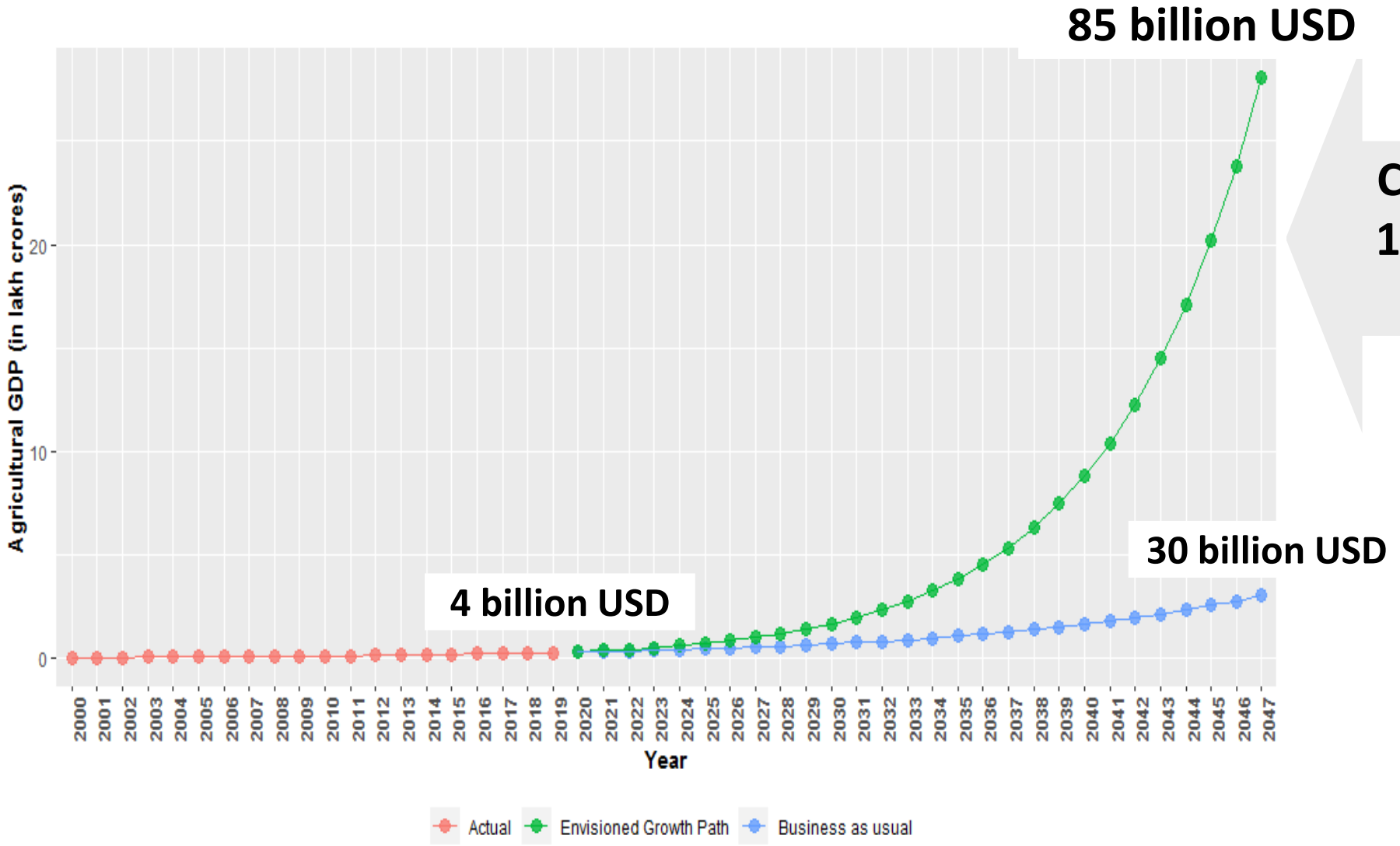
Rethinking Agriculture in J&K:

Towards a Knowledge-based, Technology-driven & Sustainable Agri-economy

Prof Nazir A. Ganai
Vice-Chancellor, SKUAST-Kashmir

Agriculture and the Bio-economy

Make J&K a Model Bio-economy State



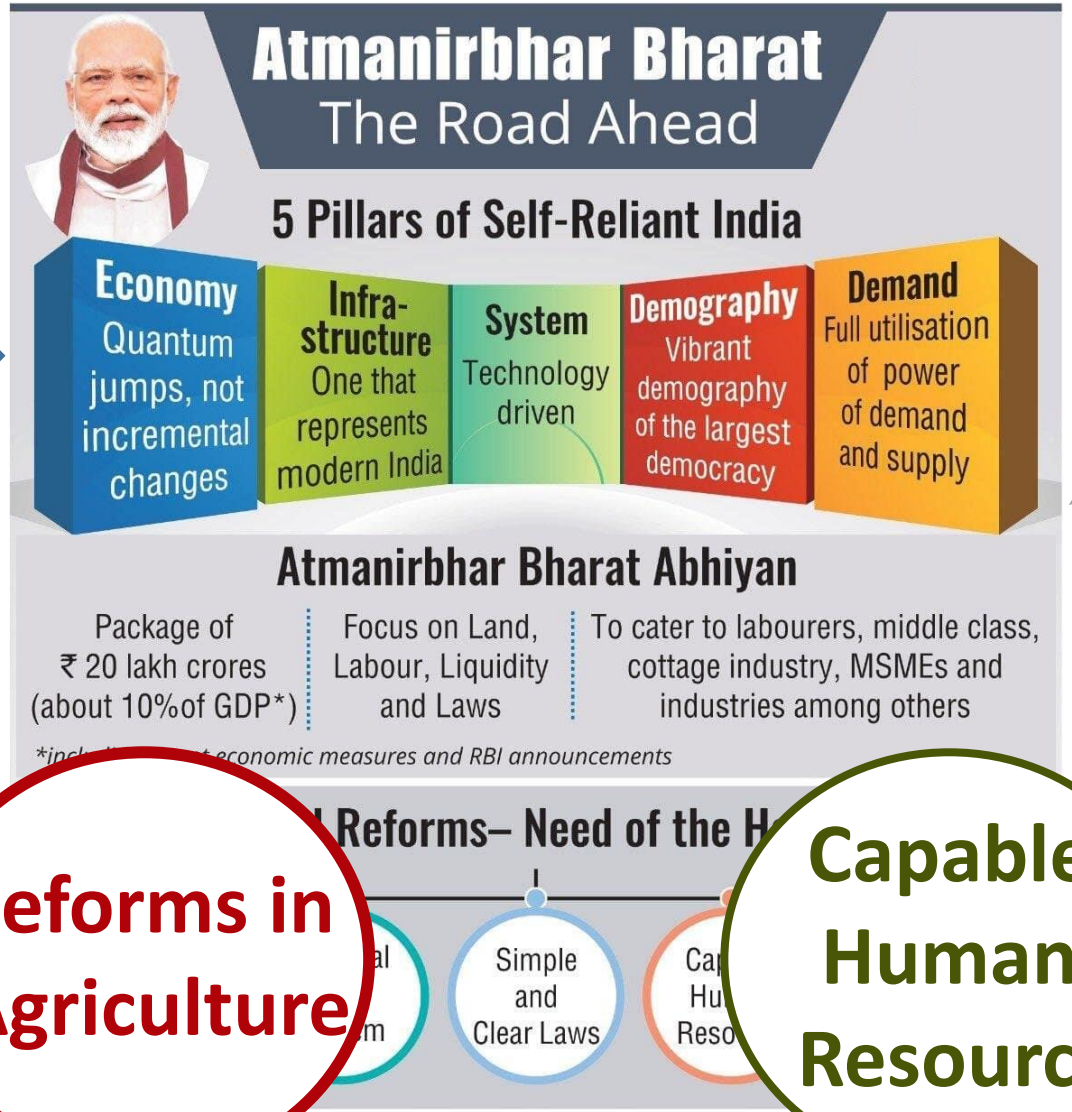
Contribute our Share to 10 Trillion USD National Economy

Atmanirbhar J&K & Atmanirbhar Bharat

From

- **Output:** Rs 10,000 Crore
- **Exports:** Nil
- **Imports:** 2500 Crore

(Livestock husbandry)



Reforms in Agriculture

Capable Human Resource

To

- **Net Exporter of Agricultural Goods and Services**

Join the League of Developed Nations

a. Social Development Indices

- ✓ Food Security
- ✓ Nutritional Security
- ✓ Economic Security
- ✓ Environmental Sustainability
- ✓ Increased Literacy
- ✓ Improved Health
- ✓ Reduced Mortality

b. Human Happiness Index

A need to rethink agriculture!

