



# IMPACT OF COVID-19 ON AGRICULTURAL SECTOR

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## ABSTRACT

Farmers, rural communities, and their most valued concern are used to analyse agriculture system risks from covid-19 pandemics. First, covid-19 has caused deaths, infections, health difficulties, stress, and trauma in rural areas. Several studies reviewed these risks for farmers and rural communities, including suicides. Covid-19 affects farmers' losses, especially fresh crops, fruit, and milk. These losses were attributed to travel and interaction restrictions, labour losses, and restaurant, hotel, and other business closures. There is a window of opportunity right now to not only effectively respond to the current crisis, but also to roll back support that is distortive, inefficient, and harmful to the environment. This would free up capital for investments in a food system that is more productive, sustainable, and resilient, and would allow it to meet new challenges. Together, this and the accompanying regulatory reforms have the potential to help create an environment that is conducive to the development of a food system that is in harmony with the limits of natural resources, a changing climate, rising consumer demand, innovative technologies, and "low probability, high impact" catastrophic risks. In the wake of the unanticipated shock caused by COVID-19, it is necessary to implement a policy package that takes a more forward-looking approach and invests in the productivity, sustainability, and resilience of the global food system

**KEYWORDS:** Agricultural sector , Covid-19 , Rural Communities

## 1. INTRODUCTION

The COVID-19 pandemic has had widespread effects on human behaviour and activities, including farming. Mobility constraints and reduced purchasing capacity have a disproportionately negative influence on food demand and, by extension, food security, with the most disadvantaged population segments suffering the brunt of the impact. The global food supply may be negatively impacted if nations took drastic measures to contain a virus as the number of reported cases increased. However, other governments adopt the opposite tack, prioritizing economic growth at the expense of people's health and access to nutritious food. The most significant impact on people's ability to make a living was felt in both the developed and developing worlds due to the lockdowns induced by the COVID-19 virus. On March 23, 2020, India's prime minister announced a lockdown. The country's economy has ground to a halt, threatening the survival of the country's 1.3 billion inhabitants. The first quarter of 2020 (April-June) GDP figures provided by the national statistical agency indicate a 23% fall in economic growth. There is a negative growth rate of 50% in the construction business, 47% in the service sector, and 39% in manufacturing. The agriculture and related industries, on the other hand, expanded by 3%. Experts in agricultural policy provide a number of explanations for the sector's resilience, including the timing of the pandemic, rapid public policy responsiveness, and the building of infrastructure for social transfers, among others. The government's price stabilization initiatives helped keep cereal prices stable at the outset of 2020, but after a poor start, the government's efforts to strengthen supply chain management helped keep essential commodity prices stable in May and June, and procurement grew during those months. Farmers' financial flow during the upcoming 2020 Kharif season may have been impacted by the delay in acquiring 2019-2020 Rabi season production (July-November). Farmers also did not receive immediate payment for their goods because most agricultural transactions in India are handled face-to-face. Eighty-five percent of Indian farmers fall under the category of "small and marginal," whereas fifty percent use informal loans and twenty percent buy agricultural inputs with credit.

The 2019-2020 Rabi and 2020 Kharif seasons will see increases of 5 and 2% in food grain production, respectively, when compared to the previous year. A plausible argument might be made that the bulk of the agricultural work for the Rabi season of 2019-2020 was completed before the shutdown. It is expected that the Kharif season (summer crop) in 2020 will be hit hardest by the COVID-19 epidemic. Farmers were unable to buy the necessary inputs for the Kharif season due to a lack of credit and liquidity caused by a combination of factors

including a delay in obtaining farm revenues and the COVID-19 outbreak. This research looks into how quickly implemented public policy in India helped farmers cope with cash flow issues.

Under the Pradhan Mantri Garib Kalyan Yojana (PM-GKY), the Indian government has released the COVID-19 social assistance package of INR 1.7 lac crore (about 25 billion US dollars) to provide immediate help to the underprivileged community.

The PM-GKY package builds on existing initiatives to provide additional benefits to farmers and rural households. The research centres on four major programs that have the potential to help farmers. Pradhan Mantri Ujjwal Yojana, Pradhan Mantri Jan Dhan Yojana, Pradhan Mantri Ann Vitran Yojana, and Pradhan Mantri Kisan Samman Nidhi are all examples of such programs (PM-AVY). About 70% of the PM-GKY package budget goes toward these four programs.

