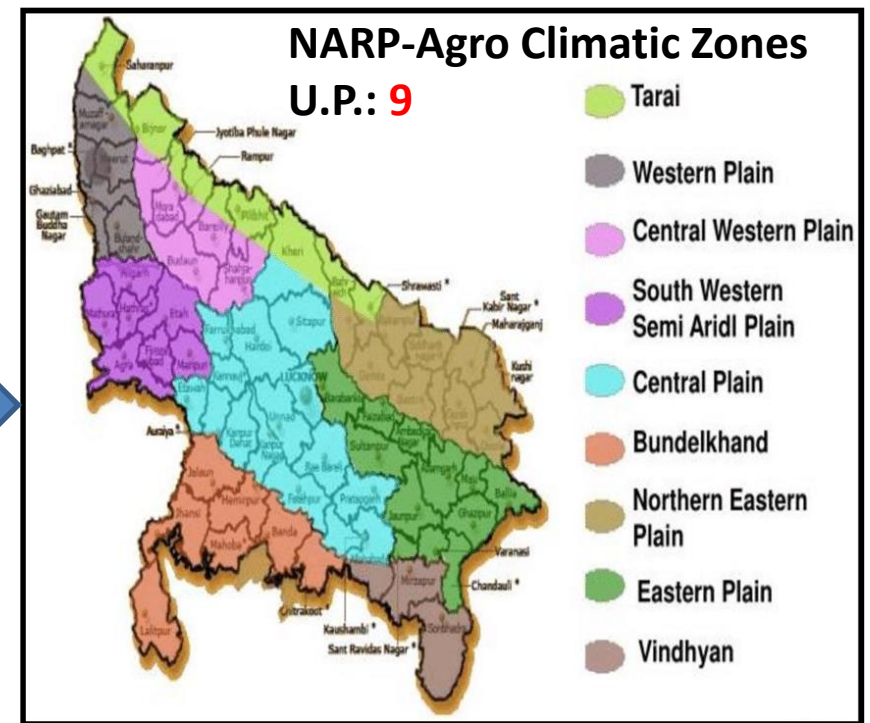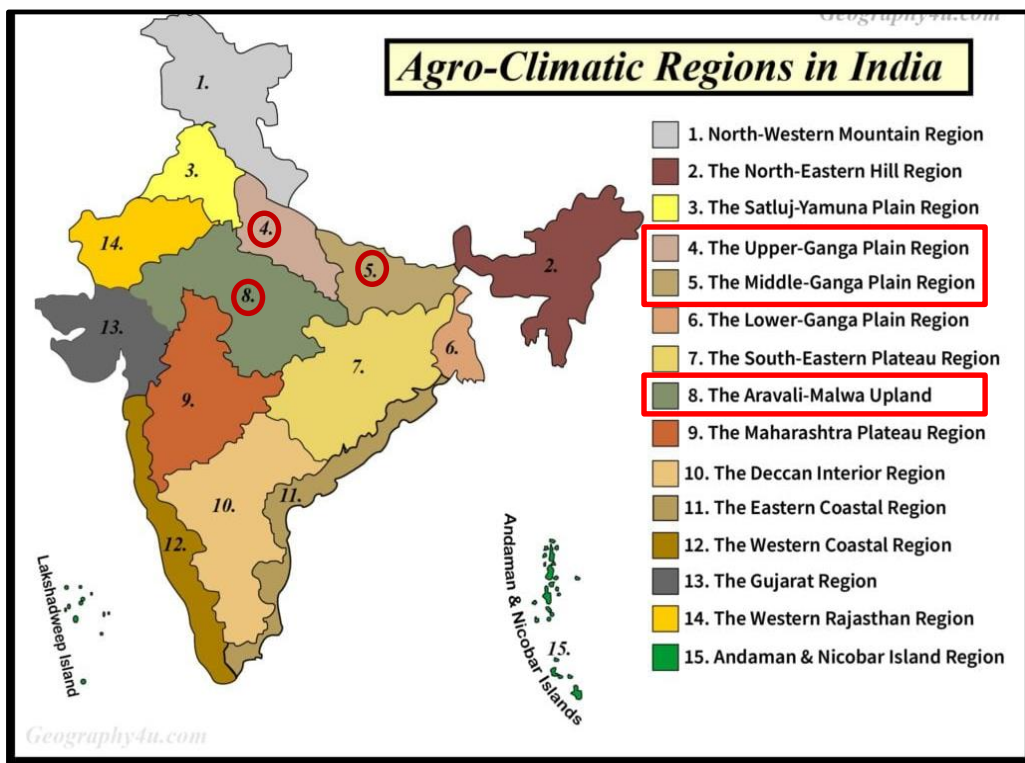**Quantification and Valuation of Ecosystem Services under Organic and agro-forestry production systems**
Uttar Pradesh, India