WHY

J & K- as Contributor to National Goals

- Make J&K a **model bio-economy** state
- Contribute significant share to national economy
- Atmanirbhar J&K & Atmanirbhar Bharat
- Net exporter of Agr. Goods & services
- **Join League of Developed Nations**

a. Social Development Indices

- Food Security
- Nutritional Security
- Economic Security
- Environmental Sustainability
- Increased Literacy
- Improved Health
- Reduced Mortality

b. Human Happiness Index

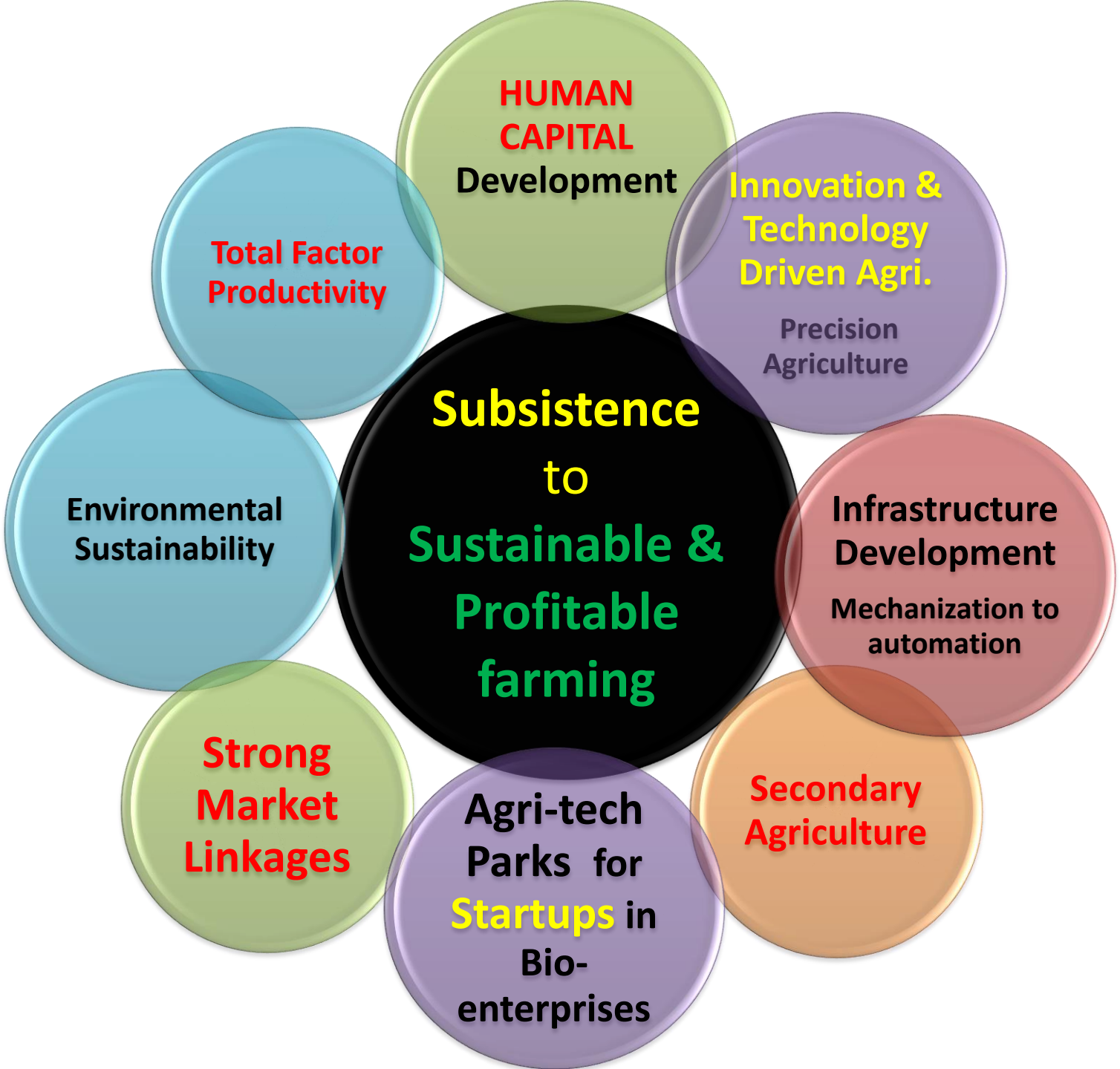
How do We get there?