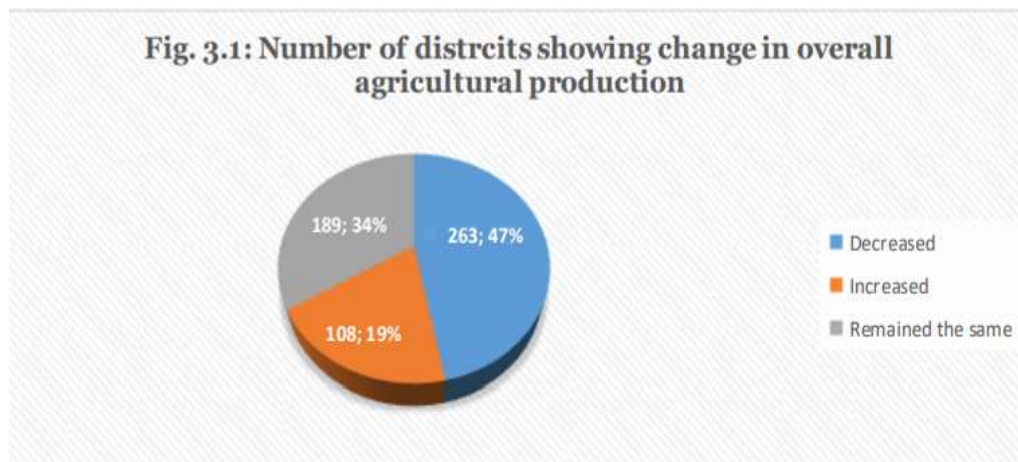
However, farmers did not receive any further support under PM-KISAN. Nonetheless, they benefited from an early advantage that is typically acquired later.

## 2. STATEMENT OF THE PROBLEM

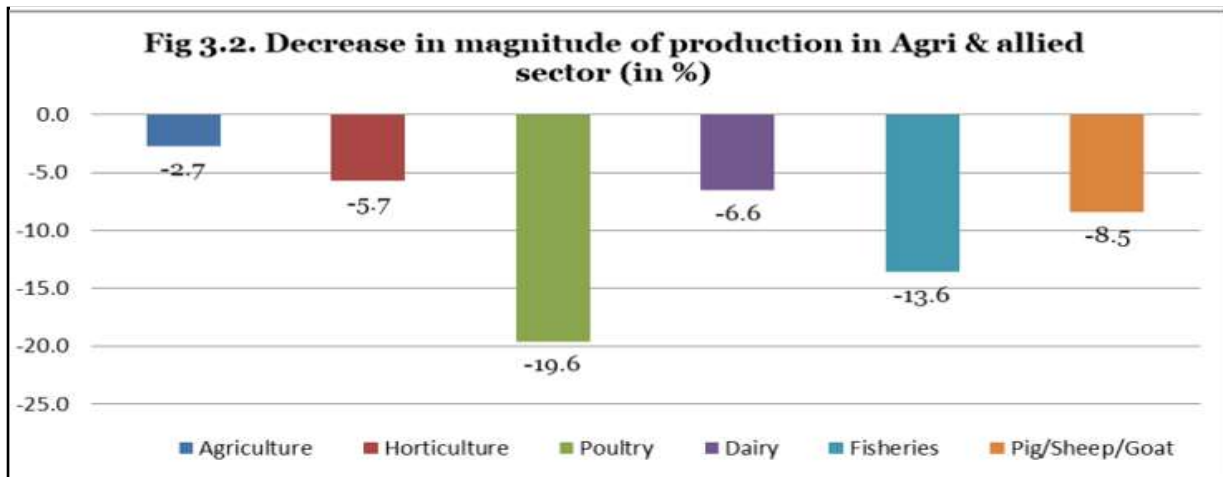
Cross-border movement restrictions and lockdowns cause agricultural labour shortages. In some circumstances, disturbances downstream from the farm gate cause surpluses, straining storage facilities and increasing food losses.

Most states' agricultural output has fallen. Chhattisgarh (13%) and Himachal Pradesh (15%) have lower agricultural productivity. Telangana (23% rise), Punjab (5% increase), Rajasthan (4.4%), and Gujarat (6.7% increase) have demonstrated an increase in agricultural productivity, which may be ascribed to bumper rabi crop production and harvesting finished before the epidemic and lockdown.

