50 % labour is female
- About 86 % operational holdings – marginal or small- more than 60 % poor and malnourished
- Input costs rising faster than output prices –ICOR making it unwise for farmers to invest

- But the technologies –

- Must reach farmers – through schemes/programmes
- Incentivize –provide subsidies/ price supports/ tariffs /regulations

- - Policy analysis and S&T policy frameworks are obviously redundant….

Centralized S&T – technology generation for Green Revolution

Important Phases	Year	CAGR
Centre		
Pre- consolidation	1960-61 to 1965-66	-1.96
Pre- department (DARE) status	1966-67 to 1974-75	9.53
Centralized Consolidated Expansion phase	1975-76 to 1996-97	7.49
Centralized Consolidated phase	1997-98 to 2009-10	8.15
States		
Pre- Model Act & SAUs	1960-61 to 1969-70	7.69
Pre- NAAC & SAUs+ AICRP Phase	1970-71 to 1989-90	2.41
Centralization phase	1990-91 to 2009-10	4.58

Disenchantment with an incorrigible S&T system?

It is necessary to take a comprehensive view of the functioning of the agricultural research system and make systemic changes in the course of the Eleventh Plan. Thus far, research has tended to focus mostly on increasing the yield potential by more intensive use of water and biochemical inputs. Far too little attention has been given to the long-term environmental impact or on methods and practices for the efficient use of these inputs for sustainable agriculture. These features are widely known but efforts to correct them have not been adequate; at any rate they have not made much of a difference (Government of India, 2008, Vol. 3, pg. 13).

Centralized supply driven S&T for the State's political agenda

- In theories of change, India's agricultural production and S&T – Great Leap (punctuated equilibrium):made a distinct break with the past, bringing (i) a redefinition of the issue (here food security), (ii) new actors, structures and rules, (iii) generated scientific and emotional (political) support for the change or the reframing of the problem.
- The state – accuses S&T of one mainstream agenda – refuses to see the evidence
- The S&T system – with evidence (even if limited), but refuses to challenge the state.

Major S&T-led debates in Indian agriculture today

- GMOs – pros and cons
- Hunger and malnutrition- Zn, Bo, Mn, deficiency
- Chemical fertilizers – subsidies vs complementary soil health investments in biomass/FYM
- Crop production – No-till/SRI/organic vs. conventional
- Pesticides – ban specific formulations/no-pesticide
- Prices – markets vs. state fixed prices
- Food supply – universal PDS vs. targeted BPL distribution
- Ownership - Private vs. public sector vs. community based
- Pollution – payment vs. punitive/preventive action
- Energy – industrial appropriation and substitution
- Gender – no. of women vs. gender relationships

Context – Politically conditioned agricultural science speaking to policy that is pre-determined

Debates…SRI

- Within one knowledge-policy-practice paradigm

Vs.

- Between two paradigms of knowledge-policies and practices

- where *knowledge, policy and practice*, have

(i) different spatial and temporal significance

(ii) different organizational formats and some common institutional arrangements in each agro-ecological space

(iii) different discursive and responsive agronomic systems – practices/technologies