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Conference Paper

Impact of Technology on Agriculture Development in Sri Ganganagar District (Rajasthan): A Geographical Perspective

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Abstract

The study makes an attempt to assess the impact of technology on agriculture development of Sri Ganganagar district in recent years. Agriculture plays a decisive role in the economic development of any region. Agriculture is the main occupation of the people, and about 73% of the total population is engaged in agricultural pursuits. Keeping in view the pressure of population, the need arises to modernise our agriculture to increase food production. With the modernisation of Indian agriculture, the use of new inputs like fertilisers, high yielding variety of seeds, improved agricultural implements, and irrigation has increased considerably. With the help of these modern inputs, food grain production has sustained an upward trend. This upward trend in food grains production after the introduction of new technology of high-yielding variety seeds, fertiliser, improved implements and irrigation has been termed the green revolution.

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KEYWORDS: Sustainable development, online freelancing, economic aspect, social inclusion, environmental benefits, gig economy.

1. INTRODUCTION

Database and Methodology

The study has been conducted on the basis of extensive fieldwork, a collection of first-hand information and primary data from the villagers, including the village sarpanch, through the questionnaire method. The participatory approach was also applied to obtain precise information about inventory and prospects of technology. The respondents were randomly selected on the basis of their economic and social compositions. Informal and formal interview methods have been used to collect the information; finally, the findings have been involved on the basis of analysis of the collected information. The villages for the survey were selected on the basis of their distinct source.

Introduction Sri Ganganagar sits in the extreme northwest of Rajasthan, covering latitudes 28.4°–30.3° N and longitudes 72.3°–75.3° E, at around 176 m above mean sea level. It falls in the Irrigated North Western Plain (Zone 1b), blending arid and semi-arid conditions with multiple micro - agro ecological situations: canal - irrigated sandy loams, Ghaggar floodplain soils, rain -fed sandy soils, and salt - affected lands. The region features intense summers (up to ~49 °C), cold winters (~0–1 °C), dusty storms, fog, and monsoon-dependent low rainfall (average 332 mm, 75% in July–September) .Historical canal systems, especially the Gang Canal and the Indira Gandhi Canal, have been pivotal in transforming the desert into fertile farmland, supporting crops like wheat, mustard, cotton, guar, bajra, sugarcane, gram, and increasingly, kinnow (citrus) and carrots.

Objectives

The paper intended to examine the exposure impact of technology on agriculture development in Sri Ganganagar district.