In 47% of sample districts, the nationwide lockdown enforced due to COVID-19 has significantly reduced agricultural and allied production. Fig. 19% of districts reported an increase in total sector output, but 34% indicated no change. Lack of manpower and equipment, social separation, and movement restrictions have all contributed to the collapse of agriculture.



Through this poll, COVID-19 and the ensuing lockdown on the rural economy's sub sectors were also assessed. To do this, the agriculture and related sector was separated into Agriculture, Horticulture, Poultry, Dairy, Fisheries, and Pig/Sheep/Goat. Figure 3.2 shows production variations in India's subsectors. Poultry production fell 19.6%, followed by fisheries at 13.0%. Crop production fell 2.7%. Since harvesting of essential rabi crops like wheat, mustard, gram, etc. was virtually complete by April 2020 in most states and farmers had already brought most of their harvest home, the negative impact on the Crop sector was minor. Poultry production declined by 19.5%, followed by fisheries (-13.6%), sheep/goat/pig (-8.5%), dairy (-6.6%), and horticulture (-5.7%).

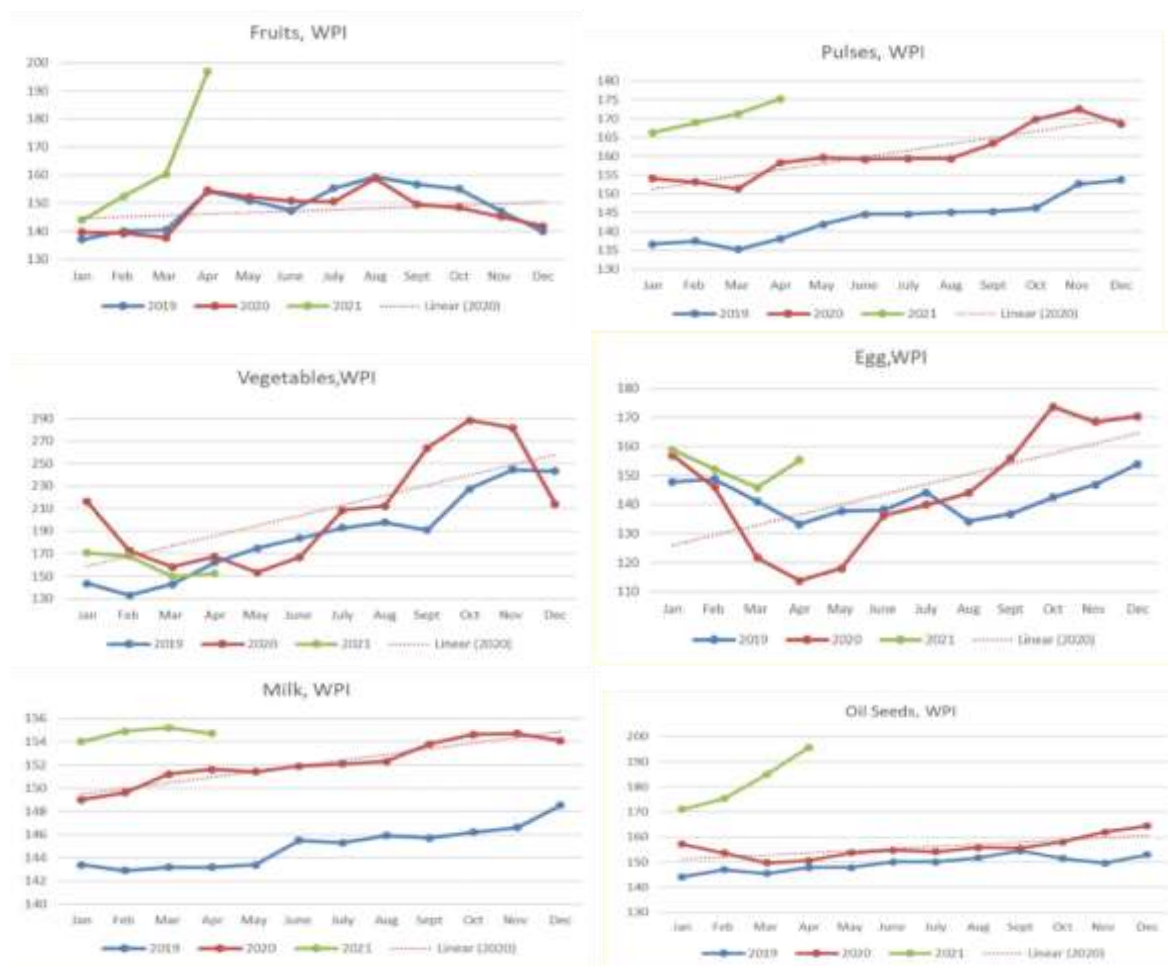


In April 2020, demand for poultry, fisheries, and sheep/goat/pig (S/G/P) products dropped. This was owing to widespread anxiety that animal products were Coronavirus carriers and may be a source of infection. This fear originated after COVID 19, which created widespread concern that animal products were a potential source of infection. These industries' production cycles were affected. In the dairy industry, milk demand was unaffected by the shutdown, but sweets, khoya, paneer, and cream were. Hotels, restaurants, confectioneries, parlours, and street sellers closed, reducing demand for processed dairy products. Due to declining demand, dairy producers weren't getting profitable prices for their milk, causing a reduction in milk production. According to field reports, dairy producers have reduced the amount of green and dry hay, feed, etc. given to their animals, reducing milk production. Within a month of the lockout, dairy production in India dropped 6%.

### 3. OBJECTIVES OF THE STUDY

- To know how covid-19 has affected the agricultural sector,
- To analyse agricultural productivity before and after covid,
- To learn how the agricultural sector has been affected by Covid-19,

With limited demand, the price of food dropped dramatically on a global scale. Due to a drop in gasoline demand, corn prices dropped significantly. In India, demand and supply both sharply decreased, which resulted in a drop in the price of agricultural commodities. For the majority of the products, there was a clear reduction in mandi pricing. In the majority of cases, wholesale costs have decreased while retail prices have been rising. The restriction that was put in place and the increased transaction costs for the retailers were linked to the occurrence of the increased retail price. Retail food costs increased by 