

# Access not Excess: Novel Ways to Nourish the World

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## Learnings from India

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## Global Trend and Need

The pattern of global consumption is concentrated on a narrow basket - Just three crops provide 50% of the world's food. Narrow genetic base leads to genetic homogeneity and genetic vulnerability.

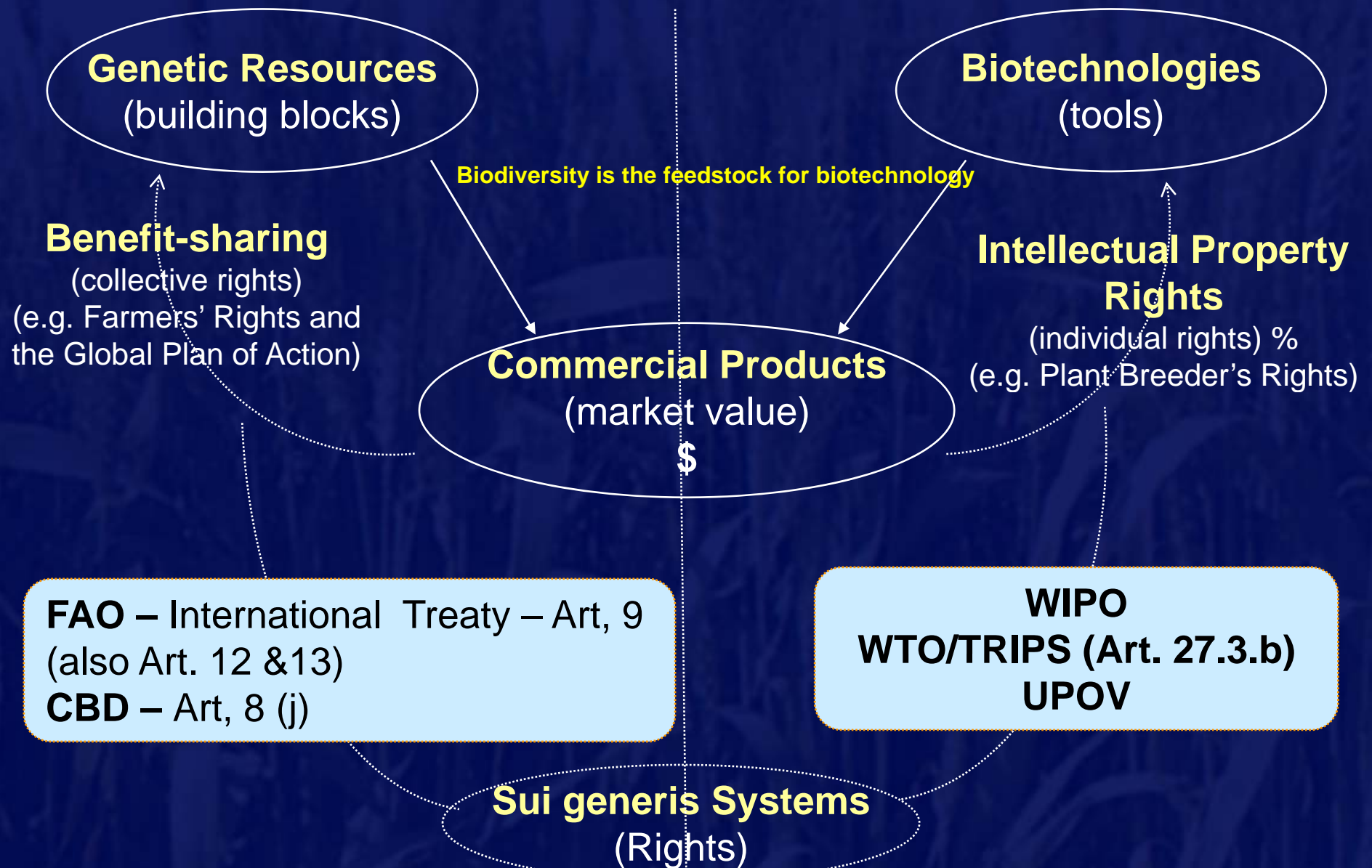
### Global Rice Production and Need

#### The Challenge

- Need : 800 million tonnes in 2025
- Production in 2006 : 585 million tonnes
- Increase in average yield needed to produce the additional rice of 215 million tonnes : 5 t ha to 8.5 t ha.



