"No problem will be solved with the same level of thinking that created it in the first place"

-Dr Albert Einstein

Innovative experiences in rainfed agriculture

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Agrarian Crisis

32 dists | 16 in Andhra Pradesh | Punjab | Karnataka | Kerala | Maharashtra

- Crisis in agriculture evident
  - Migration
  - Unemployment and underemployment
  - Suicides
- Ecological and economic costs
  - Soils destroyed
  - Groundwater exhausted
  - Diversity lost
  - Increasing costs of cultivation
  - Decreasing returns
- Losing control
  - Seeds, water, land

Net Returns per ha over Investment for Different Crops

Crops	Marginal Farms			Small Farms		
	1991-92	1992-93	1993-94	1991-92	1992-93	1993-94
Paddy	2235	1758	696	3010	2328	1049
Cotton	3862	2757	1407	3962	2962	1637
Chillies	3913	3073	1573	5098	4428	3023
Groundnut	4602	3950	1371	4900	4282	1302

Source: State of Indian Farmer, A Millennium Study, 2004, Min of Agriculture, GOI

Returns per Rupee Investment for Different Crops

Crops	Marginal Farms			Small Farms		
	1991-92	1992-93	1993-94	1991-92	1992-93	1993-94
Paddy	1.51	1.39	1.15	1.66	1.50	1.21
Cotton	1.99	1.68	1.34	1.98	1.71	1.38
Chillies	1.59	1.45	1.23	1.74	1.64	1.43
Groundnut	2.10	1.87	1.28	2.05	1.85	1.24

Source: State of Indian Farmer, A Millennium Study, 2004, Min of Agriculture, GOI

Cotton in Andhra Pradesh

	Bt cotton	Non Bt cotton
Yield (q/acre)	9.49	7.21
Cost of production (Rs/acre)	16975	14507
Cost of kapas (Rs/quintal)	1750	1711
Gross Returns (Rs/acre	16607.5	12336.31
Net incomes (Rs./acre)	-367.5	-2170.69

Source: SOCIO-ECONOMIC IMPACT ASSESSMENT OF BOLLGARD COTTON IN ANDHRA PRADESH, S. Mahendradev and N. Chandra Sekar, Centre for Economics and Social Studies, Hyderabad. Supported by IPE, Osmania Univeristy, July, 2006.

Response to Crisis

- Innovations evolve in response to the crisis people face
  - Old methods, old material and old products
  - Old methods, old material and new products
  - New method, old material and old product
  - Old methods, new materials and new product or use
- Need not be an invention but
  - new ways of understanding-theories, knowledge etc
  - new ways of doing-practices, products etc, and
  - news ways of organizing-partnerships, institutions etc
- More diverse as they happen at different nodes
- Spread is horizontal rather vertical
- Driven mostly by informal institutions and systems

Innovations in sustainable Agriculture

- Strong evidences across the country show that regenerative and resource-conserving technologies and practices can bring both environmental and economic benefits for farmers and communities
  - all have made use of locally adapted resource conserving technologies.
  - in all there has been coordinated action by groups or communities at local level
  - there have been supportive external (or non-local) government and/or non-governmental institutions working in partnership with farmers

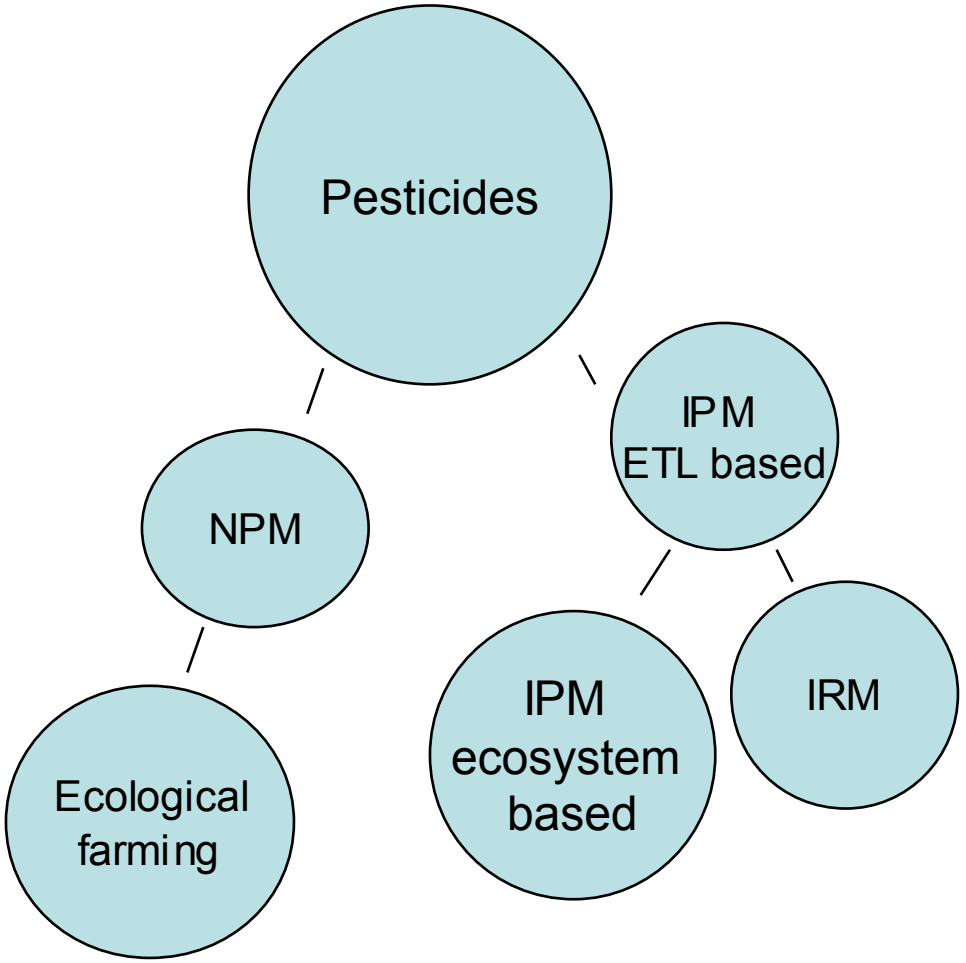
- Community Based Organizations can provide good platform for various innovations to take roots