2.3% from March to April 13, 2020, according to the Reserve Bank of India's (RBI) daily price review of 22 basic food products. Farmers, however, noticed a sharp decrease in farmgate prices as a result of the widespread price increases at the consumer end. The lack of transportation decreased the farmgate price, particularly for perishable items like perishable fruits and vegetables. Farmers who participated in the poll reported that vegetable prices dropped by more than 50%, making it impossible for them to recoup their production costs. The transaction cost increased as a result of the restriction and decreased number of transport trucks, which reduced the farmers' large margins in vegetables and fruits. Due to purchases made by the agriculture marketing board, the wholesale pricing index (WPI) only showed a tendency of growth in March and April for pulses, fruits, milk, and meat; however, for cereals, the WPI declined while the consumer price index (CPI) increased. The supply chain disruption and supply-side shocks are to blame for this difference in the WPI and CPI. The government took the appropriate steps to relocate the crops from the states where they were purchased and efficiently distributed them. Fruits' prices increased as a result of supply chain interruptions, particularly apple and mango. Private dairy groups increased the cost of milk by Rs. 2 to 3 per litre. Vegetables and eggs saw a sharp decline in WPI, but after the lockdown was lifted in July 2020, demand resumed. Since the beginning of the pandemic, in March 2020, the WPI of pulses has been rapidly rising.



#### 4. DATABASE AND METHODOLOGY

farmers, rural communities, and their most valued concern are used to analyse agriculture system risks from covid-19 pandemics.

First, covid-19 has caused deaths, infections, health difficulties, stress, and trauma in rural areas. Several studies reviewed these risks for farmers and rural communities, including suicides.

Covid-19 affects farmers' losses, especially fresh crops, fruit, and milk. These losses were attributed to travel and interaction restrictions, labour losses, and restaurant, hotel, and other business closures.

Covid-19 epidemic is expected to harm soils, ecosystems, flora and animals.

Scholars have identified several hazards for the break of agricultural economic development owing to pandemics linked to food export and import break, bankruptcy of enterprises, loss of revenue, unemployment, poverty, and inequality. As pandemics have far-reaching effects on international relationships outside of agriculture, export limitations hinder global agricultural products, food trade, and market access. Interconnected agriculture. All closed ports and airports or drastically reduced agricultural freight capacity can disrupt global food and agriculture supply systems.

Most research analysing covid-19's influence on agriculture emphasized food insecurity as the principal consequence, tying it to poor health impacts on the population.

