Towards Viksit Bharat@2047
Technological Innovations and Policy Options for Eastern Region

भाकृअनुप
ICAR

ICAR Research Complex for Eastern Region
ICAR Parisar, P.O. Bihar Veterinary College
Patna-800 014, Bihar

ISBN -978-81-954348-4-8

Towards Viksit Bharat@2047: Technological Innovations and Policy Options for Eastern Region

Editors: Abhay Kumar, Anup Das, PC Chandran, SS Mali, DK Singh, P Bhavana, Kumari Shubha, Arti kumari and Sarfaraj Ahmad

©2025 ICAR RCER All rights reserved.

Year of Publication: February, 2025

Citation:
Abhay Kumar, Anup Das, PC Chandran, SS Mali, DK Singh, P Bhavana, Kumari Shubha, Arti kumari and Sarfaraj Ahmad (2024). Towards Viksit Bharat@2047: Technological Innovations and Policy Options for Eastern Region. ICAR-Research Complex for Eastern Region, Patna, India. pp-195. ISBN -978-81-954348-4-8

Published by:
The Director,
ICAR-Research Complex for Eastern Region
ICAR Parisar, Patna- 800014, Bihar, India
Ph: +91-0612-2223962, FAX: +91-0612-2223956
E-mail: director.icar-rcer@icar.gov.in
Website: www.icarrcer.icar.gov.in

Printed at:
VIRTUE ENTERPRISES, Patna, Call : 9304410331, 9383836044

CONTENT

Introduction 1

Chapter-1: Technologies

1. Crop Production and Protection

1. Sustainable Intensification of Rice-Fallow System of Eastern India 5
2. Sustainable Intensification of Rice-Wheat Cropping System with Summer Green-gram using Resource Technologies in Eastern India 7
3. Improved Agro-techniques for Enhancing the Productivity of Millets in Eastern India 9
4. Innovative Millet-Based Climate Resilient Cropping System for Eastern India 11
5. Interspecific Grafting in Solanaceous Vegetables for Bacterial Wilt Management 13
6. Package of Practices for Upland Field Water Spinach 15
7. Rice-Legume System for Enhancing Productivity of Rainfed Uplands 17
8. Rejuvenation of Unproductive Mango Plants 19
9. Transforming Rice Straw into Eco-Friendly Growing Medium for Microgreens 21
10. Eco-Friendly Plantable Seedling Pot or Decorative Pot from Agricultural Residue 23
11. Conceptual Model for Integrated Organic Farming in an Acre farm plot 24
12. Air pollution Tolerance Index and Anticipated performance Index in Trees and Crops Across the Eastern Gangetic Plains India 26
13. Selacting Wheat Cultivars for Heat and Drought Stress Adaptation in the Middle Gangetic Plains 28
14. Optimizing soil c under different cover crops and irrigation systems 30

2. Farming System and Land Use Models

1. Integrated Farming Systems for Different Ecologies of Eastern India 33
2. Multitier cropping system for Rainfed Uplands of Eastern India 35
3. Carbon stock quantification models for important fruit trees of Eastern India 37
4. Climate Resilient Agriculture Practice in Rice- Fallow Ecosystems of East India Plateau 39
5. Agroforestry Models for Rehabilitation of Coal mine affected Areas in Eastern Plateau & Hill Region 41

3. Soil and Water Conservation Measures

1. Modified drip fertigated mulched Planting System for commercial Cultivation of Vegetable in East India Plateau 44
2. Modified Drip Fertigation Technology for Vegetable Production in Eastern India 46
3. *Tephrosia* Biomass Mulching Technology for Improving Soil Health and Productivity of Fruit Orchard 48
4. Low-Cost Non-Weighing Lysimeter for Assessing Nutrient Leaching Loss 50
5. Fertilizer recommendation in mango using leaf nutrient standard 52
6. Doba Technology of Water Harvesting for Orchard Establishment in Uplands 54
7. Subsurface drip fertigation in vegetable crops 56
8. Drum Kit System for Drip Irrigation 58
9. Modified Non-weighing Paddy Lysimeter 60
10. Prioritized map for identifying drought susceptible zones in Sakri basin 62
11. Model Framework for Water Harvesting Planning using multivariate techniques 64
12. Mapping Flood Prone Areas of Bihar based on Frequency 66

4. Livestock & Fish Production and Protection

1. Serological Diagnosis (Indirect ELISA) of *Theileria annulata* using Recombinant spm² antigen 69
2. Identification of CCL8 and CXCL10 as Early Pregnancy Biomarker in Buffaloes 71
3. Spent Mahua Flower as Growth Promoting Pig Diet 73
4. Low-Cost Feed Formulation for T&D Pig 75
5. Sustainable Poultry Feed Formulation for Desi Chicken 77
6. Breeding, rearing and juvenile seed production of Magur fish (*Clarias magur*) 79
7. Optimization of Integrated Fish Farming Systems for Livelihood Improvement of Small and Marginal farmers of Eastern Region 81
8. Formulation of vitamin-mineral enriched diet for quality seed Production and survival of Rohu (*Labeo rohita)* 83
9. Grass Carp Cultivation Using Seasonal Forage and Aquatic Crops 85
10. Mitochondrial genome maps of duck germplasm inhabiting Eastern Region of India 87
11. HSP70 as marker for heat stress in *Murrah* buffalo 89
12. Effect of glucosamine supplementation on egg laying Performance of chicken 91
13. Identification of novel SNP marker within the PROP1 gene associated with growth characteristics in goat 93
14. Genetic effects of STAT3 gene polymorphism on body Size traits in Assam Hill goats 95