- Continued dialogue with mainstream system
  - 1994: National Workshop in collaboration with NAARM
  - 1998: National Workshop in collaboration with MANAGE
  - 2007: National Workshop on ‘New Paradigm for Rainfed Farming’

Pesticide crisis

In Manufacturing Usage Residues Ecological, social and Economic costs

- Acute poisoning effects
  - Agriculture workers killed
- Chronic poisoning effects
  - Children growth affected
  - Effect on reproductive health
- Increased costs of cultivations
  - Rs. 1000 to 15000/acre
- Ecological Disturbances
  - Beneficials killed, pest shifts
  - Pest resistances, pest resurgences
- Contamination
  - Soils, Water and air and Food
- pesticide residues
  - Bio accumulation
  - Bio magnification
- Pesticide Resistance



Non Pesticidal Management

CSA SANET MMS 1500 villages 5 lakh acres 2 lakh farmers

- NPM is a ‘System that maintains the insect from reaching damaging stages and damaging proportions by managing healthy crop and managing the population dynamics in the crop ecosystem”.
  - Understanding insect biology and behavior
  - Understanding crop ecosystem
  - Making best use of local resources and natural processes

- A paradigm shift
  - From plant-pest relationship to pest-ecosystem relationship
  - From input centric to knowledge and skill centric model
  - From external inputs to local natural resources
  - From linear learning to an interactive learning

World Bank
D M Place Award 2005
with ICRISAT
a prize money of
$ 1,50,000 US

NPM Economics and yields

Crop	Cost of Plant protection (Rs./acre)		Saving (Rs/acre)
	Conventional	NPM	
Cotton	5000	1000	4000
Chillies	15000	2000	13000
Redgram	1500	300	1200
Groundnut	1500	300	1200
Castor	2000	400	1600
Paddy	2000	225	1775

Source: Data from NPM scalingup program with SERP (2005-06)

Strategy	Genotype	No. of chemical sprays	Cost of cultivation (Rs/acre)	Yield (kg/acre)	Gross returns (Rs/acre)	Net returns (Rs/acre)
NPM	Non Bt	0	6524	889	18036	11512
NPM	Bt	0	6222	888	17469	11247
Control	Non Bt	5.0	6555	835	16500	9945
Control	Bt	3.8	7235	897	17786	10551

Source: Study by CRIDA in WWF project on Sustainable Cotton production, Warangal, 2007

Farmers Field Schools

http://www.farmersfieldschools.net

FAO IRRI Department of Agriculture Many Countries

- Chemical pesticides seriously disrupt the balance of the wet rice ecosystem, in ways which are mostly destructive. Pesticides often induce pest outbreaks by killing beneficial insects/spiders, reducing natural pest control, and resulting in explosive outbreaks of pest species which are either a) resistant to,or b) physically invulnerable to, pesticides

  (Kenmore, 1980).

- Contrary to previous understanding, beneficials typically enter the tropical wet rice ecosystem before pests, and feed on detritivores and other "neutral" insects, e.g., Springtails (*Collembola*) and Midge larvae (*Chironomidae*) already present in the rice paddy. Beneficials are therefore present from the start of the crop season and effective in pest control from an earlier stage than had previously been assumed

  (Settle, et. al., 1996; Wu et. al., 1994)

- Farmers field school based IPM modules across the world show that interactive learning and field-experimentation by groups of farmers on how to experiment and problem-solve independently, and adapt the technologies to their own specific environmental and cultural needs

  (Vasquez-Caicedo et al., 2000)

Community Seed Banks

Several NGOs across the country/world — Dept of Rural Dev. AP

- Seed is unavailable both in quantity and quality
- All the public sector institutions, seed corporations and private companies put together do not supply more than 18 % of the total requirement
- Seed village programs are designed to produce and supply to others
- Operational problems and logistics

Community Seed Banks

- Seed retention than replacement
- Select, use, store and share locally adopted traditional and improved seed
- Catalogue based on farmers choices and observations
- Tools like seed matrix, PVP for decision making
- Networking for sharing
- Support in the form of revolving fund, capacity building

Organic Farming

OFAI TOFM MOFA Jatan Navadanya KVM DRI 11 state govts.