Studies in developing Asian countries like India, Malaysia, and Nepal showed that lockdown had huge negative effects on attaining Sustainable Development Goals (SDG) linked to food and nourishment (SDG1 and SDG2), especially in least developed and developing countries due to a lack of actions to sustain food production and ensure food safety and supply security. Food supply interruptions can harm people around the world. Due to the covid-19 outbreak, food distribution channels in most countries have been severely disrupted, affecting the most vulnerable.

During the covid-19 pandemic, panic buying hindered supermarkets' ability to replenish after enormous demand. Fresh food like vegetables, fruits, and dairy products were lost due to farmers' inability to transport them to local markets or logistical challenges with delivering them to stores in local cities.



## 5. METHODOLOGY

When broken down, the most pressing issues are found to be pesticides, a shortage of labour, fresh crops, soil deterioration, and a lack of transportation options.

Our ultimate goal is to aim for low cost with more benefits

Drone technology is used to solve multiple problems at once.

For example:

AGROSCOUT, a firm based in Israel, developed a SaaS system that it uses to keep an eye on, sniff out, and report on crops.

so as to share information on crops.

in that it affords

- Symptomatic analysis of crops  
Pest and disease outlook on a plot-by-plot basis
- Assessing Emergencies  
Plant stand detection and dynamic scouting
- Assessment of Biomass  
True insights into canopy convergence throughout the plant life cycle
- Satellite-based surveillance  
Use NDVI and RGB satellite imagery to monitor crop health and detect changes.
- The Carbon Footprint of a Product  
Slash your business's carbon footprint.

Among the benefits of employing this technology are

\*Revamp your supply chain operations.

\*Increase your earnings

Successfully accomplish environmental objectives

Why isn't India, which has all the requirements and is agriculture's backbone, in a different position, given that it is a desert region that uses low-cost methods and fewer facilities? Now is the time to act and restore our country's agricultural pre-eminence.

The big question is whether or not conventional farmers will welcome this fresh approach.

Among the 43 farmers polled via telephone, 21 agreed, 12 expressed unease, and 10 expressed interest in testing the system out first.

not a bad idea, and I think farmers will agree with the overall prediction that it will be accepted by 52% of the population.

## 6. RESULTS AND DISCUSSION

The below data shows the positive results of few successful new approaches and its financial impacts

The Financial Effects of Precision Agriculture

Profitability was initially analysed in relation to the number of PA technologies adopted to determine if there were any significant differences in profitability between early adopters and late adopters. Net farm income (NFI), net farm income ratio (NFIR), and operating expense ratio (ERR) were examined as indicators of profitability or efficiency (OER). Net farm income and operating expense as a percentage of gross farm income are two examples of financial ratios. Although Net Financial Income (NFI) is easily understood, the Net Financial Income Ratio (NFIR) is a measure of efficiency that reflects one's ability to convert gross income into net income. Like OER, a lower OER indicates greater efficiency in converting operating inputs or expenses (less interest and depreciation) into gross income. Table 1 displays the results of a preliminary regression analysis that evaluates the effects of implementing PA technology.

**Table 1. Precision Agriculture Adoption Impact on Profitability Regression Results**

Dependent Variable	Parameter Estimate	Standard Error	t-Value	P-Value
Net Farm Income	43,616***	10,495	4.1557	0.0001
Net Farm Income Ratio	1.0399	.06964	1.4932	0.1359
Operating Expense Ratio	-1.0404*	0.4736	-1.8140	0.0701