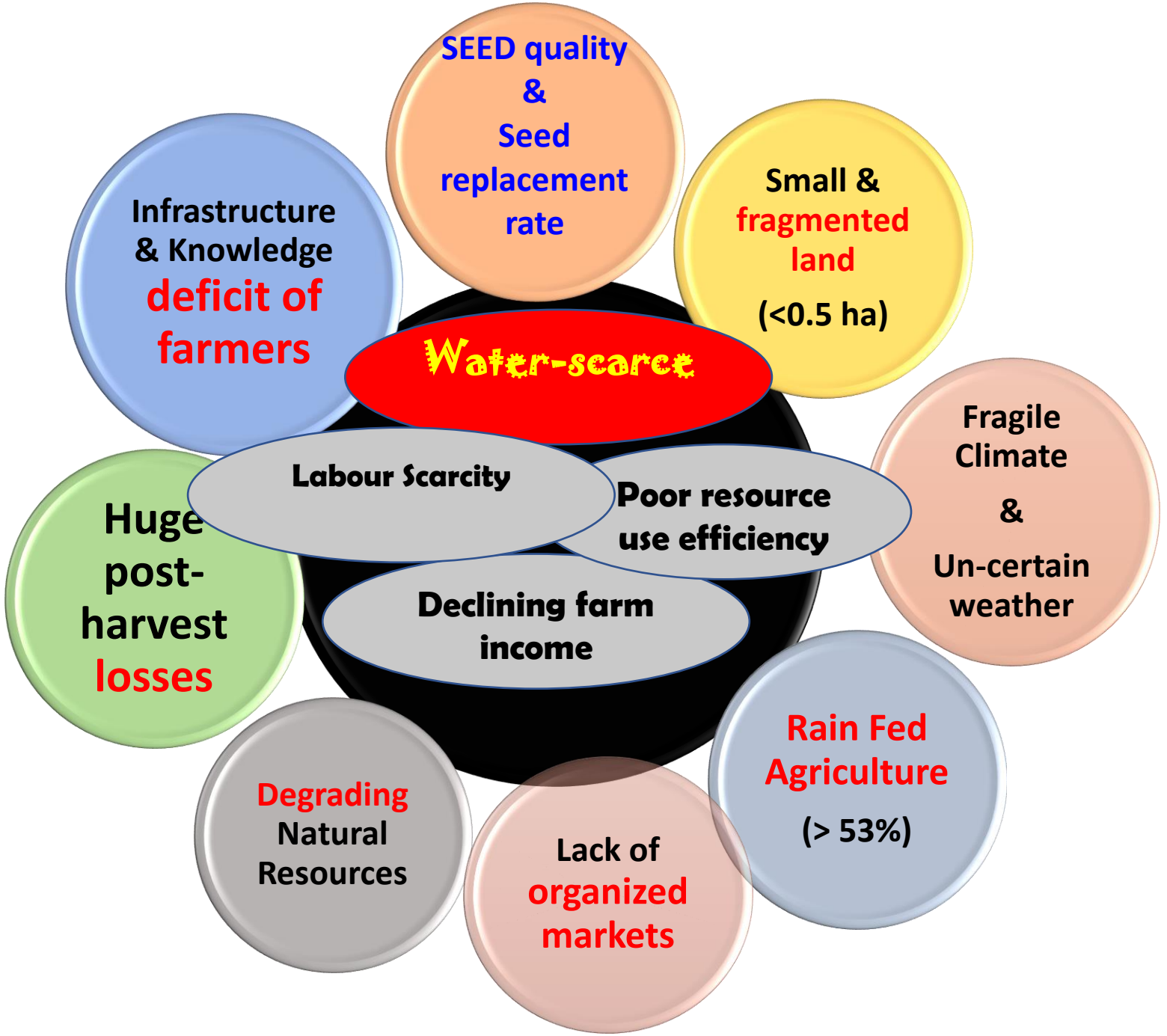
Commercialization & diversification

from **low value to high value crops,**

post–harvest processing and value addition,

quality standards to stand market competition





No fantasy but Compelling reasons

Taking Cue from Israel

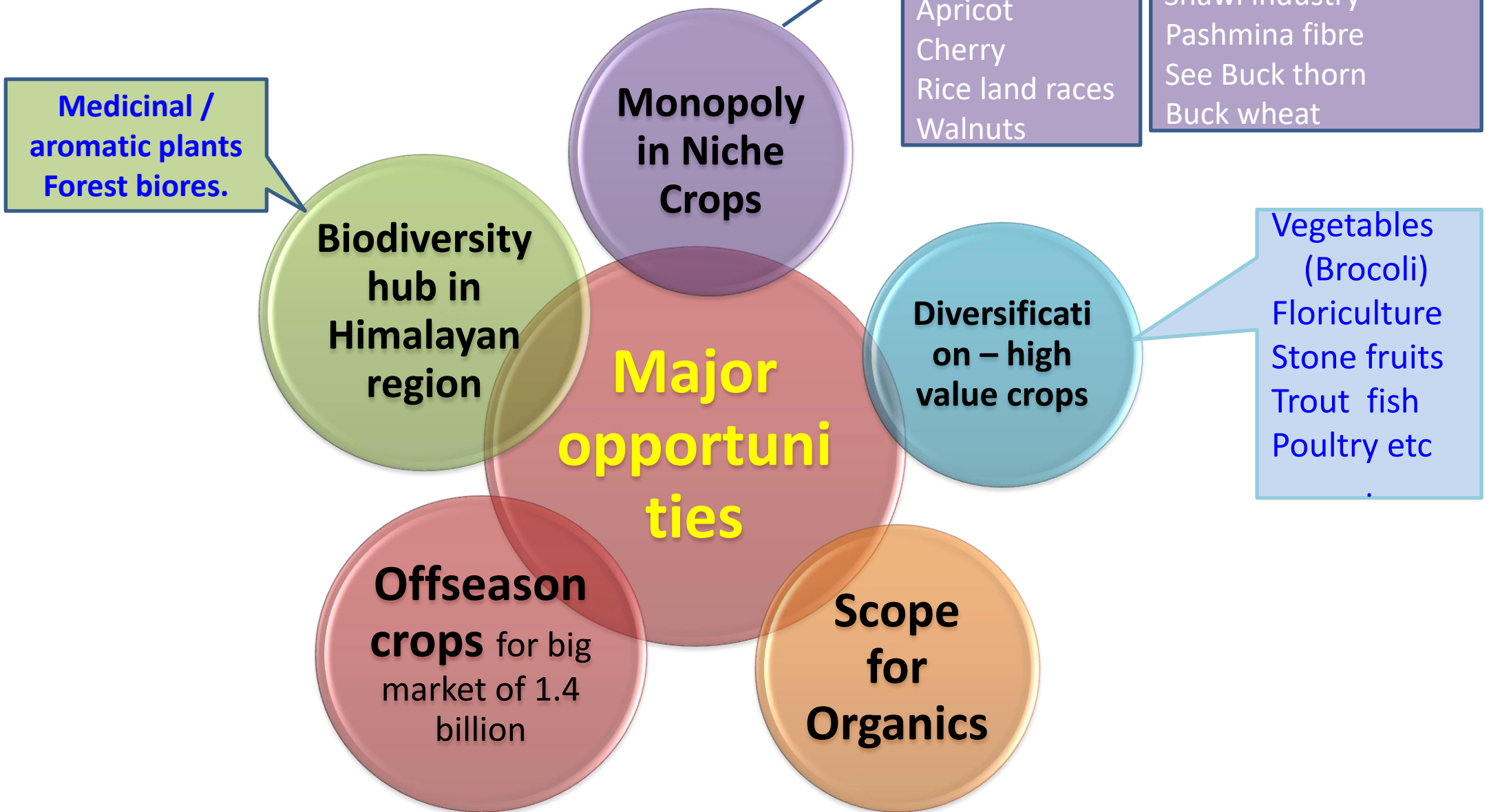
Unfavourable Natural Conditions:

Tropical Arid Desert
Cultivated land 10 lac ha

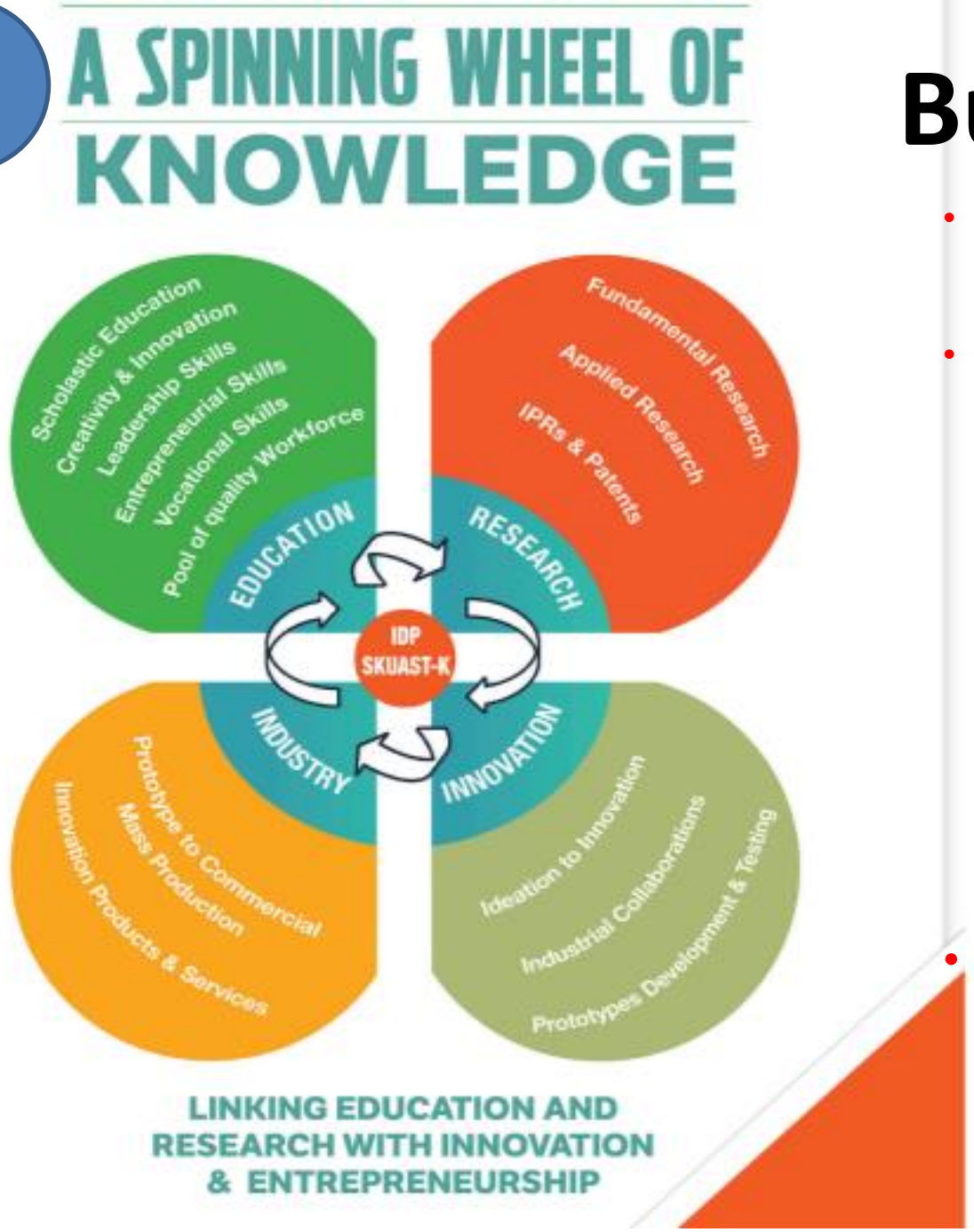
Global leader in agriculture and water management

- *Agri. Growth (1948) – 16 times*
- *Citrus fruits : 262 tons / ha vs 10 ton/ha*
- *Tomatoes : 300 ton /ha vs 25 ton/ha*
- *Milk : 50 lts / cow vs 10 lts/cow*
- *Water –recycle : 95%*
- *Post harvest losses: < 2 % vs 22-30%*
- *Drip irrigation- 95% vs 3%*

Major Opportunities



1



Building Human Capital

- **Niche nationally: Model of Education adopted at National level**
- **Next Moves** :
  - **Next Gen Leaders : (**innovative and entrepreneurial)
  - **Mine Grassroot Innovations**: Rural Exploration by students
  - **Vocational & skill trainings** to rural Youth
  - **Continuous education** and training of field staff.
  - **Agri-Educational Tourism** with students from across country and world
  - **Team with premier international organisations**
- **Requirements**
  - Policy
  - Infrastructure – Housing, Laboratory and classroom
  - New courses
  - Support for innovations and startups

2

Conserving Land

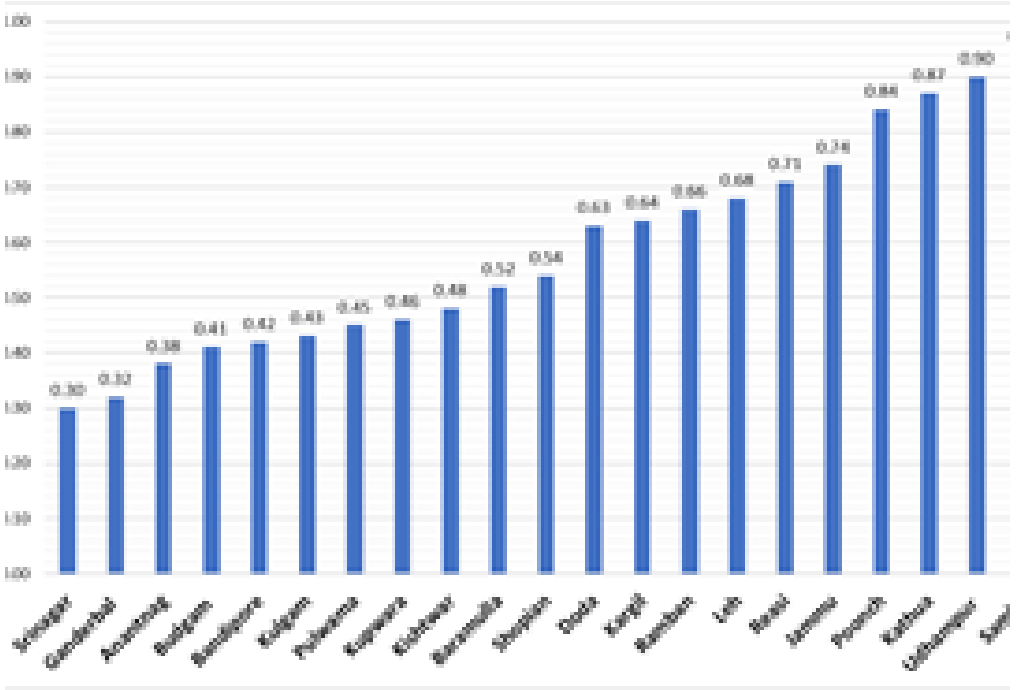
Food Security Scenario Matrix

(Quantity in 000 MT)

Commodity	Region	Production	Requirement (2022)	Deficit / Surplus (2022)	Deficit / Surplus (2047)
Cereals	Jammu	1205	956	26 %	-20%
	Kashmir	478	1225	-61 %	- 80%
	J&K	1683.5	2230	-24 %	- 60%
Pulses	Jammu	5.7	91	-93 %	?
	Kashmir	3.7	117	-96 %	?
	J&K	10.1	213	-95 %	?