# Access to Genetic Resources and Biotechnologies for Food and Agriculture



# India, 1968 – The Beginning of Green Revolution and an Era of Optimism



Synergy between Technology, Services and Public Policy  
Green Revolution Symphony



# From Green to an Ever-green Revolution

Challenge Today:  
Advancing Crop  
productivity in perpetuity,  
without ecological and  
social harm

**Indian Agriculture today – at the crossroads,  
on all fronts:** across the board failure of  
support systems, particularly seeds, technical advice,  
credit and market



## Indian Context

India's population is likely to reach 1.5 billion by 2030. There will be no option except to produce more and more from *diminishing per capita arable land* and irrigation water resources and *expanding abiotic and biotic* stresses.

We need to double the food production, from the present 212 million tonnes to 420 million tonnes, within the next 10 years.

This calls for accelerated scientific efforts in the field of enhancing productivity per unit of water, in coastal and inland areas under conditions of both water scarcity and water salinity.



## Causes for Agrarian Crisis

- Our agriculture is at the crossroads economically, environmentally, socially and technologically (falling - growth rate, capital formation, investment in agriculture research)
- Five basic factors are central to the present agrarian crisis:
  - Unfinished agenda in land & asset reform; soil health crisis
  - Lack of adequate and timely institutional credit; insurance
  - Quantity and quality of water
  - Technology fatigue and inadequate efforts in education and extension and consequent drop in factor productivity
  - Lack of opportunities for assured and remunerative marketing
- Areas needing priority attention: Land, Water, Credit, Technology, Services and Market; Most importantly – **Farmers' Income**



## Agrarian Crisis - Issues

- Land degradation and diversion, depletion of soil organic matter and widespread soil micronutrient deficiencies (particularly sulfur, zinc and boron)
- Irrigation Water Crisis: unsustainable exploitation of the Aquifer; inadequate efforts in rainwater harvesting
- Biodiversity – habitat loss and invasive alien species
- **Unfavourable economics** - decline in investment and income and adverse cost-risk-return structure;
- Deficient input supply system
- Genetic, Gender, Digital and Technology Divides
- Adverse impact of monsoon and market – no insurance support
- Lack of access to institutional credit (rate of interest, procedures, missing farmer-friendly approach)
- Inadequate efforts in generating **multiple sources of income** (lack of farming systems approach)



## The Trend and the Need

- Loss of crop diversity – crucial aspect of Biodiversity Crisis
- Need to widen the Food Security Basket to improve food supply
- In terms of crop diversity – cultivating more different kinds of crops
- Nurturing the agro-biodiversity within each crop in terms of cultivating and conserving the land races and indigenous varieties of a crop through *in-situ* on-farm conservation. Participatory Plant Breeding for improved yield
- *In-situ* on farm conservation – provides mechanism for sustaining evolutionary avenues for genetic variability
- Community Food Security System through Field Gene Bank, Community Seed Bank, Village Grain Bank and water management strengthen *in-situ* on farm conservation
- Integrated Farming Systems Approach - Income and Food Security not just productivity
- Use biotechnology to meet strategic needs – abiotic stress (salt/drought/heat resistance, address micronutrient deficiency)



## Opportunities

- Wide gap between potential and actual yields – large untapped production reservoir; address rainfed areas
- Considerable scope for soil health enhancement
- Many agricultural bright spots – Farmers' Field Schools
- Technologies on the horizon – post-harvest technology and value-addition, eco-technology, biotechnology, ICT and space technology
- Expanding national and global trade opportunities
- Expanding group cooperation (on-farm and off-farm) for economies of scale
- Symbiotic Private–Public sector partnerships, including farmer-centric contract farming



## Enhancing Small Farm Productivity Support Services

- As a single step, helping small farmers to enhance productivity per unit of land and water will lead to a considerable reduction in poverty, since they constitute nearly 50% of our population
- Soil health enhancement through concurrent attention to the chemistry (macro- and micronutrients), physics and microbiology of the soils is essential to raise productivity
- Land Use Advisory Service - Revitalize existing soil testing laboratories; national grid of advanced soil testing laboratories; issue every farm family with a **Soil Health Card**; address soil micronutrient deficiency; develop and adopt **Integrated Nutrient Management** procedures



