

# A DECADE OF AGRICULTURAL INPUTS IN INDIA: PROGRESS, CHALLENGES, AND THE EMERGENCE OF REGENERATIVE AGRICULTURE

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## ABSTRACT

*This comprehensive analysis explores the dynamic shifts in India's agricultural landscape over the past decade, focusing on the production and consumption trends of key agricultural inputs from 2011-12 to 2021-22. The study delves into seed production, fertilizer consumption, and pesticide use, unraveling a narrative of adaptation, resilience, and potential opportunities. As India navigates toward a sustainable future, the analysis identifies an alignment with regenerative agriculture principles, emphasizing biodiversity, balanced nutrient management, and sustainable pest control. The conclusion underscores the challenges and opportunities ahead, presenting a roadmap for policymakers, researchers, and farmers to cultivate a regenerative tomorrow.*



**KEYWORDS** Fertilizer consumption, Pesticide management, Regenerative agriculture, Seed production, Sustainable farming practices

## INTRODUCTION

The Indian agricultural landscape, a canvas of sustenance and livelihood for millions, has undergone a profound metamorphosis over the past decade. From the bustling fields of Punjab to the arid landscapes of Rajasthan, the sector has witnessed dynamic shifts in the production and consumption of key agricultural inputs. As we delve into the intricacies of this transformative journey, guided by the wealth of data provided by the Department of Agriculture & Farmers Welfare for the years 2011-12 to 2021-22, we embark on an exploration that transcends mere statistics. This comprehensive analysis seeks not only to unveil numerical trends but also to unravel the narrative of resilience, adaptation, and growth etched into the very fabric of India's agricultural evolution.

The agricultural sector, often referred to as the backbone of the nation, is an intricate tapestry woven by the hands of millions of farmers, each sowing seeds that bear the promise of sustenance. Against the backdrop of a rapidly changing climate, technological advancements, and evolving consumer demands, the sector has stood resilient, navigating the complexities of modern agriculture.

This exploration goes beyond the numbers; it delves into the soul of Indian agriculture, where the toil of the farmer meets the challenges of the 21st century. Seeds, the fundamental units of growth; chemical fertilizers, the nourishment for the Green Revolution; and pesticides, the guardians of agricultural yields, together, tell a tale of adaptation, innovation, and a profound connection to the land.

As we embark on this journey through the agricultural landscape of India, the intention is not just to present data but to unravel the layers of challenges, triumphs, and potential opportunities that lie beneath. This introspective exploration serves as a guide, not just for policymakers and researchers, but for the very custodians of the land—the farmers—providing insights that can shape strategies for a future where sustainability, environmental consciousness, and the well-being of farming communities intertwine seamlessly. In this pursuit, we not only analyze the past but also cast our gaze forward, envisioning a future where Indian agriculture thrives in harmony with regenerative practices, ensuring a resilient and sustainable path for generations to come.

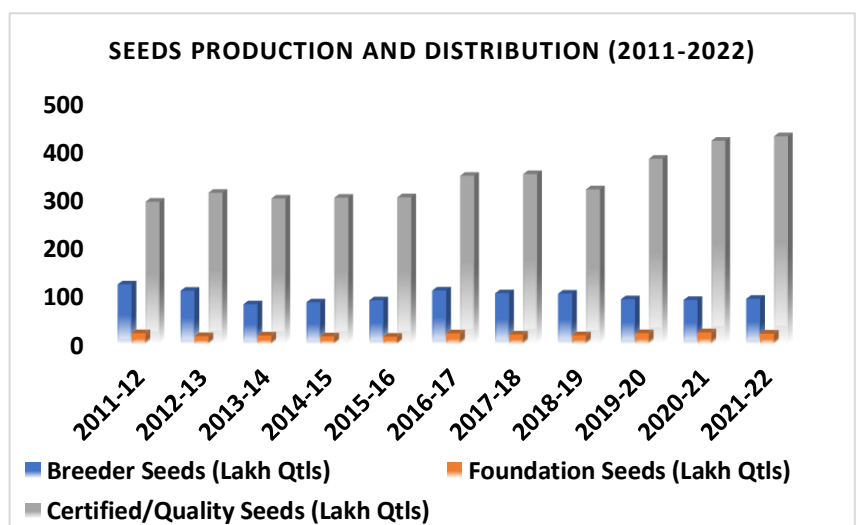
## SEEDS: NURTURING GROWTH

### BREEDER SEEDS PRODUCTION

The production of breeder seeds, the cornerstone of crop development, presents a nuanced narrative. The initial years of the decade witnessed a substantial peak of 22.26 lakh quintals in 2011-12, followed by a gradual stabilization around the 21-22 lakh quintals mark in recent years. This trend reflects the intricate balance between the demand for high-quality breeding material and the challenges posed by factors such as climate variability and technological advancements.