Un-economical holdings

(<0.5 ha) 2015-16



3

Conserving Land
Intervention NOW

Land use Planning Policy
(RS-GIS)
Soc & Envi Disas

Regulated Housing Policy

- ❑ New dwellings on Foothills and Karewa lands
- ❑ Vertical growth in housing

Promotion of Secondary Agriculture

KEY to BOOST our Agri-Economy

- Adding value to primary agriculture
- Building agricultural enterprises
- Demand for Processed Foods
- Increase processing from 3% to 25%
- Reduce waste from 30% to 5%
- 3 to 4 fold increase in value
- Job creations

4

Promotion of Secondary Agriculture
REQUIREMENTS

- **Creation of the ecosystem for agri-preunership**
- **Promotion of Food Processing Industry**
- **Promotion of Packaging Industry**
- **Building Agri-Infrastructure**
- **Creating Market Linkages for proceed products**

Upgrading Directorate of HP&M

to

Directorate of Secondary & Commercial Agriculture

5

Building Infrastructure in Agriculture

Storage Parks – Modern silos

Modern silos can **reduce wastage to less than 1%** and reduce desperate sell

Warehouses

Warehouses can reduce wastage to less than 5% and improve PHM

Integrated pack-houses

Drive exports by meeting international standards and quarantine safety

IoT/ Precision farming assets

Promote AI based smart farming solutions – can increase yield by 10% - 20%

Cold chain infrastructure

Cold storages can reduce post-harvest losses to less than 5%

Community farm assets

Mechanization can help reduce costs/acre by ~30%

Refrigerated transportation

Ensure long distance fresh produce transfer; wastage in transportation ~5%

Community drying yards

Yards in every village - Can reduce post-harvest losses by 5% to 10%

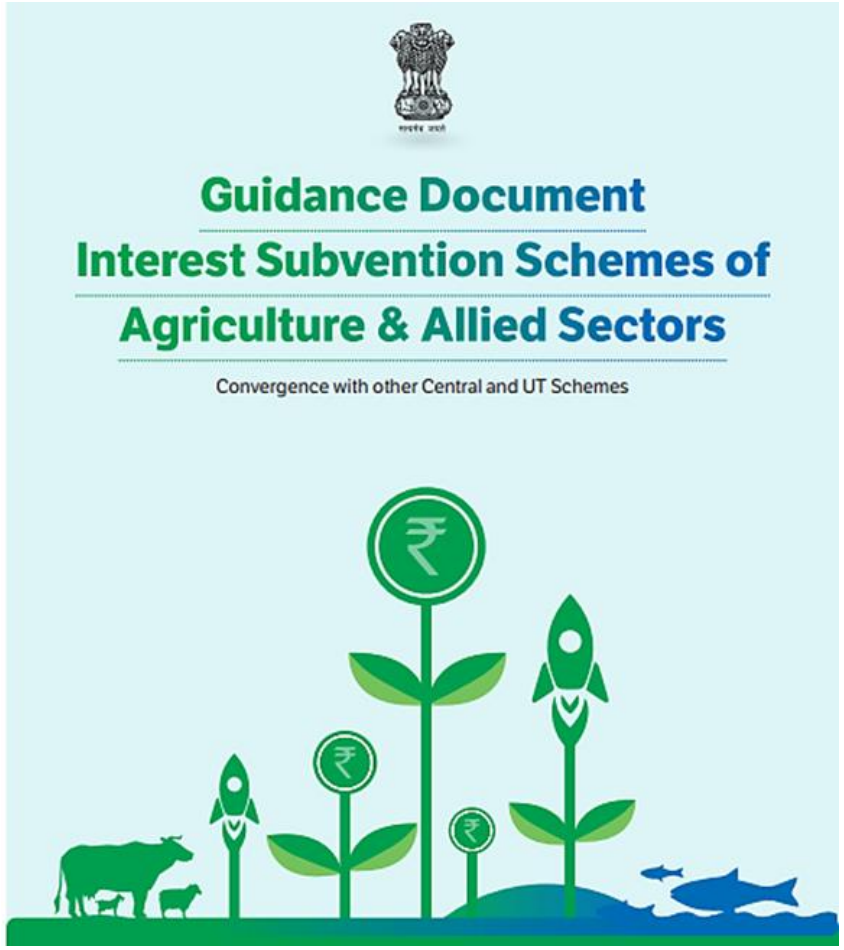
Building Infrastructure in Agriculture

Fund allocation: > 1.5 trillion

Amount Claimed:

Nationally:	23,000 Crores
J & K	< 5 crores

Awareness for Building Infrastructure in Agriculture



Hand-holding

District Level Awareness & Advisory Committees (DLAAC)

Awareness about schemes

Connecting with PDU

Training & Capacity building

Oversee execution of the Projects

Mentoring

Project Development Unit

- Sensitization
- Ready available DPRs
- Customisation of DPRs
- Submission of DPRs

Revamping Agriculture through Smart Technologies

Data Science & Machine Learning in Agriculture
Predict risks at production and post-production stages
Data driven decisions

Precision Farming
Efficient and sustainable use of resources
10 tons /ha to 70 tons/ha

Mechanization & Automation
Smart farming with efficiency & timeliness
Increase efficiency by 70%
Reduce PH losses by 20%

Water Management (IWT Commitments)
Efficient and sustainable use of water
Conserve water by 60%

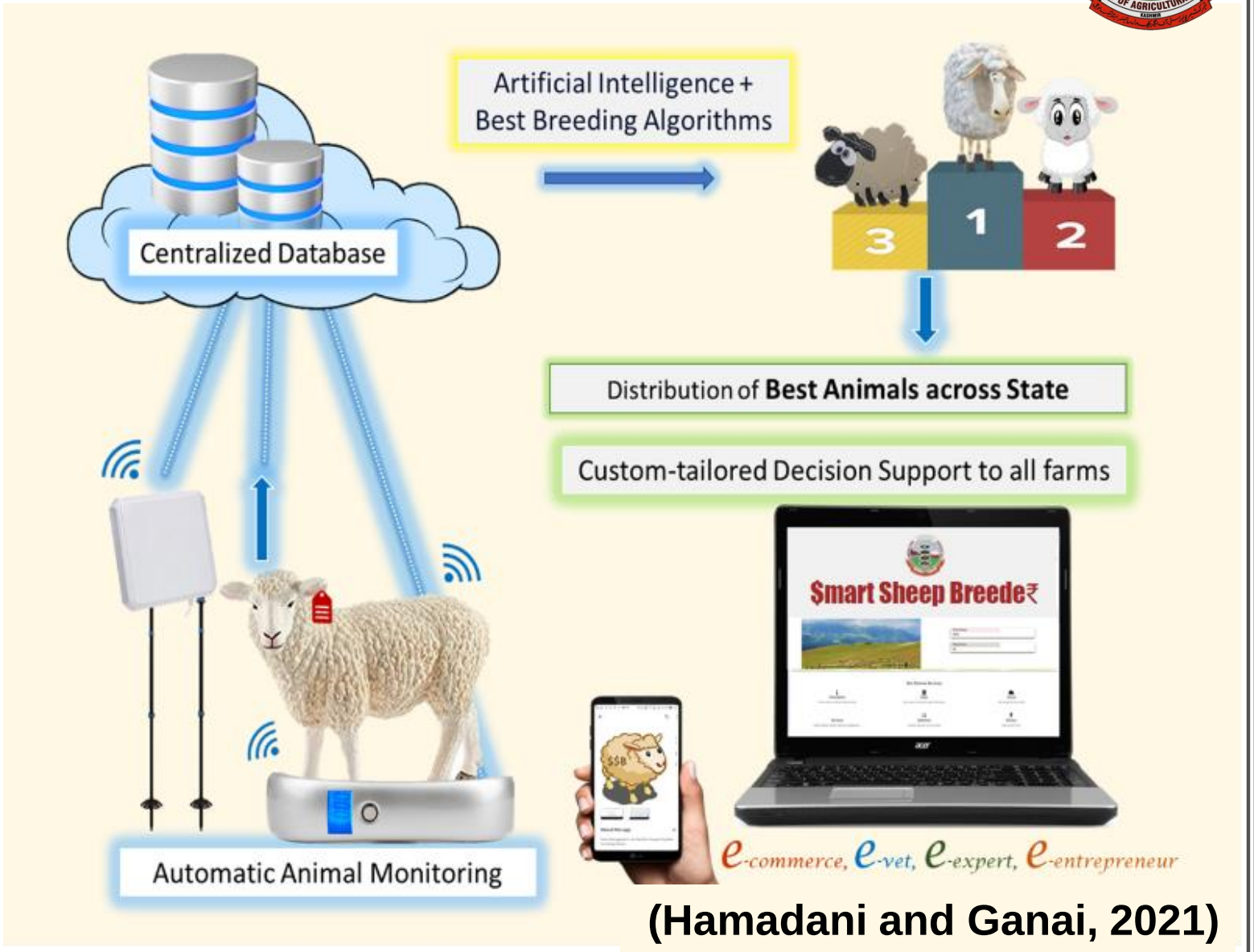
High Tech Protected Cultivation
For improving yield, quality with efficiency at low cost
25 tons / ha to 300 tons/ha