5. Farm Mechanization and Post-Harvest

1. Design and Development of Solar Operated hold-on type paddy thresher 98
2. Solar Irrigation Pump Sizing Tool 100

3. Custom Hiring Centre (CHC) for promotion of Climate Resilient Agriculture 102
4. Over the Plant (OTP) Manual Weeder for Row Crops 104
5. Manual Makhana Seed Grader 106
6. Peripatetic fish vending cart 108
7. Farm Machinery Hiring Calculator: a web Based tool 110
8. Solar Cabinet Dryer for Leafy Vegetables 112
9. Hybrid Solar Light-Pheromone Insect Trap 114
10. Mixed Para-Pheromone Fruit Fly Trap for Horticultural Crops 116

6. Socio-economic, Extension & Policy Measures

1. Climate Resilient Model Villages Developed at Gaya and Buxar districts of Bihar 119
2. Model for structural and functional analysis of Makhana value chain 121
3. Strengthening Export Potential of Farmer Producer Organizations (FPO) through One District One Product (ODOP): A Conceptual Model 123
4. Seed based technology delivery model through Farmers Producer Organization (FPO) 125
5. Flood Prone Area Identified as Fruit Hub in Bihar: A Policy Framework 127
6. Nutrigarden Model Addressing Anemia and Hypovitaminosis Challenges of Eastern India 129
7. Policy Measures for Tenant farmers of Bihar 131
8. Socioeconomic status scale for farmers of Bihar and Jharkhand 133
9. Participatory Research Application for Year-Round Income and Agricultural Sustainability (PRAYAS): A process model for empowering weaker sections 135
10. Process Model for Developing Zero Hunger & Zero Technology Gap Village 139
11. Conceptual Model for Evaluation of Carbon Credit Projects 141
12. Forecasting Kharif Rice Production and Rainfall Assessment in Bihar : ARIMAX and Spatial Interpolation Models for Food Security in Easter India 143
13. Model-Based Resource Mapping and strategies for Rice Cultivars in Food Prone Ecosystems 145

Chapter-2: Climate Resilient Rice varieties 148-158

Chapter-3: Improved varieties of Vegetables 160-186

Chapter-4: High Yielding varieties of Fruits 188-190

Chapter-5: Other Improved varieties (Chickpea, Makhana & Faba bean) 192-195

Socioeconomic Status Scale for Farmers of Bihar and Jharkhand

Period of development: 2017 - 2022

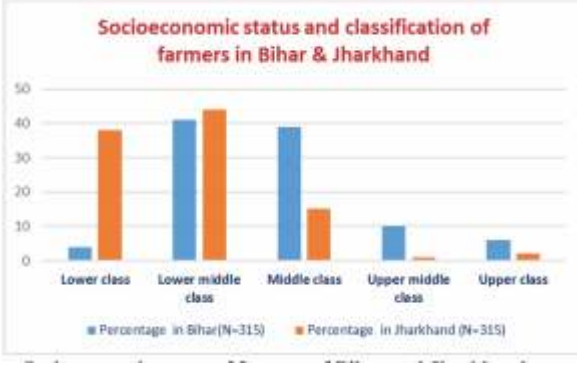
Developers:

VK Yadav, Ujjwal Kumar, RC Bharti, Pankaj Kumar, RK Raman

Background:

Implementation of Rural development programs, extension projects, etc. are generally based on socioeconomic status (SES) of farmers determined through SES scale developed by Pareek and Trivedi (1964), Prasad (1961) and Kuppuswamy scale (1981). These scales do not include latest socio-economic parameters like mobile, internet, social mobility, social security, etc. Besides this, earlier scales were developed in particular areas and there is scope for development of SES scale in eastern India, as India is culturally and socially very diverse. Income level of farmers is also changing very rapidly which is major parameter of their socioeconomic status. Therefore, there is need of new scale for measuring Socio-economic status of farmers in Bihar and Jharkhand.

Assessing socio-economic status of farmers



Socioeconomic status of farmers of Bihar and Jharkhand

Description of the technology:

Socioeconomic status (SES) is one of the prime factors influencing the health status of a nation. It is the measure of the social standing of the individual or a family and has a wide impact on an individual/family's health, educational attainment, diet, lifestyle, etc., A socio-economic scale has been developed which contains 10 factors and 17 variables to assess socioeconomic status of farmers from Bihar and Jharkhand. However, it may be used for assessing SES of farmers from other states also with suitable modifications. The Maheshwari-Kumar-Jhamtani-Bhaskaran-Dandapani multidimensional scaling method was used to develop a socio-economic status (SES) scale for farmers in Bihar and Jharkhand. Data from 100 farmers, expert opinions, and literature review led to the identification of 181 SES variables, of which 127 were selected using Trivedi criteria and 64 through a relevancy test. A schedule with these 64 variables was used to collect data from 492 farmers across districts. Factor analysis identified 10 factors explaining 93% variance, with 17 key variables weighted by beta values. The final SES scale had a reliability coefficient of 0.97, and Known Group Technique confirmed its validity.

Commercial potential:

The technology can be offered through consultancy services, licensed, or outsourced to the Students, State Agricultural Department, development agencies, FPOs, NGOs, and farmers' groups.

Impact:

SES scale is being used in assessing socio-economic status of farmers by social researchers.

Agro-eco region suitability:

Bihar and Jharkhand and other states having same Socioeconomic level

Reference:

Annual Report, ICAR-RCER, Patna