- Inspiring personalities like
  - Subash Palekar, Maharastra
  - Dr. Nammalwar, Tamil Nadu
  - Sundarraman, Tamil Nadu
  - Bhaskar Save, Gujarat
- To solve production problem than market driven
- Universal application than exclusive production models
- Several models
  - Zero budget farming
  - Ecological farming
- A paradigm shift
  - From Plant-Nutrient relationship to Cropping System-Soil Health relationship
  - From external inputs to local resources
  - From chemical fertilizers to biologically derived nutrients
  - Productivity from Crop Yield per unit to total production of a system
  - Monoculture to crop and genetic diversity

Organic Farming

IISR CAZRI ICRISAT TNAU

- Yields increase in rainfed areas, remain stable in large areas where chemicals are optimally used, may decrease in input intensive areas
- Total cost of nutrients returned to soil through silt is substantial and nutrients (N and P) are put back for effective crop production
- Benefit-cost ratio (1:1.17) suggests that desilting operations are not only economically viable but have additional benefits through environmental protection and increased water storage.
- *In situ* biomass production in the form of cover crops can meet nutrient requirements of the crops
- Increased organic matter content in soil improves moisture holding capacity of the soil and effective in drought proofing
- Effectiveness of microbial formulations like *Panchagavya*, *Amruthapani* and *Jeevamrutham*

Decentralised Food Security Model

Deccan Development Society | ADS | Agragaame

- Sanskritisation of crops, practices and food habits
- MSP and Procurement-narrow base few states and few crops
- Paradox of overflowing godowns and starvation
- High costs of handling-subsidies to storage and transport
- Led to shifts in food habits and cropping patterns

Community Grain Banks, APDS

- Production, storage and distribution interlinked
- Subsidy – one-time and not recurring; Subsidy to villagers and not outsiders
- Improved purchasing power (additional employment)
- Nutritional and livelihood security

Social Regulation of Water

- Irrigation centric
- Public support to surface water vs groundwater
- Indiscriminate drilling of wells and over-extraction of groundwater

Social regulations and interventions in the village:

- No new bore wells in the village
- Equitable access to groundwater to all the families through well sharing
- Increasing the groundwater resources by conservation and recharge
- Efficient use of irrigation water by demand-side management
  - Cropping patterns
  - Participatory hydrological monitoring and water budgeting

Collectivizing ground water

Ecological Foot Prints

Each ha of paddy yields	@ 30 bags/acre and 75 kg/bag	5625 kg/ha grain
In terms of rice	70 % milling	3938 kg/ha
Water requirement	2000 mm (2 m) crop water requirement x10000 sq m.	20000 cu m water Which is equal to 5.078 cu.m/kg rice (5078 litres/kg rice)
Each family consuming monthly 30 kg rice		152340 Litres of water per month per family
This is equivalent to		
Each family consumes water directly at around	@ 300 litres/day and for 30 days	9000 litres
Water consumption by way of rice is		**16.93 times higher than the water we consume directly**

Other experiences

- System of Rice Intensification
- Diversity based cropping systems
- Millet based cropping systems
- Innovative use of labor
- Drought adaptation initiatives

Can they be scaled up ?

- The experiences are successful even the absence of public support
- People looking for options
- Community Managed Sustainable Agriculture in AP already in 1500 villages
- Zero Budget farming in more than 10 lakh acres in Maharashtra, Karnataka, AP, Punjab
- Natural Farming in Punjab
- APDS in AP in 9 districts

Learnings

- Ecological farming possible
- Needs new ways of understanding, evaluating and supporting
- Community managed systems
- Strong natural resource management systems

What is needed for scaling up ?

Research

- New knowledge on Crop ecosystem
- Efficacy of locally evolved recipes and formulations
- Economics of ecological benefits
- Newer protocols to validate
- More participatory methods of knowledge and technology generation from linear top down models
- NGOs and as partners in knowledge and technology generation than as passive recipients

Extension

- Knowledge centric than product or information centric
- Farmer field school approaches
- Respecting farmers knowledge and using successful farmers as resource persons
- NGOs and Farmers as equal partners in planning and designing rather than as delivery channels
- Community Managed rather than community paid

How to support

- **Institutional approach**
  - Organising farmers for better decision making and practice
  - Organising labor to deliver inputs and services like pest surveillance, pest management contracts etc

- **Extending Public Support for**
  - research on ecological farming
  - newer partnerships in extension which are community managed rather than community paid
  - using, building and protecting local resources

For more info

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