SKUAST-K's Smart Solution

$mart Sheep Breede₹©

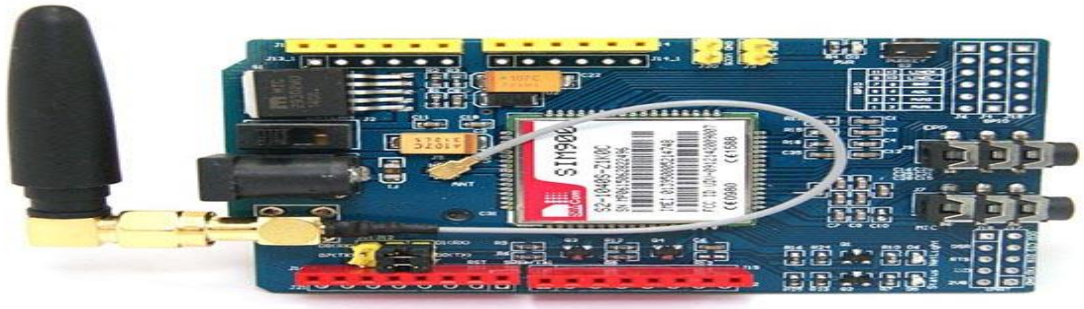
AI and IoT based Decision Support System *(Web & Android App)* for farm automation, real time decision support, e-commerce and more

- ✓ Increases Precision
- ✓ Decreases Labour
- ✓ Increases Production



(Hamadani and Ganai, 2021)

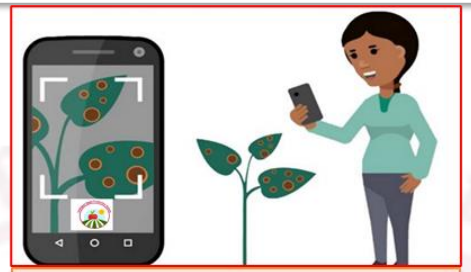
Prototype Smart Irrigation System at SKUAST-K



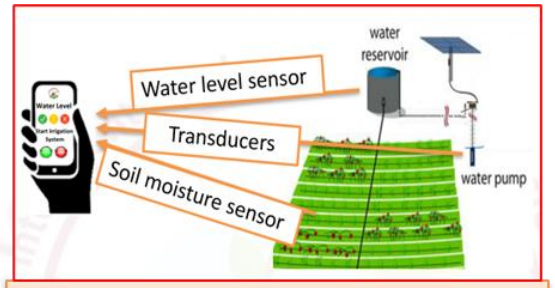
Fabricated model of the micro-controller based system tested in High Density Apple field at SKUAST-K Shalimar Research farm

AppleDoc – SKUASTs First launched Startup Company

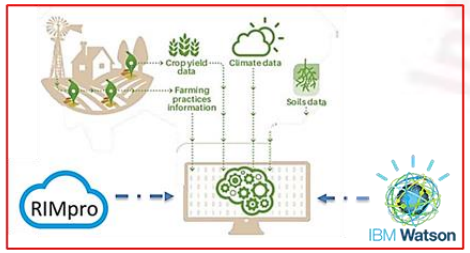
Custom Advisories



Apple Doctor: AI driven



Automated Irrigation Control

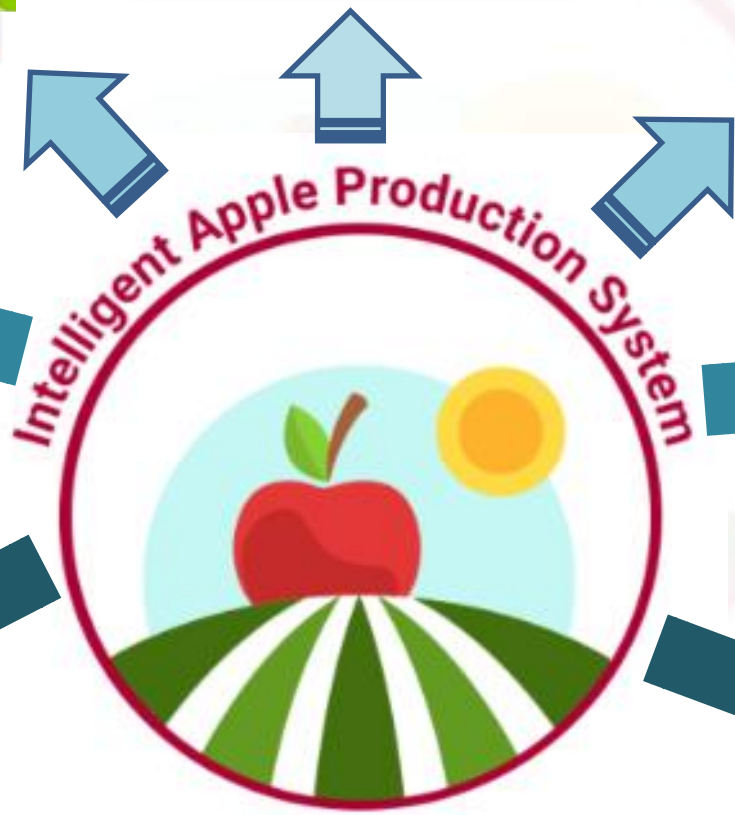


Data Analytics- IBM Watson & RIMPRO Model

E-commerce: B2B, B2G, G2B, B2C

Big Data from 7 lakh orchards

Connect to e-mandis and CA Stores



How to Go about Smart Agriculture:

CoE – Collaboration with ISREAL

Special Policy for promotion of Hi-Tech Agriculture J & K

- A working Group of experts / consultants

Infrastructure Creation

- Special Scheme to support smart agriculture

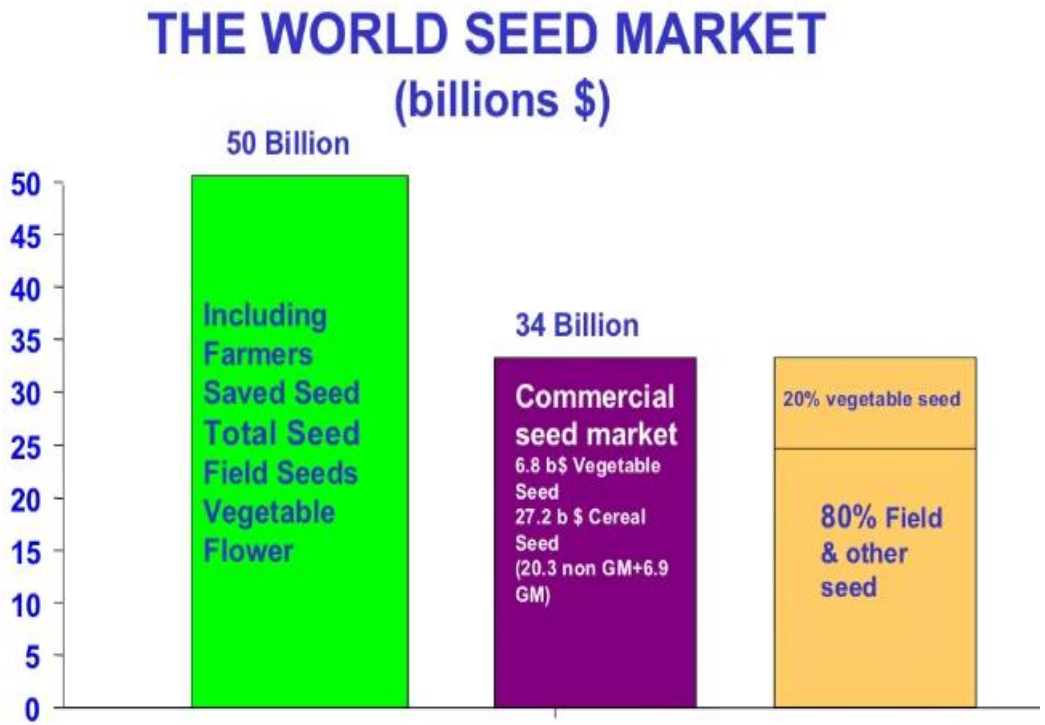
Strengthen Capacity of two farm universities :