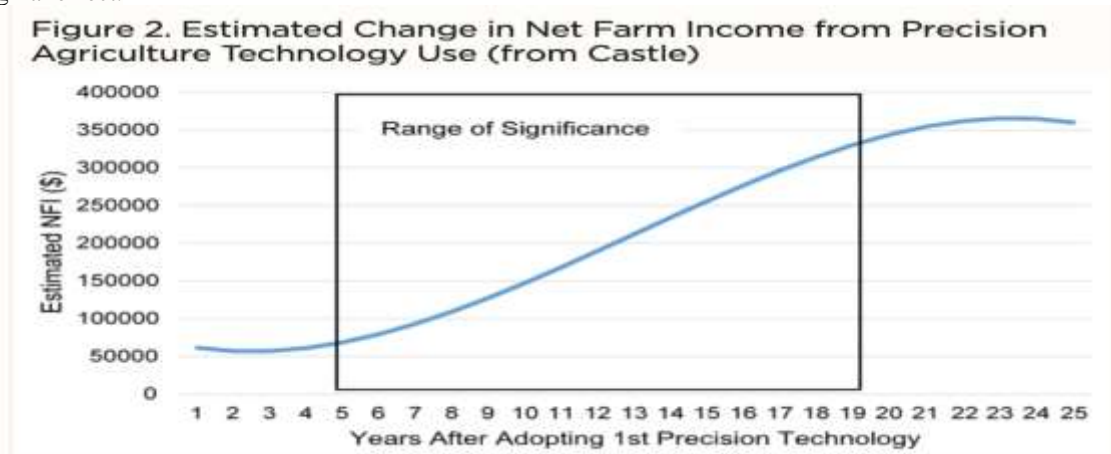
Table 1's NFI parameter suggests that each additional technology adopted increases net farm income by over \$43,000, a statistically significant measure. Each additional technology increases NFIR by 1.04 percentage points and decreases OER by 1.04 percentage points. However, neither parameter estimate is statistically significant (=0.05). (P-values of less than 0.0500). Initial regression results suggest PA technology adoption is linked to higher profitability. This initial analysis only shows a strong relationship. Whether PA technology adoption drives profitability or profitability drives PA technology adoption (or if they endogenously drive each other) is unclear. To test the hypothesis that PA technology adoption drives profitability, the analysis compared pre- and post-adoption NFI. An initial linear regression of technologies used by years provided support for the hypothesis. The impact of years used may not be linear, but may be sigmoid, or S-shaped, reflecting a learning curve associated with PA technology adoption. The learning curve can represent many skills and could describe PA technology, where adoption is initially small as knowledge or skill is gained or data is collected. Once enough data and skill are available, the benefits of PA technology adoption could grow quickly to a point where further gains are limited. Analysing pre- and post-adoption data with a polynomial regression model estimates an adoption learning curve. Table 2 shows polynomial regression results.

**Table 2. Polynomial regression of precision agriculture's impact on farm income**

Variable	Parameter Estimate	Standard Error	t-Value	P-Value
Tech. Use	70,697	45,394	1.5573	0.119
Tech. Use *Years Used	-11,855	13,427	-0.8830	0.3776
(Tech Use*Years Used) <sup>2</sup>	2,635*	1,372	1.9199	0.0553
(Tech Use*Years Used) <sup>3</sup>	-67.91	42.48	-1.5985	0.1104

*Note: Year dummy variables were also included to control for the time trend. \* indicates statistical significance at the  $\alpha=10\%$  level.*

The polynomial model shows greater statistical significance for explanatory terms than the simple linear model, but parameter estimates and interaction term significance don't provide an interpretation. The measure of significance is the marginal effect of an additional year of technology use on NFI. Figure 2 shows PA technology's marginal effect.



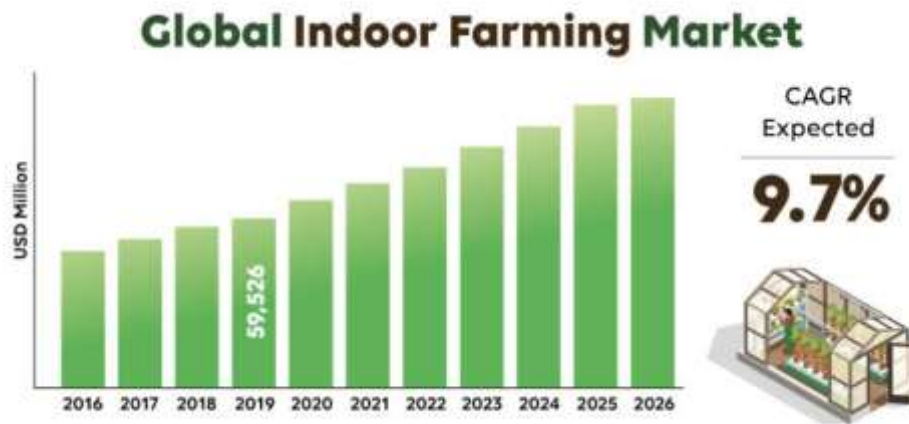
### Share of Indoor vertical farming in the global farming market

The last few years have seen tremendous growth in the popularity of indoor vertical farming among global growers. Numerous farmers in North America and Europe are switching from conventional to indoor vertical farming since it uses less land and water and yields a more profitable crop. The market is being driven by a number of issues, such as the rapidly expanding population, shifting climatic conditions, depletion of natural resources, rising urbanisation, and a lack of water supplies. Numerous businesses, like Aero Farms, Gotham Greens, and Plenty, among others, are actively engaged in vertical farming to address the issue and provide a wide selection of fruits and vegetables.