EU & UNEP Webinar
4 August 2021, 15.00 -17.15 hrs (IST)

ICAR-Indian Institute of Farming Systems Research

Modipuram, Meerut-250 110, Uttar Pradesh

Agro-Climatic Regions in India

1. North-Western Mountain Region
2. The North-Eastern Hill Region
3. The Satluj-Yamuna Plain Region
4. The Upper-Ganga Plain Region
5. The Middle-Ganga Plain Region
6. The Lower-Ganga Plain Region
7. The South-Eastern Plateau Region
8. The Aravali-Malwa Upland
9. The Maharashtra Plateau Region
10. The Deccan Interior Region
11. The Eastern Coastal Region
12. The Western Coastal Region
13. The Gujarat Region
14. The Western Rajasthan Region
15. Andaman & Nicobar Island Region

NARP-Agro Climatic Zones
U.P.: 9

- Tarai
- Western Plain
- Central Western Plain
- South Western Semi Aridl Plain
- Central Plain
- Bundelkhand
- Northern Eastern Plain
- Eastern Plain
- Vindhyan

Geographical coordinates of state

Latitudes	23°52 to 31°28'N
Longitudes	77°3' to 84°39'E
Altitudes	300 meters (NW) 6o meters (E)

Special features of state

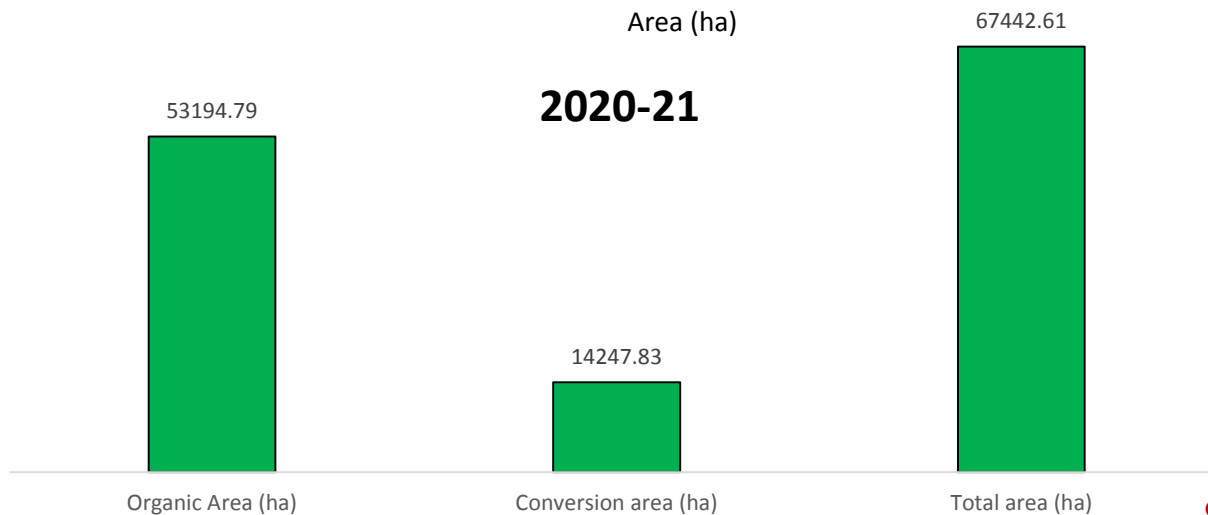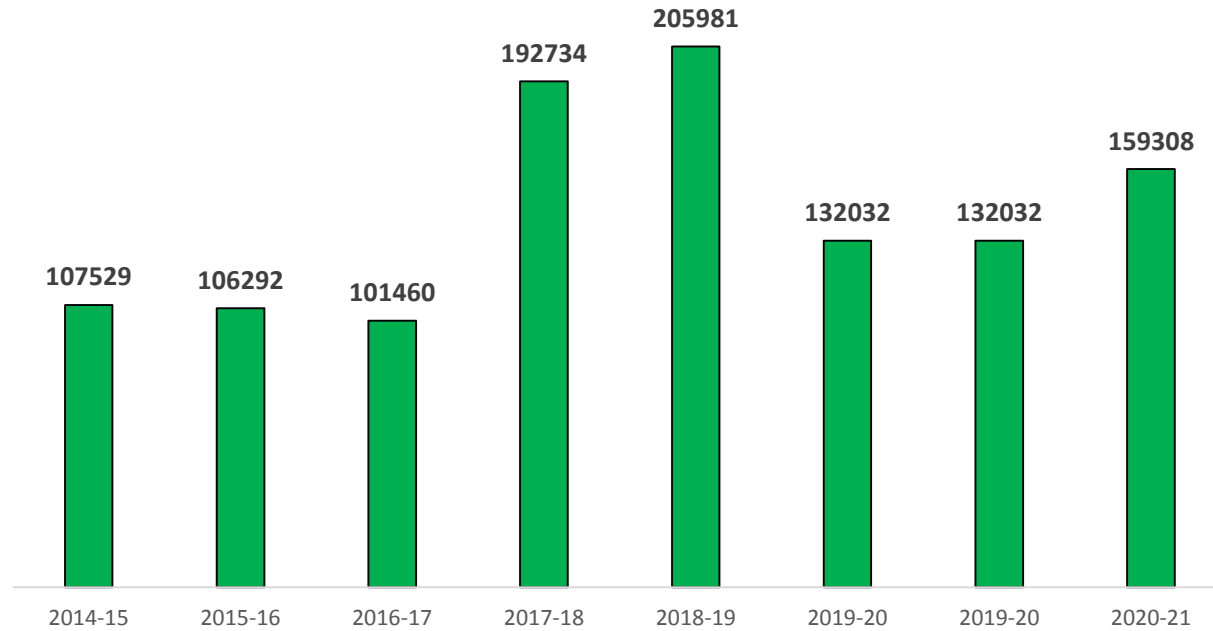|	
Population	199.8 million (16 %)
Male	104.5 million
Female	95.3 million
Agro climatic zones	3 (Planning Commission), 9 (NARP)
Total geographical area (m ha)	29.44 (9 %)
Total cultivated area (m ha)	24.17
Net cultivated area (m ha)	16.57 (12 %)
Forest area (m ha)	1.65