### FOUNDATION SEEDS DISTRIBUTION

The distribution of foundation seeds, instrumental in maintaining seed quality and genetic purity, demonstrated a consistent upward trajectory. Starting at 294.85 lakh quintals in 2011-12, this figure surged to an impressive 430.31 lakh quintals in 2021-22. The steady increase underscores a concerted effort by the agricultural sector to



provide farmers with reliable and superior planting material, contributing to the overall improvement of crop yields.

### CERTIFIED/QUALITY SEEDS:

The distribution of certified and quality seeds emerged as a focal point in the agricultural landscape. The consistent rise from 294.85 lakh quintals in 2011-12 to 430.31 lakh quintals in 2021-22 highlights the sector's commitment to ensuring farmers have access to seeds that meet stringent quality standards. This not only enhances agricultural productivity but also serves as a foundation for sustainable and resilient farming practices.

## CHEMICAL FERTILIZERS: NOURISHING THE GREEN REVOLUTION

### NITROGENOUS (N) FERTILIZERS

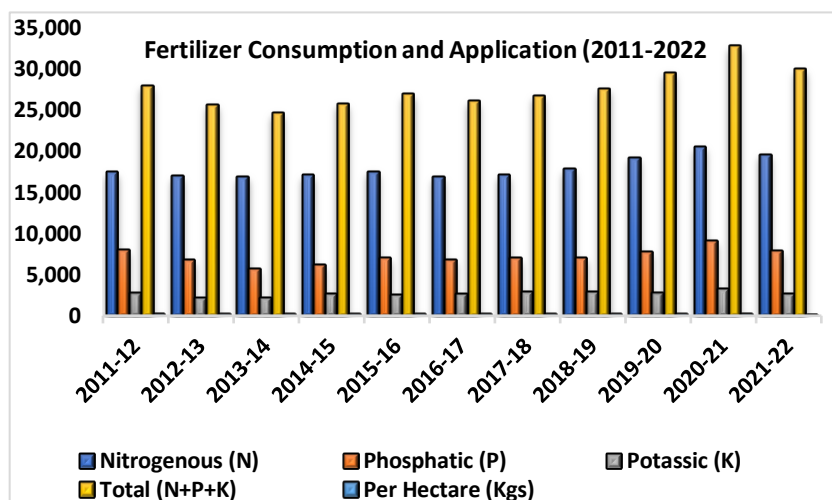
The consumption of nitrogenous fertilizers, vital for plant growth and development, witnessed a persistent upward trend. From 17,300 thousand tonnes in 2011-12, the consumption reached a noteworthy 20,404 thousand tonnes in 2020-21. This sustained increase reflects the agricultural sector's continuous efforts to enhance soil fertility and optimize crop yields, a crucial aspect in sustaining the momentum of the Green Revolution.

### PHOSPHATIC (P) AND POTASSIC (K) FERTILIZERS

The consumption patterns of phosphatic and potassic fertilizers displayed fluctuations, influenced by factors such as market dynamics and policy interventions. Despite the variability, the overall trend suggests a steady rise in the consumption of these fertilizers. This indicates a nuanced approach to balanced nutrient management, acknowledging the importance of phosphorus and potassium alongside nitrogen for comprehensive soil health and sustainable agriculture.

### TOTAL FERTILIZER CONSUMPTION

The combined consumption of nitrogenous, phosphatic, and potassic fertilizers surpassed 29,000 thousand tonnes in recent years, signifying the agricultural sector's commitment to optimizing fertilizer use. This concerted effort toward balanced nutrient application contributes not only to increased agricultural productivity but also to mitigating environmental concerns related to excessive fertilizer usage.



### PER HECTARE CONSUMPTION

Examining the per-hectare consumption of fertilizers provides valuable insights into the efficiency of fertilizer utilization. The data reveals a trajectory from 142.05 kgs per hectare in 2011-12 to 137.15 kgs per hectare in 2019-20, indicating a nuanced approach to fertilizer application. This suggests a potential shift towards precision farming and a focus on sustainable agricultural practices that prioritize both productivity and environmental conservation.

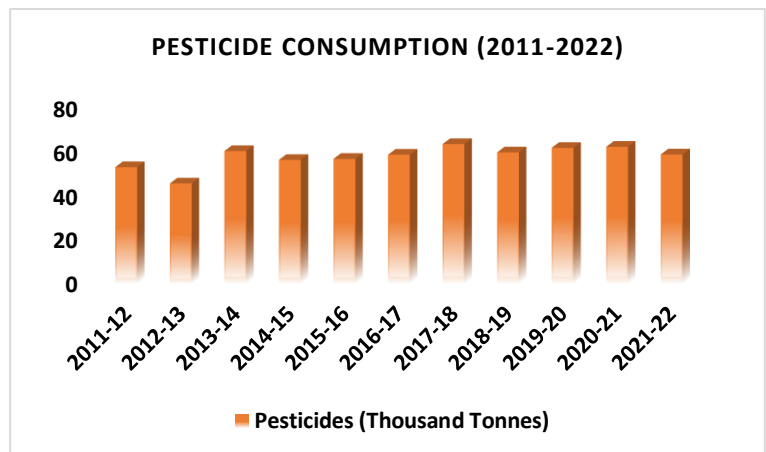
### PESTICIDES: SAFEGUARDING AGRICULTURAL YIELDS