# Reorganise and Retool the Land Use Boards

## Mandate

- **Proactive advice** to farm families on land and water use, based on ecological, meteorological and marketing factors
- Production planning based on likely home and external market demand
- Contingency plans for meeting different patterns of monsoon behaviour
- Early warning on likely supply-demand distortions (serious surpluses and shortages, e.g. the recent onion crisis) based on meteorological factors and agronomic factors - climate change
- Hub and spokes model with feedback linkages between the National Board and State Units



## Convergence and Synergy around a Watershed/Command Area

- Bring about convergence under the umbrella of Panchayats – the lowest level of government; enable horizontal integration of vertically structured programmes;
- Organise a **National Federation of Farm Technology Missions** headed by a farmer-achiever, which can help to bring to the watershed community the benefits of all other relevant Technology Missions like pulses, oilseeds, cotton, horticulture, dairy, etc.
- Thrust on Rainfed Farming Areas
- Have measurable impact indicators



# Watershed Centred Rainbow Revolution



**Generating Synergy and Reducing Transaction Costs**

## Strengthen Land to Lab Linkages

- Equip all existing *Krishi Vigyan Kendras* (Agriculture Science Extension Centres) with facilities for training in post-harvest technology and quality maintenance and convert them into *Krishi and Udyog Vigyan Kendras*.
- Establish **Farm Schools** in the fields of innovative farmers to spread farmer to farmer learning
- Organise Travelling seminars for farm men and women to learn the factors responsible for “**agricultural bright spots**”, with priority to horticulture



## National Research Network for an Ever-green Agricultural Revolution

- Integrated Gene, Pest and Nutrient Management
- Higher factor productivity, with particular reference to water and nutrients
- Precision Farming Techniques
- Bio-organic agriculture combining relevant features of organic farming and biotechnology, including the development of the biological software essential for sustainable agriculture
- Biomass utilization for adding economic value to every part of the biomass, as for example Rice Bio-Park
- Knowledge connectivity through internet-aided rural knowledge centers



## Market Reform & Increasing Global Agricultural Competiveness

- Bottomline has to be assured and remunerative price for farmers
- Market planning should begin with production planning - linkages between State Land Use Boards and State Agricultural Marketing Boards
- Role of Marketing Board - change from regulatory to promotional
- Develop an **Indian Common Market** for agricultural produce
- Food safety, quality and trade literacy movements on Codex *Alimentarius* food safety standards are urgently needed at various levels; strengthen SPS infrastructure
- Barefoot legal literacy on Breeders' and Farmers' Rights
- Biosecurity measures to address increased threat of introduction of new invasive pests, diseases and weeds in the liberalized trade regime; help in preventing pandemics like Avian Flu (H5N1 viral strain)



## Strategy for Food and Nutrition Security

- Large number of children, women and men are under-nourished; 47 per cent children – malnourished; high percentage of Low Birth Weight children; 81 per cent in 6-35 month age group – anaemic
- Nutrition Security involves economic, physical, social and environmental access to balanced diet and safe drinking water
- Management of Nutrition Security:
  - Decentralized Nutrition Security programme under the supervision of Panchayats – awareness; access
  - Community managed Food and Water Banks – store Grain and water everywhere



# Food for All

## Six Point Action Plan for Hunger-free India

- Overcoming chronic and under-nutrition: Reform of Delivery system relating to nutritional safety nets on a life-cycle basis, pregnant women and infants to old and infirm; Horizontal integration of vertically structured programmes. Community Foodgrain Banks
- Eradication of hidden hunger – Food-cum-fortification approaches – multi fortified Salt is a powerful vehicle; promotion of Household and Community Nutrition Gardens; dietary diversification, supplementation, food fortification and community and public health measures;
- Attention to non-food factors – primary education, health care and sanitation

**Contd ...**



# Food for All

## Six Point Action Plan for Hunger-free India

- Improving Purchasing Power : New Deal for the self-employed – paradigm shift from Micro-finance to Livelihood Finance; Rural Non-Farm Livelihood Initiative
- Enhancing the productivity and profitability of small holdings to increase marketable surplus (small and marginal farm families constitute nearly 50% of the consumers)
- Designing and introducing a **National Food Guarantee Act**, combining the features of Food for Work and Employment Guarantee; the intelligent use of food as currency will benefit producers and consumers. Farmers will produce more if consumption goes up