The market for indoor vertical farming worldwide was valued at USD 59,526 million in 2019 and is projected to grow at a CAGR of 9.7% to reach USD 117,214 million by 2027.

### Market share of Agricultural drones

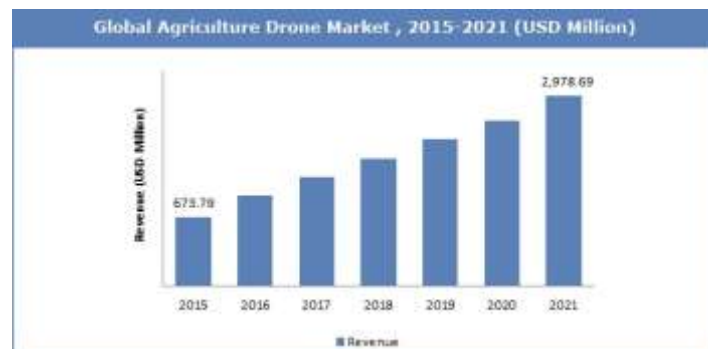
A drone in agriculture can be utilised for a variety of tasks, including soil and field analysis, planting, crop



spraying, crop monitoring, and irrigation. Drone-generated data can assist farmers in gaining a more precise and in-depth understanding of how their crops are responding to their management plans, potentially resulting in the most efficient use of scarce resources. Drones of various kinds contribute to increased agricultural productivity.

A growing number of drone applications in the agricultural sector have led the sector to invest heavily in funding UAV-based enterprises. Additionally, the market expansion for agricultural drones is being fuelled by an increase in funding from venture-based companies. However, over the course of the projected period, the market for agricultural drones may be constrained by a lack of experienced pilots and strict restrictions.

A rise in the market's use of agriculture drones is due to the need for technological improvements in farming equipment and the improvement of farming practises. Agriculture drones powered by solar energy and GPS mapping developments are anticipated to boost business expansion throughout the forecast period. Drones have the ability to implement more effective plantations with crop rotation plans and provide vital information on the daily progress of crops, which would further contribute to the market's expansion.



The key players involved in the agriculture drone market are GoPro, Google, Boeing DJI, Trimble Navigation Ltd., Drone Deploy, Ageable LLC, AeroVironment, Inc., Agribotix LLC, Auto Copter Corp., 3DR, Honeycomb Corp., Parrot SA and Yamaha Motor.

### 7. SUGGESTIONS

1. It is important to always give respect to our roots, but the approach must change depending on the circumstances. Soil degradation, crop damage, and other agricultural issues would be greatly diminished if we could eliminate their root causes. etc.
2. Since this modern form of farming reduces costs for both the state and farmers, the government should encourage and support a wide variety of similar programs.
3. A little chill can do wonders for storage facility offices. storage bins or silos that can be placed on a municipal scale based on the Panchayat's holdings and the city's account balances society.
4. If they adopt the new method, banks will be more willing to extend credit, and farmers will have an easier time paying it back as output rises.



5. Farmers can increase their earnings by cutting out the middleman and buying from one of the many companies that buy from farmers and sell it on the open market.
6. The general public ought to adopt this strategy in which consumers will buy directly from farmers for the sake of all parties involved.
7. Farmers and the general public would both benefit from government-enforced price stability.
8. Tenant rights improvements are essential for agriculture's growth. The value of land must be locked in at a constant rate

## 8. CONCLUSIONS

There is a window of opportunity right now to not only effectively respond to the current crisis, but also to roll back support that is distortive, inefficient, and harmful to the environment. This would free up capital for investments in a food system that is more productive, sustainable, and resilient, and would allow it to meet new challenges. Together, this and the accompanying regulatory reforms have the potential to help create an environment that is conducive to the development of a food system that is in harmony with the limits of natural resources, a changing climate, rising consumer demand, innovative technologies, and "low probability, high impact" catastrophic risks. In the wake of the unanticipated shock caused by COVID-19, it is necessary to implement a policy package that takes a more forward-looking approach and invests in the productivity, sustainability, and resilience of the global food system.

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