#### PESTICIDE CONSUMPTION

The consumption of pesticides, crucial for protecting crops from pests and diseases, showcased variability over the years. Peaking at 63.41 thousand tonnes in 2017-18, the figures fluctuated in subsequent years. This variability can be attributed to factors such as weather conditions, changes in pest dynamics, and evolving agricultural practices. The nuanced nature of pesticide consumption underscores the sector's proactive stance in pest management.

#### TECHNICAL GRADE MATERIAL

The use of technical grade material in pesticides remained consistently above 50 thousand tonnes, highlighting a sustained effort to deploy advanced and effective pest control measures. The focus on technical grade material signifies a commitment to adopting sophisticated and environmentally sustainable pest



management strategies, reflecting the evolving nature of agricultural practices in India.

### CHARTING A REGENERATIVE FUTURE FOR INDIAN AGRICULTURE

In concluding this comprehensive analysis of India's agricultural trajectory over the past decade, we find ourselves at the crossroads of tradition and transformation, challenges and opportunities. The data has unfolded a narrative that extends beyond numerical trends, offering a profound glimpse into the heartbeat of the nation's agrarian landscape. As we reflect on the seeds sown, the fertilizers spread, and the pesticides deployed, a clear path toward regenerative agriculture emerges—one that harmonizes with the pulse of the land and the aspirations of a sustainable future.

## **SEEDS: A TAPESTRY OF BIODIVERSITY AND RESILIENCE**

The journey through seed production and distribution has been one of adaptation and commitment. The consistent rise in the distribution of certified and quality seeds underscores a dedication to providing farmers with the building blocks of resilient crops. This not only augments productivity but also lays the foundation for biodiversity, a cornerstone of regenerative agriculture. As the nation progresses, the emphasis on diverse and resilient crop varieties becomes integral to cultivating a regenerative ethos in Indian farming practices.

## **CHEMICAL FERTILIZERS: BALANCING NUTRIENT MANAGEMENT FOR SOIL HEALTH**

The patterns in fertilizer consumption reveal a nuanced approach, a dance between tradition and innovation. While the sector has witnessed an overall increase in consumption, the subtle decrease in per-hectare usage hints at a shift toward precision farming. This transition aligns seamlessly with the principles of regenerative agriculture, where the focus is not merely on productivity but on fostering soil health. The challenge lies in sustaining this balance, fostering a future where nutrient management is both efficient and ecologically mindful.

## **PESTICIDES: NAVIGATING PEST MANAGEMENT WITH FORESIGHT**

Pesticide consumption, marked by its variability, signifies a sector dynamically engaged in pest management. The sustained use of technical grade material indicates a commitment to sophisticated and sustainable pest control strategies. As we look to the future, integrating biological controls and eco-friendly approaches becomes imperative. Regenerative agriculture champions these strategies, ensuring that pest management aligns with the broader goal of ecological harmony.

## **CONNECTING WITH REGENERATIVE AGRICULTURE: A SYNERGY UNVEILED**

The intertwining threads of seed quality, balanced fertilizers, and proactive pest management collectively weave a tapestry that aligns with the principles of regenerative agriculture. The data, beyond being a retrospective glance, serves as a compass for charting a course toward sustainable and regenerative practices. This alignment is not just a suggestion but a call to action—a call for policymakers, researchers, and farmers to collaboratively forge a regenerative future.

## **CHALLENGES AND OPPORTUNITIES: PAVING THE WAY FORWARD**

While the path to regenerative agriculture is promising, challenges linger. The agricultural community, policymakers, and stakeholders must collaborate to overcome barriers and capitalize on the opportunities revealed in this exploration. Education, policy support, and a collective commitment are essential ingredients for realizing the vision of a regenerative agricultural landscape.

## CONCLUSION: NURTURING A REGENERATIVE TOMORROW

As India navigates the future of its agriculture, the insights gleaned from this analysis illuminate a path toward regenerative practices. The story told by the data is not just about the past; it is a guide for the days to come. A regenerative tomorrow beckons, where Indian agriculture thrives in harmony with nature, where farmers are stewards of the land, and where sustainability is not just a goal but a way of life. The journey ahead is marked by challenges, but it is also illuminated by the promise of a resilient, sustainable, and regenerative future for the fields that sustain the nation.

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