Technological Innovations and Agriculture Development

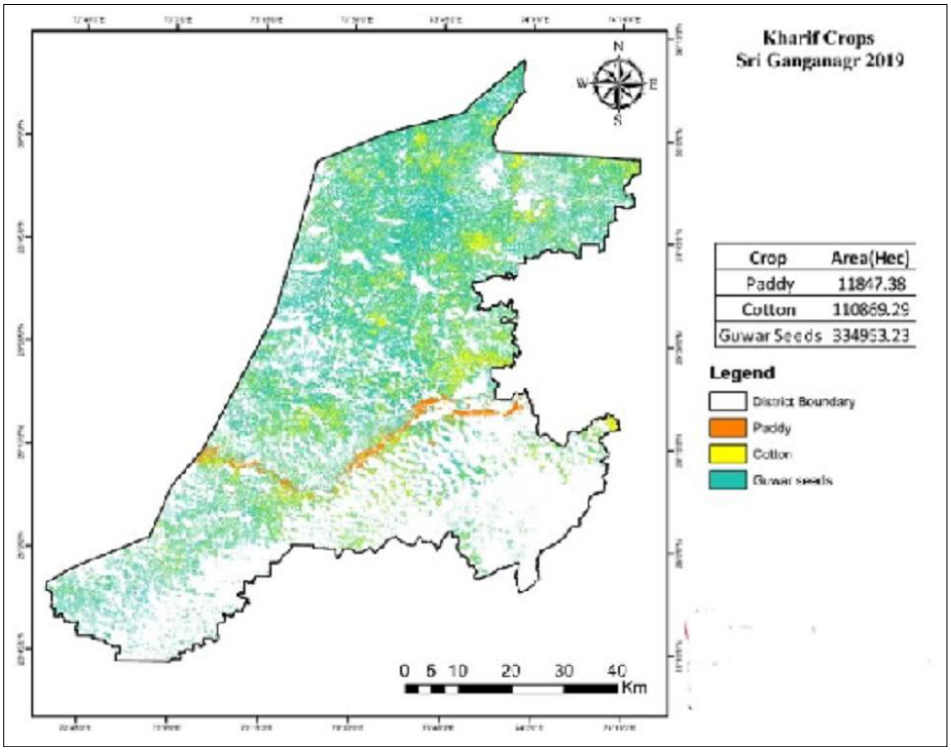
1. Irrigation & Water Infrastructure

Canal Expansion: The century old Gang Canal laid the foundation for agricultural transformation. Now, plans to divert Indus (Sindhu) River waters into Sri Ganganagar promise further irrigation expansion and greater water security for farming. Solar- powered and mechanized systems: At Jaitsar Central State Farm, modern machinery arrived via Indo- Soviet collaboration in the 1960s; now there's also a 200 MW solar project on its land, reflecting the coupling of energy and agri technology.

2. Geospatial and Digital Technologies

Remote sensing & satellite imagery: Tools like Sentinel-2 help map crop acreage, yield estimation, and monitor seasonal patterns (e.g., for Guar, Paddy, Cotton), aiding forecasting and planning.

GIS, GPS & Data Analytics: These tools support precision farming providing tailored insights on soil, topography, and optimal cropping practices. They help farmers decide what to plant and where, enhancing yields and resource use efficiency.



3. IoT, Drones & Precision Agriculture

IoT-based smart irrigation: Systems using soil moisture sensors, drones, and cloud platforms automate and optimize water use by region minimizing wastage and improving timing/control. Machine Learning & Multimodal Precision Farming: Integration of IoT, AI, and deep learning enables real-time crop damage prediction, disease detection, and optimized fertilizer application based on environmental data.

4. ICT, Mobile Apps & Farmer Extension Services

Digital literacy & advisory tools: By deploying mobile apps and ICT platforms, farmers gain access to weather data, market prices, pest alerts, and scientific best practices—even in remote areas.

5. Sustainability & Climate Smart Practices

Remote sensing for soil & land use management: Detecting soil erosion or nutrient depletion helps farmers adopt crop rotation, cover crops, and other strategies to maintain land productivity. Emerging tech trends: Broader technological tools—AI, block chain, precision systems support efficient, transparent, and inclusive rural development, though equitable access remains a challenge.

Table: 1

S.N.	Item	Unit	Particulars (2001)	Particulars (2011)
a	Food Grains	Kilogram	3000	4200
b	Oilseeds	Kilogram	1400	1800
c	Sugarcane	Kilogram	40000	45000
d	Cotton	Bales	2.5	3.41
11	No of Pump sets used for irrigation	Number	8320	8320
12	Normal Rainfall	mm	226.4	322.3
13	Actual Rainfall	mm	167.58	296.1
14	Average Size of Holdings	Hectare	3.5	3.5

Local Technological Challenges and Pest Management

A recent leafhopper infestation (cotton) in Sri Ganganagar highlights the importance of tech-enabled monitoring. The pest population exceeded economic thresholds, threatening up to 30% yield loss. Experts recommend vigilant digital field scouting, eco-friendly insecticides, and weed management assisted by scientific interventions.

Results and Discussion

Geographical Perspective & Technological Impact Arid/semi-arid climate, low rainfall, extreme temperatures Canal irrigation (Ganga, upcoming Indus), solar energy deployments Diverse soil types including salt-affected areas GIS, remote sensing for mapping and targeted interventions Dispersed and remote rural communities ICT and mobile advisory tools for real-time alerts and extension Agricultural diversity (crops, horticulture emerging) AI -driven precision farming, smart irrigation, drone monitoring Pest vulnerability (e.g., leafhoppers) Tech-based scouting, eco-friendly management guided by dat.

From its geographical origins as a desert plain reshaped by canal irrigation, Sri Ganganagar exemplifies how layered technological innovations spanning hydrology, satellite imaging, data, automation, and ICT are boosting agricultural productivity, sustainability, and resilience. While infrastructure like Indus water diversion promises new potential, integrating digital tools into everyday farming remains essential. Challenges like digital divides, equitable access, and local capacity-building are just as important to address as the technologies themselves.

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