- Setting-up of **CoE on AI and ML**

Capacity Building of the Technical Staff of Dev. Deptts / Universities

- Short trainings overseas in Israel / Netherlands

Vegetable and Seed Industry
Low volume - High value



INDIAN SEED INDUSTRY

- Total Seed Industry is worth about 7500-8000 crore
- Cereal industry is worth 6000 crore approximately
- About 1/3 rd is contributed by cotton worth 2000crores
- Rice OP and hybrids contribute about 1000crores
- Millet hybrids contribute 500 Crore
- corn contributes around 800 crore
- Vegetable seed industry is worth 1500 crore

Hydroponic Technologies Standardized by SKUAST-Kashmir for Tomato, Capsicum, Lettuce

S.No	Vegetable Crop	Net Profit (Rs. In lakhs)/ Kanal
1	Tomato Hydroponics	3.85
2	Tomato Open Field	0.39
3	Capsicum Hydroponics	2.88
6	Capsicum Open Field	0.36

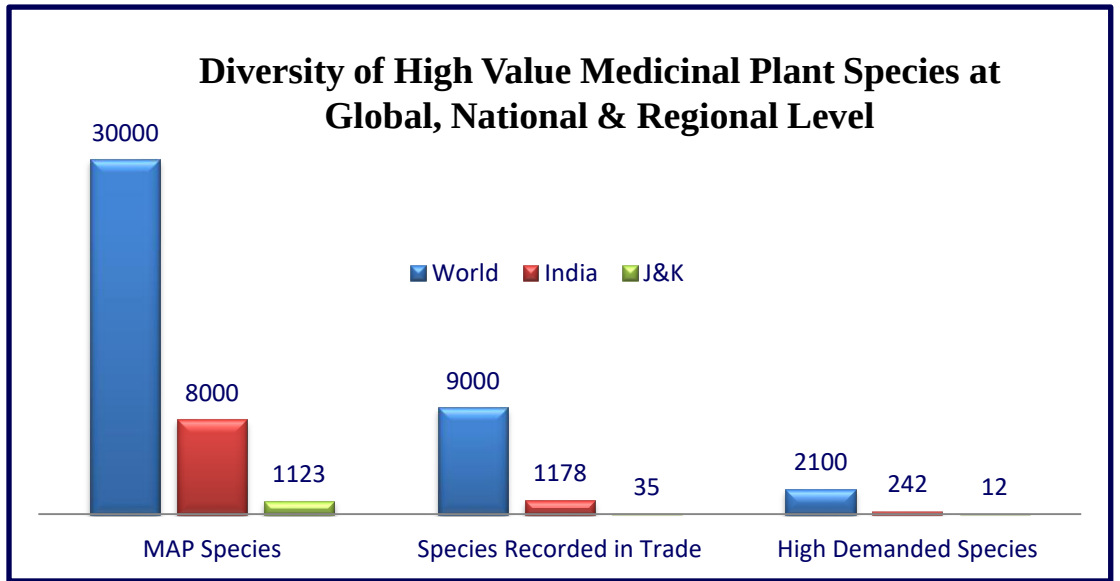
Exotic Vegetables

S.No	Vegetable Crop	Net Profit (Rs.)/ Kanal/Season
1	Cherry Tomato	86,516
2	Lettuce	111,516
3	Sprouting Broccoli	136,516
6	Chinese Cabbage	58,516
4	Asparagus	136,516

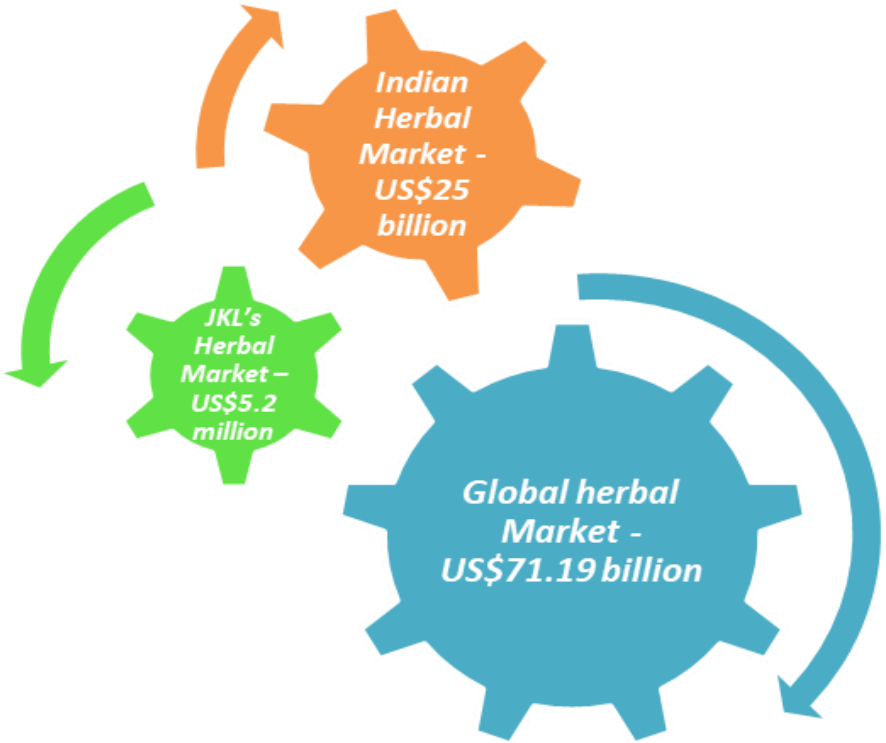
Our Richness in Herbals: Unexplored

- **Global herbal market : $ 71.19** billion

- Global **nutraceutical**, $ **117** billion
- **Cosmoceutical** market: $ **42.4** billion
- **Biopesticide** market : $ **1.3** billion



Share in Market Sectors of Herbal Products (in US$)



Average Market Price of high demanded NTFPs/MAPs Growing Abundantly in JKL

S.No	Species	Part Traded	Av. Price Rs/Kg
1	*Morchella esculenta*	Fruiting body	12000
2	*Acomitum heterophyllum*	Root	7959.32
3	*Viola odorata*	Aerial Part	4825.0
4	*Paris polyphylla*	Root	3475.0
5	*Picrorhiza kurroa*	Root	2141.94
6	*Valeriana wallichii*	Root	566.11
7	*Saussurea costus*	Root	498.82
8	*Inula racemosa*	Root	323.5
9	*Swertia chirayita*	Aerial Part	309.1
10	*Podophyllum hexandrum*	Root	220.0

Source: e-Charak, NMPB, GoI

Key Challenges

Policy

- Lack of Policy
- Unregulated Trade System
- Perceived Ban on Cultivation

Operational

- Ambiguous resource availability.
- Destructive Extraction & Over-exploitation
- Lack of Revolving Funds for Sustenance

Technical & Institutional

- Lack of Institutional Capacities and Management Inputs
- Lack of Skilled Human Resource
- Lack of R&D Infrastructure
- Lack of Marketing Channels & Marketing Information System.

Way Forward

Approach for development of medicinal plants sector

Establishment of **National Institute of Himalayan Herbal Technology (NIHHT)** - to create an institutional mechanism for policy interventions

Bio resource assessment and mapping of medicinal plants

Promotion of commercial cultivation through FPOs/BMCs/JFMCs etc.

Enforcement of law and regulation on existing trade practices

Marketing: Value addition, certification, branding and marketing

Result oriented R&D with focus on chemical characterization and screening of high value drugs

Documentation and preservation of traditional knowledge & biocultural community protocols on medicinal and aromatic plants

Focus Processing & Packaging

What is It?

- Fast growing sector in agriculture (11-24 %)
- Output values at USD 535 billion
- India: 5th largest consumer in world
- Very high employment generation potential

What to DO?

- **Promotion of Food Processing Units:**
  - Capital investment subsidy for new units
  - Incentive for technology upgradation in existing units
  - Lower GST rates on food processing machineries
  - Electrical duty and land related concessions
- **Promotion of Food Packaging Units:**
- **Focus on regional heritage foods**

ORGANIC AREAS

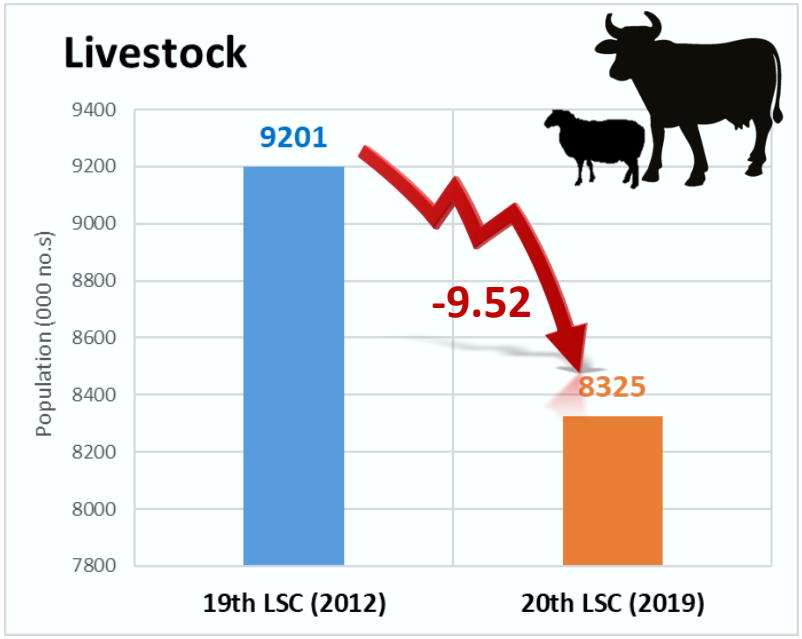
GUREZ	• POTATO, RAJMASH, ZEERA
MACHILL	• WALNUT, RAJMASH, ZAG
BADERWAH	• RAJMASH
PAMPORE	• SAFFRON
HIRPORA	• POTATO
KOKERNAG	• MUSHKBUDJI
BANDIPORA	• TOP ONION