Importance of the state for India in food and agriculture

Particulars	Area (m ha)	Share (% of All India)	Production (m t)	Share (% of All India)	Productivity (t/ha)	
					Uttar Pradesh	India
Rice	5.81	13.28	13.27	11.75	2.28	2.58
Wheat	9.75	32.98	31.88	31.98	3.27	3.37
Nutricereals	1.99	8.23	3.89	8.29	1.95	1.94
Maize	0.75	7.87	1.48	5.14	1.98	3.03
Total food grain	19.83	15.54	51.25	17.99	2.58	2.23
Total pulses	2.27	7.56	2.21	8.75	0.97	0.84
Oilseeds	1.09	4.41	1.15	3.66	1.05	1.27
Sugarcane	2.23	47.21	177.01	46.98	79.3	79.6

IMPORTANCE OF ORGANIC FARMING FOR THE STATE

HEALTH	Sustain and enhance the health of soil (OC <0.5 % in most areas), plant, animal, human and planet as one and indivisible.
ECOLOGY	Based on living ecological systems and cycles, work with them, emulate them and help sustain them.
FAIRNESS	Build on relationships that ensure fairness with regard to the common environment and life opportunities.
CARE	Managed in a precautionary and responsible manner to protect the health and well-being of current and future generations and the environment.

Challenges of Organic Farming

❖ **Lack of availability of organic inputs for nutrient, insect, disease and weed management**

❖ **Reduction in Yield during the conversion period especially in cereals and in high input use areas**

❖ **Quality of micro-dosing and enriched biofertilizers, botanicals for pest management etc.**

❖ **Establishing infrastructure and mechanisms for certification and marketing (PGS and APEDA)**

❖ **Lack of trained Human resource on modern concepts of organic farming**

IMPORTANCE AND OPPORTUNITIES OF AGROFORESTRY

❖ Most of the study have been carried out on experimental fields which requires on-farm validation

❖ Reducing variability and increasing resilience of farming systems as well as increasing buffering households against climate related risk.

