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Crop Sowing Pattern in India Using Analytical Approach

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Abstract
Agriculture plays a big role in Indian society and economy. Due to role in ensuring food security, agriculture is very important for India. India is one of the largest producer of food in the world and agriculture production is increasing over the years. Arrangement of crop on a piece of land is called crop pattern. Crop sowing pattern is a challenging task for farmer and policy makers because sowing pattern totally depends on natural factors like rainfall, temperature, soil etc. The Minimum Support Price (MSP) of many crops has also been fixed by the Government of India and it keeps changing year after year. Apart from natural factors, this is also an important factor which affects the crop sowing pattern. This paper aims to see the sowing pattern of major crops grown in India using analytical approach.

Keywords: Cropping pattern, analytical approach, influential factors, MSP

Introduction

As India is a one of the largest food producers in world. However, there is a question is India producing enough food for its population. There are many factors which are influencing this situation like growth of population, productivity of agriculture, climate and environment factors.

Approximately 60% population are directly or indirectly working in agriculture field. Agriculture provide food to people, raw material to various agro industries and fodder for livestock. Hence, cropping pattern and combination of crops are the important aspects for better agriculture output. Cropping pattern is changing in India over space and time. There are some factors like topography, rainfall, soil property, temperature, humidity, availability of water, pH value and MSP are responsible for the cropping pattern.

In agriculture sector Government has taken many initiatives in past few years. Major initiatives are as National Animal Control Pradhan Mantri Krishi Sichai Yojna (PMKSY), Pradhan Mantri Samman Nidhi Yojna, Transport and Marketing Assistance (TMA) Scheme, Primary Agricultural Credit Society (PACS), AGRI-UDAAN programme. Many achievements in Indian agriculture sector like sugar production has reached 33.16 MT in 2018-2019 its export became more than 5 MT, agriculture storage capacity reached 131.8 MT, the Electronic National Agriculture Market (eNAM) is a national market for agriculture produce [1].

Major focus of agriculture policy or strategy which was implemented earlier was primarily on the agriculture production and improvement in food security of country. This was achieved by introducing quality seeds, agro chemicals, fertilizers, increase use of irrigation etc. These policies or strategies were not in favour of farmer's income [2]. NSSO published a report in year 2016, which shows annual income of agricultural household between July 2012 and June 2013. As per this report, an annual average income of agricultural household was Rs. 77112 [3]. After green revolution, food production increased in India, which made India self sufficient in food and India also became a food exporting country. In some cases, growth in agriculture output brings similar growth in the income of farmer, but in many cases, income did not grow as much with increase in agriculture output.

Literature Review

Locating and describing cropping system is required for scenario or diagnostic needs, where environment models are used to simulate cropping systems impact [4]. To increase the monitoring of cropping practices in the context of best management of agricultural environment issues and food security the sentinel constellation is expected [5]. Yang discussed the impact of cropping practice on soil health and issues in agricultural ecosystems that highly affect the soil health, how various cropping practices have developed year on year with human activities in agricultural ecosystem [6]. Cropping practice includes practice of harvesting, irrigation, varieties of crop and fallow. The cropping system effective management is through control of chemicals, diseases, nutrients, usage of land, and the choice of suitable cropping pattern to maximize yield and optimize the use of available resources [4,6,7].

On the basis of crop arrangement in the field, cropping pattern is distinguished in two categories one is monocropping (per year one crop in the field) and multiple cropping (per year more than one crop in same field) [8]. Multiple cropping practice can reduce risk of crop failure [9]. Soil fertility can improve by complementary pairing of different crops [10]

Crop Sowing Pattern in India

1. Methodology

The objective of research work is to analyze crop sowing pattern in India. The dataset utilized in this study consists area of crops, MSP, production of crops, use of fertilizers and yield data for 15 different crops in India. These data were collected from various resources and underwent thorough preprocessing to ensure quality and consistency.

2. Dataset

This paper uses related data from 1950 until 2020 of 15 crops. Variables related to crops are as follows:

- Yearly sowing area (in million hectares)
- Yearly production (in million tonn)
- Yearly yield (in kg per hectare)
- Yearly use of fertilizers (in lakh tonn)
- Yearly MSP (in rupees)

3. Description of Variables

Table 1 is showing a summary of all the variables. It includes variable name, variable description and variable type.

Table 1 Description of Variables

Sno	Variable Name	Description	Type
1	Year	Represent year	int64
2	Item	Represent crop	object
3	Area	Represent sowing area of crop in million hectares	float64
4	Production	Represent production of crop in million tonns	float64
5	MSP	Represent Minimum Support Price in rupees	float64
6	Yield	Represent kg yield of crop per hectare	int64
7	Total (N+P+K)	Represent fertilizers in lakh tonn	float64