Livestock

Livestock Population Trends (J&K) (000 no's)

Species	19th LSC (2012)	20th LSC (2019)	Trend (% Change)
Cattle	2798.33	2539.24	-9.26 ↓
Buffalo	738.99	690.83	-6.52 ↓
Sheep	3389.49	3247.50	-4.19 ↓
Goat	2017.90	1730.22	-14.26 ↓
Pigs	2.42	1.22	-49.81 ↓
Horses & ponies	144.49	63.34	-56.17 ↓
Mules	36.50	16.72	-54.19 ↓
Donkeys	17.25	9.56	-44.55 ↓
Camel	0.93	0.47	-49.62 ↓
Yak	54.49	26.22	-51.88 ↓

(DAHD, 2019)



Way- Forward
Less number – More productive animals

How : A clue from developed world

	1951	2010
Milk productivity (Per animal)	2000 lts / lac. (6.5 lts/day)	10,500 lts/lact. (34 lts /day)
Cattle population	21 million	9 million

Total value of Livestock Products in J & K

Animal product	Production (2016-17) *	Amount (Rs)	Current Price
Milk	25.56 lac MT	70.68 billion	Rs 30 / kg
Meat	324 lac kg	12.96 billion	Rs 400 / kg
Eggs	123 lac eggs	0.06 billion	Rs 5 / egg
Poultry	230 lac birds	2.3 billion	Rs 100 / bird
Wool / fibre	72.6 lac Kg	0.72 billion	Rs 100 /kg
Pelts/skin	30 .0 lac pelts	0.6 billion	Rs 200 / pelt
Fish	200 lac kg	6.0 billion	Rs 300/ kg
Manure			
Traction power			
Total	**93.32 billion** (= Rs 9332 crores)		

*** Data from Deptt of of animal Husbandry and Dairying, GoI**

Imports of animal products / ingredients in J & K

Animal Product	Qty imported	Amount	Unit Price
Milk	0.87 million Tons	2.7 billion	Rs 30 / kg
Meat	210 lac kg	9.3 billion	Rs 400 / kg
Eggs	6000 lac eggs	3.0 billion	Rs 5 / egg
Poultry	182 lac kgs (40,000 birds/day)	2.19 billion	Rs 120 / bird
Day old chicks	600 lac chicks	3.0 billion	Rs 50 / chick
Compound Feed	3.5 million qts	7.0 billion	Rs 20 / kg
Total Imports		**27 billion**	

Interventions in Dairying

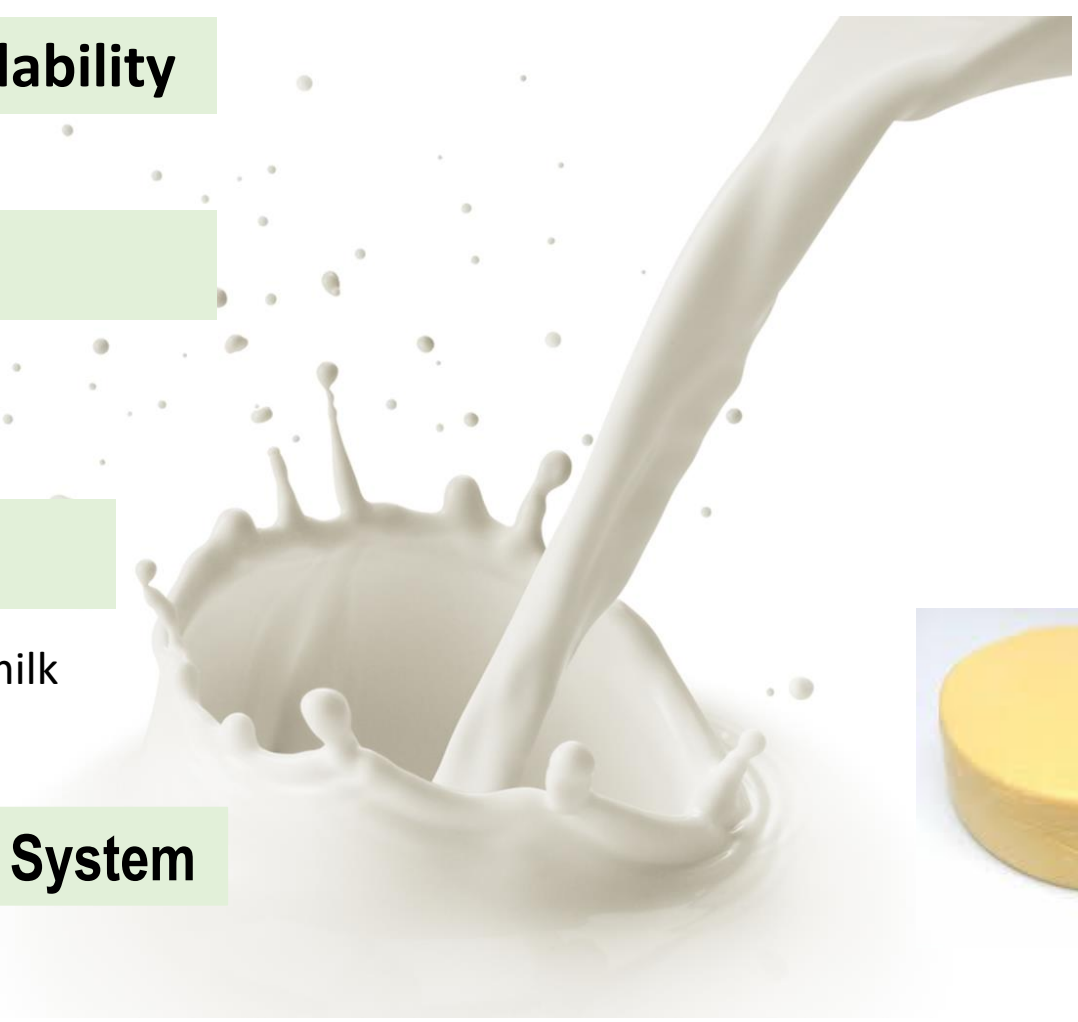
Germplasm improvement and Availability

Promote Processing of Milk

De-regulate the milk pricing

Market forces & quality to determine rates of milk

Strengthen Feed & fodder Production System



Meat & Poultry

Deficiency

Mutton/Chevon = 50%
Chicken = 60%
Eggs = 90%

Annual Imports:

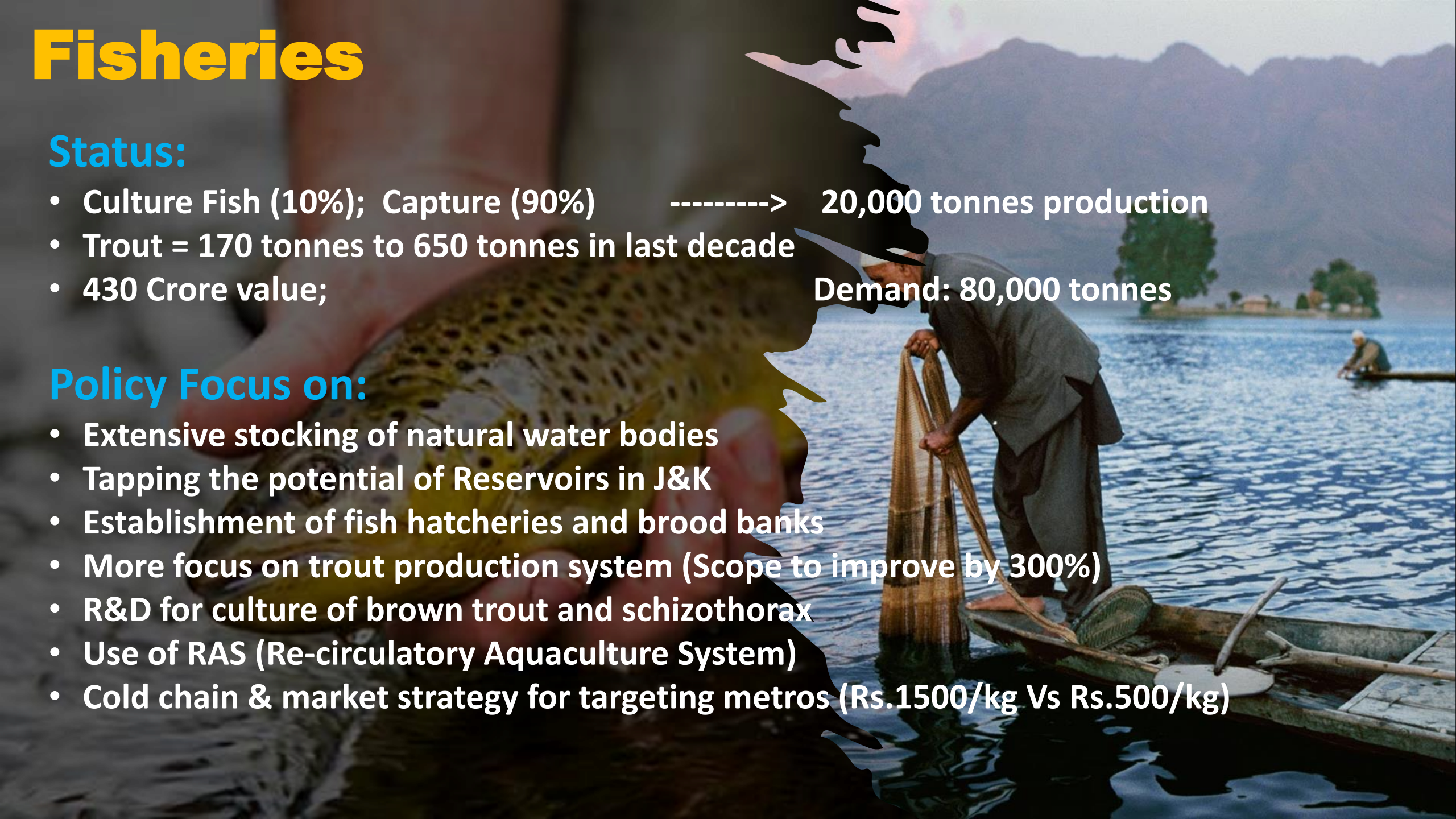
Sheep: 15 lakh
Chicken: 250 lakh Kg
Eggs: 9400 lakh