## Semi-Arid Ecosystems: Measures for a Rainbow Revolution in Dry Farming Areas

- Create Pulses and Oilseeds villages (e.g. *Arhar* village, Sesame village); adopt technology packages to improve productivity; **hybrid *Arhar*** (pigeon pea) can be a catalyst for initiating accelerated progress in pulse production.
- Lab to Land: Organize 5000 large-scale demonstrations on both factor oriented and system oriented catalytic interventions, converting scientific know-how into field level do-how
- Integrated Farming Systems Approach
- Add a post harvest technology wing to *Krishi Vigyan Kendras* to prevent spoilage and enhance income.

**Contd ...**



## Arid Ecosystems

- Foster horticulture cum livestock led growth
- Strengthen livestock for livelihood security – fodder, feed, seed, value addition and marketing
- Water Conservation – more crop and income per drop of water
- Land use advice – High value, low water requiring crops
- Irrigation of arid land – *Indira Gandhi Nahar Pariyojana* – Traveling workshop of experts from the Nile, Jordan and Imperial Valleys to develop a sustainable and equitable water management system
- **Heritage Gene Banks** to conserve Livestock Heritage – Suratgarh and other State Farms
- Special attention to the cold deserts of Ladakh and Lahul and Spiti Valley from the point of view of agro-processing and value addition – identify niche products



## Hill Ecosystem

- Hydrological and Water security
- National Research Centre on Glacierology – implications of melting of glaciers as a result of global warming
- Soil Health Care and Biodiversity and ecological security
- Post-harvest technology and value-addition to primary products – promote niche-based high value, income enhancing integrated farming
- Organic Farming
- Promote cultivation of Medicinal and Aromatic Plants and set up Herbal Biovalleys
- Producer-oriented marketing



## Coastal Ecosystem

- 25% of India's population live along the coast – Need for an integrated coastal zone management strategy
- Coastal Systems Research (CSR) for concurrent attention to coastal agriculture, agro-forestry, culture and capture fisheries
- Integrated Sea water farming for coastal area prosperity – sea water as a social resource – pilot projects covering about 50,000 ha in all coastal States to demonstrate conjunctive use of sea and fresh water and forestry and aquaculture for food and livelihood security
- Anticipatory and participatory research to address sea level rise due to climate change
- Conservation and sustainable use of coastal freshwater aquifers
- Medium term strategy for the economic use of the Exclusive Economic Zone (EEZ)



## Livestock and Livelihoods

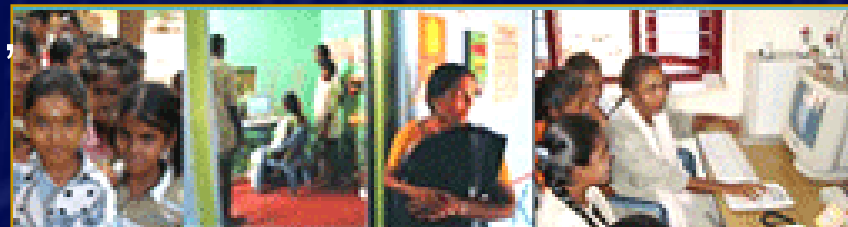
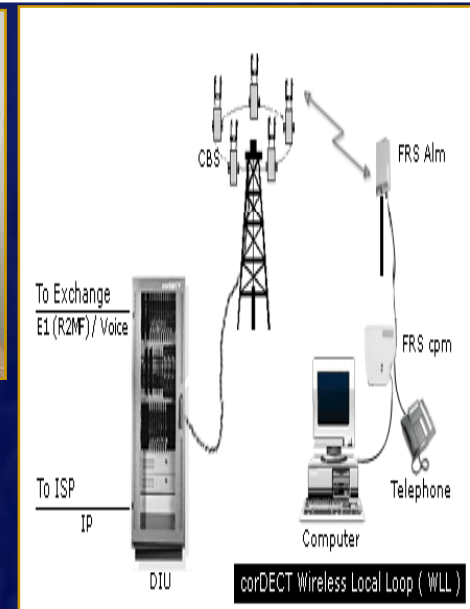
- India is the home for over 20% of the global farm animal population; Ownership of livestock is more egalitarian
- But problem of low productivity and yield – e.g. productivity of our dairy cattle is low, both due to genotype and poor nutritional intake
- Rapid progress in milk production can be achieved through integrated attention to breed improvement, disease management, better nutrition and producer oriented processing and marketing (NDDDB experience)
- **Need for body like Livestock Feed Corporation of India** to provide support to decentralised production of fodder and feed and organise community managed Fodder and Feed Banks
- Promote small farmer poultry estates
- Put proper quarantine and biosecurity measures in place