❖ Generation of farm employment and enhancement in households income also through enhancing system productivity

❖ Helpful for improvement in soil health through holistic approach (Physicochemical properties, Micro fauna and Flora)

Existing Agroforestry System

❖ Poplar (*Populus spp*) based Agroforestry system is dominant (78% of total agro-forestry area)

CHALLANGES OF AGROFORESTRY

❖ Shortage of superior planting materials
❖ Poor establishment
❖ Lack of proper marketing channels

POTENTIAL FOR THE PROJECT TO CONTRIBUTE

❖ Evaluate the comparative and relevant ecosystem services for location specific sustainable crop adoption system and its valuation for extending the benefits to farmers.

❖ Identification niche area and crops for organic production and Agro-forestry through modelling.

❖ Holistic and innovative approaches for organic production: Restoration of land, ecosystems and habitats.

❖ Policy input to be used at district, state, national as well as global level

Organic Farming
Future of Agriculture

STUDY SCOPE AND LOCATION

Districts	Population (million)	Potential crop of the District	GA (Sq. Km)	Net cultivated area (lakh ha)	Cropping intensity (%)	Area under forest	
						Net area (ha)	% of GA
Bulandsahar	3.49	**Kharif:** Rice> Sugarcane> Maize > Pulses **Rabi:** Wheat > Mustard > Barley	4352	2.99	225	8448	1.94
Aligarh	3.67	**Kharif:** Rice ≥ Pearlmillet > Maize > Pulses **Rabi:** Wheat > Potato > Oilseeds	3650	3.05	185	2577	0.71
Mirzapur	2.49	**Kharif:** Rice > Pigeonpea> Pearlmillet **Rabi:** Wheat > Chickpea	4521	2.11	157	109448	24.2
Kannuauj	1.65	**Kharif:** Maize > Rice > millets (Sorghum) > pulses **Rabi:** Wheat > Potato > Sunflower > Chickpea	2093	1.55	170	19069	9.11
Bundelkhand (Jhansi)	1.99	**Kharif:** Sesamum > Urdbean > Groundnut >Rice > Moongbean > Sorghum > soyabean **Rabi:** Wheat > Gram > Pea > Lentil > Mustard	5024	3.12	156	34401	6.84

Meerut district may also be considered especially with reference to on-station experiments under organic farming

Methodology

❖ Data collection for the rhizospheric changes in soil health under various cropping system

❖ Identification of potential ecosystem services

❖ Modelling under each scenario, i.e. BAU, Optimistic scenario and Pessimistic scenario

❖ Econometrics of changes in ecosystem services

❖ Impact analysis on livelihood, ecosystem services and societal changes

USE OF BIO PHYSICAL AND ECOSYSTEM SERVICES MODELS

Biophysical models...

- **CROPWAT:** for crop water requirement and irrigation based on soil, climate and crop data

- **APSIM:** for Scenario analysis of agricultural productivity by simulating the biophysical processes in agriculture systems
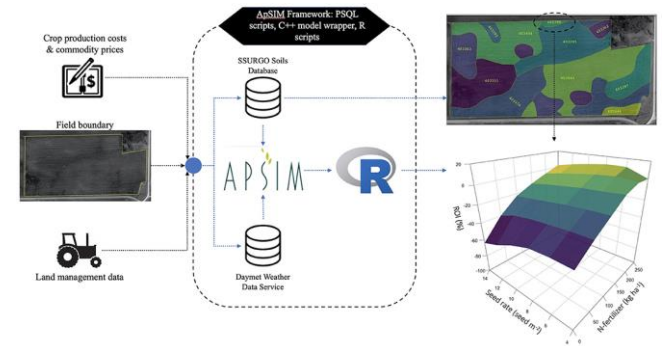
Ecosystem service (Provisional, Regulatory, Cultural and Supporting) models...

- **InVest:** for valuation of integrated ecosystem services and tradeoff

Economic valuation
- Direct market values
- Cost-based methods
- Revealed or stated preference

PROJECT IMPLEMENTATION

❖ **Policy scenario analysis:** Water requirements of crops under changing climate, effect of

changing climate on agricultural food productivity, Scenario analysis of ecosystem services

❖ **Results for policy recommendation**

District level coverage

- Benchmarking of **120 farm households in each selected district**

- **2 blocks** (1 low productive and another one high productive block)

- **Scenario build up** using modelling tools

RISKS IN PROJECT IMPLEMENTATION PLAN

- **Precise data** availability especially secondary, Satellite imageries /GIS maps

- Travel and contact restrictions in collecting data due to Covid pandemic

TEEB
The Economics of Ecosystems & Biodiversity

THANKS

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