- Policy to Commercial Sheep Breeders
- Introduction of **mutton** breeds & High Fecundity Breeds like **FINN**
- Accelerated Breeding Programs
- Organized Slaughter houses
- Align **Pastoral Sheep/Goat Husbandry** with Agro-Tourism.
- **Strengthen Feed & fodder Production System**
- **Price De-regulation of livestock products**

Leather Industry??

- **Positives:**
  - 3.5 million of sheep & goat skin
  - Potential to generate 700 crore annual economy to Kashmir region
  - Employment generation of 25,000 in the value chain
  - Will create demand for hides and skin which otherwise goes waste
- **Negatives:**
  - Environmentally not-sustainable
  - One skin Consumes 3000 lts

Fisheries



Status:

- Culture Fish (10%); Capture (90%) ---------> 20,000 tonnes production
- Trout = 170 tonnes to 650 tonnes in last decade
- 430 Crore value; Demand: 80,000 tonnes

Policy Focus on:

- Extensive stocking of natural water bodies
- Tapping the potential of Reservoirs in J&K
- Establishment of fish hatcheries and brood banks
- More focus on trout production system (Scope to improve by 300%)
- R&D for culture of brown trout and schizothorax
- Use of RAS (Re-circulatory Aquaculture System)
- Cold chain & market strategy for targeting metros (Rs.1500/kg Vs Rs.500/kg)

Unraveling the Potential of Horticulture Crops




S. No	Fruit Crop	Area (Lakh ha)	Production (Lakh MT)	Productivity (MT/ha)	World's best Pty (Mt/ha)	Output Value Economy (Crore Rs.)	Potential (In Crore Rs.)	Value factor times to increase potential
1	Apple	1.68	24.19	14.39	70.00	10,000	55,000	5-6 times
2	Pear	0.14	0.86	6.14	37.00	400	3000	7-times
3	Apricot	0.06	0.21	3.5	21.00	100	600	6-times
4	Cherry	0.03	0.12	4.0	10.00	75	500	6-7 times
5	Mango	0.13	0.30	2.31	-----	--		---
6	Walnut	0.85	2.80	3.30	25.00	5000	15,000	3- times
7	Almond	0.06	0.11	1.83	5.00	450	3000	7 -times
8	Saffron	0.03	13.00	3.5 kg/ha	-	360	600	2 - times
						16,385	**77,700**	**4.75 times**




Interventions in Horticulture

Minimize Chemical Use

- More thrust on scientific spray schedule
- Use of efficient sprayers
- Develop disease resistant varieties
- Use of bio-control agents

Polinizers & Pollination Management

- Decline in natural pollinators ------- Deficit Pollination
- 1700 Crore loss in apple alone
- Developing migratory routes and Pollinator Gardens
- Restriction & regulation of harmful pesticides

Cold Chain Facility

- Creation of more CA store facility near production hubs
- Grading & Pack Line Facilities
- Reefer Vans
- Value addition & employment generation

Processing & Value addition

- From 3% to 25%
- Converting mandies into value chain parks (making them viable year round)
- Processed Fruit Product Diversification

Breeding for climate resilient quality varieties

- R&D interventions

Policy Strategy for FPOs

- Formation of FPOs for niche areas and niche commodities
- Technical, legal and policy support
- Huge relevance with smallholders
- Collectivities in backward and forward linkages
- Branding and Marketing of niche produce
- Better Terms of Trade
- Opportunities for Contract Farming
- FPOs in J&K will address major issues regarding application of technology, value chains, branding & marketing

Think Tank Institute for Agricultural Policy Planning

Need of the Centre

- Think tank policy centre for agricultural policy & planning in J&K
- Imperative for devising better strategies and pathways for sustainable growth & development of agriculture & allied sectors in J&K

Vision

- Policy Science for Development, Equity & Gender in Agriculture

Mandate

- Resource use efficiency & true cost of cultivation for better agricultural policy & planning
- **Optimal use of resources in sustainable & cost effective manner**
- **Price forecasting of important commercial crops for better price realization to producers**

Likely **Impact**

- Better dividends from scientific policy inputs
- Improved outcome in terms of growth & development out of scarce resources
- **Overall Welfare Implications to Economy, Society & Environment**

Policy Recommendation

Issue	Policy Recommendation
Shrinking Land for agriculture, & its improper use	• Policy for **proper land use planning** for efficient use of land resources, as well as for social and environmental outcomes. • A **regulated Housing Policy** – to spare the agriculture land and water bodies
Seed Quality and Seed Replacement rate	• Development of high quality and **climate resilient varieties** of seeds • Strategy for **seed multiplication through PPP** mode and incentivisation
Secondary Agriculture	• Policy for Promotion of **Secondary Agriculture** in J K • Upgrading the Dir.of HPM as **Dir. of Secondary and Commercial Agriculture**
Agri Infrastructure Development	• Establishment of **Dist Level Awarness and Advisory Committees** (DLAAC) at KVKs • Establishment of the **Project Development Cells** at 2 farm universities
Developing Agri-entrepreunership	• Policy strategy for developing **Agri-Entrepreneurial Ecosystem** • Establishment of **" Innovation, Incubation and Entrepreunership Centers** in Hub-Spoke Model" in 2 farm universities • **2 Agri-Tech StartUp Parks**

Issue	Policy Recommendation
Digital / Hi-Tech Agriculture	• Policy on Promotion of **Hi-Tech Protected Cultivation (Veg / Flowers)**, **Hydroponics** for livestock fodder • Policy on Promotion of the **Precision / Digital Agriculture** • Setting up of **CoE on AI & ML** in 2 Farm Universities • **Short Term overseas Training** of the Technical persons of the Development Deptts / Farm Universities in Hi-Tech Agriculture
FPO and Cooperatives	• Policy on **Promotion of FPOs and Cooperatives** in J K
Human Capacity Development	• Policy for 2 **Farm universities to go international** • Policy for **Continuous Learning for Field functionaries** • **Vocational Training** for rural youth • System to Mine **Grassroot Innovations by students**

Issue	Policy Recommendation
Organic agriculture	• Policy on **organic farming and certification** and **declaration of Gurez as organic**
Medicinal & Aromatic plants	• Establishment **of Institute of Himalyan Herbal Technology**
Food Processing	• **Food Processing Policy** to support and incentivize the Food Processing Startups
Livestock & Fish	• Policy for **Feed and Fodder Development** in JK • Genetic Improvement of Cattle **through better A I coverage** • Use of **Sexed Semen** in Cattle • Policy for promotion of Milk Processing and Product Development in Private through FPOs and Cooperatives • Policy strategy for large scale **culture of the Trout Fish** to catch national market. • Policy for promotion of **Commercial Sheep Breeders**

Issue	Policy Recommendation
Horti-sector	• Policy for promotion **of Horti-nurseries in Private Sector**. • **Pollination Management** Policy for Sustainable crop production ecosystems • Policy on reducing the **pesticide load** • Policy **on diversification** of Horticulture • Development of own varieties of Horti-Crops for international trade • Improvement of the **Ambri apple as the next commercial fruit** for upper class society
Sericulture	• Policy on Revival of Sericulture
Floriculture	• Policy on Promotion of **Commercial Floriculture**
Policy Planning in Agriculture	• Establishment of **Center for Policy Planning in Agriculture**
Working Groups	• Constitution of different **Working Groups** **to formulate the policies** in next 4 months for detailing the Policies. Schemes, Guidelines, Financial implications, outcomes and Impact


thank
you