# Village Knowledge Movement - Every Village a Knowledge Centre

## Harnessing the power of ICT -

- Various models
- Several actors (private, public, academics, civil society.....)
- Demonstration effects have been very positive
- Knowledge empowerment is critical to Livelihoods
- Key: timely, demand driven, need-based information

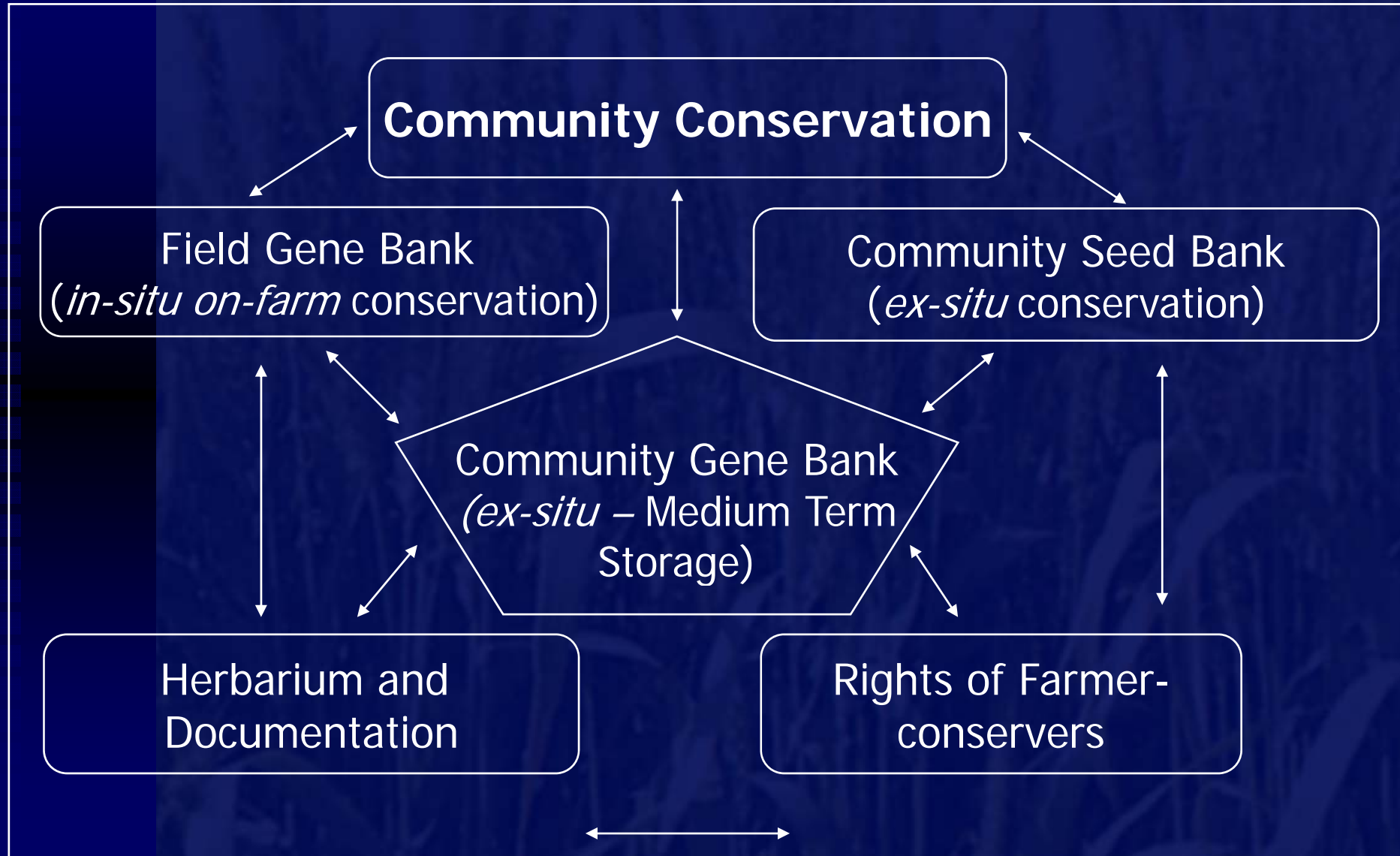


## Work at MSSRF

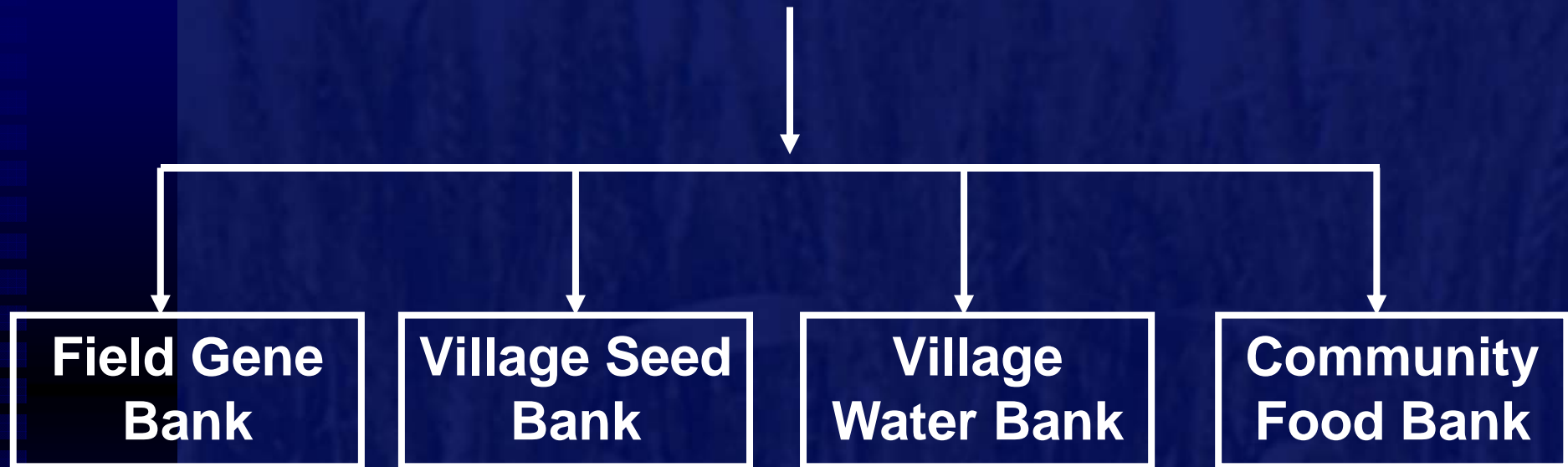
- I. Biodiversity Conservation through Integrated Gene Management, participatory plant breeding research; creating an economic stake in conservation and protection of IPR of primary conservers
- II. Promoting Local Food and Livelihood Security – Biovillage Model of NRM
- III. In the area of coastal resources, analysing genetic diversity and using state of the art technology for genetic characterization and enhancement of coastal bio-resources to promote sustainable livelihoods
- IV. Biotechnology for crop improvement – anticipatory research; bio-prospecting; phyto-remediation; biological software



# Concept of Integrated Gene Management



# COMMUNITY FOOD AND WATER SECURITY SYSTEM



Integrated attention to the Conservation – Cultivation – Consumption – Commerce chain is the cornerstone of sustainable food security



# Strengthen Local Food Security for Better Access

- Aid in quality seed production, strengthening local seed and grain supply systems (Seed and Grain Bank), formal practices of cultivation
- Promote cultivation and utilisation of underutilised crops – minor millets
- Assist in Procurement
- Safe storage
- Harnessing technology to promote local food security



# Enhancing Incomes for Better Access

*Processing*

*Value Addition*



*Marketing*



Thank you...