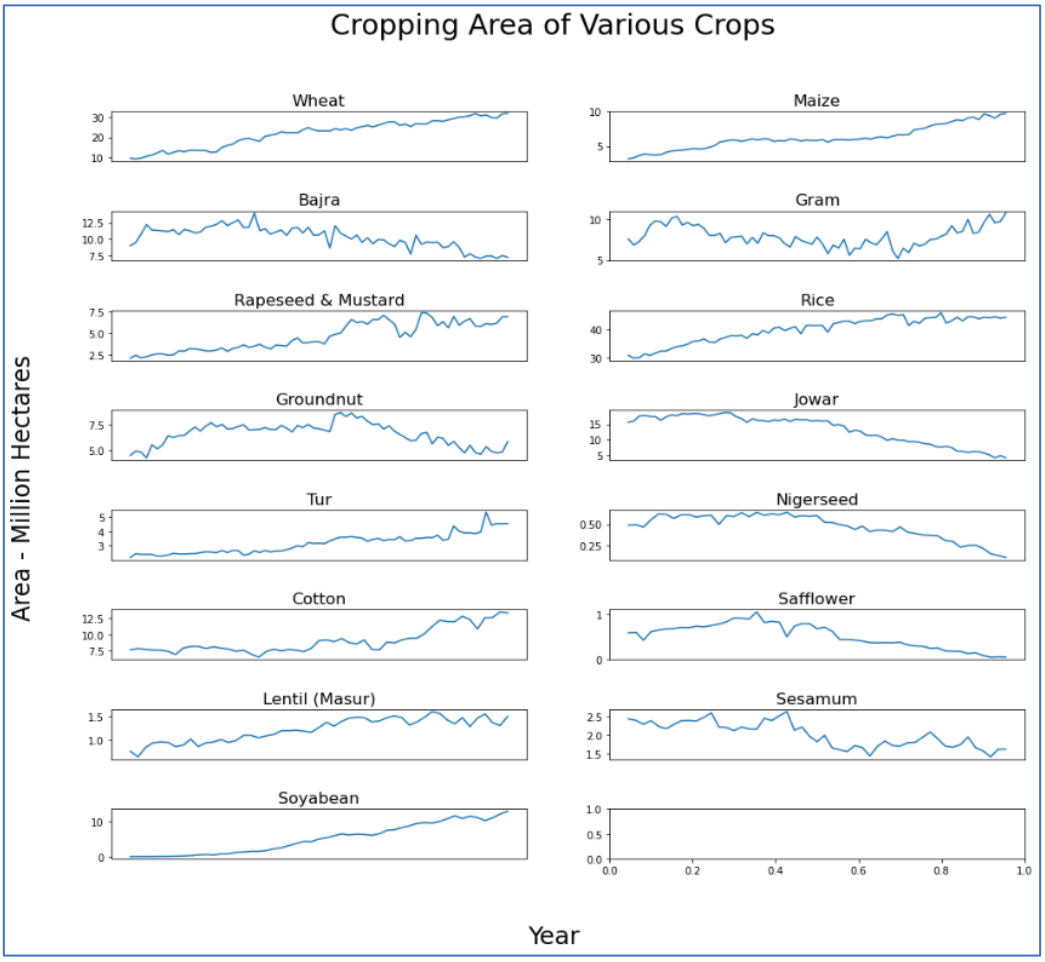
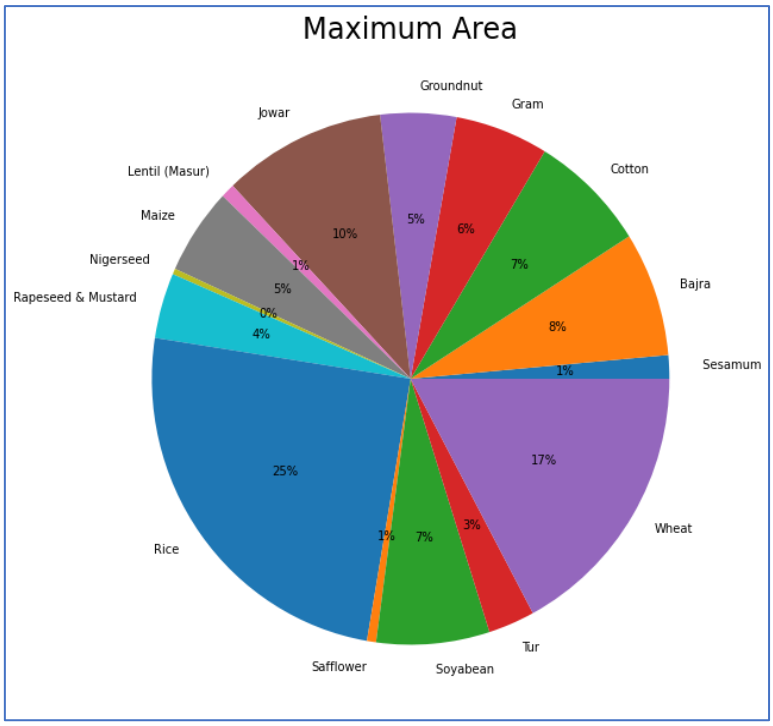


Figure 1 Selected Crops – Maximum Area



4. Crop Area

There is a big change in the area of crops selected for this paper. As per fig 1, after analyzing 50 years data for all selected crops, it is clear that there is continuous increment in the area of few crops, but there is decrement in the area of other crops. In present time wheat and rice have 42% share in area of sowing and remaining 13 crops have 58% sowing area.

5. Crop wise yield

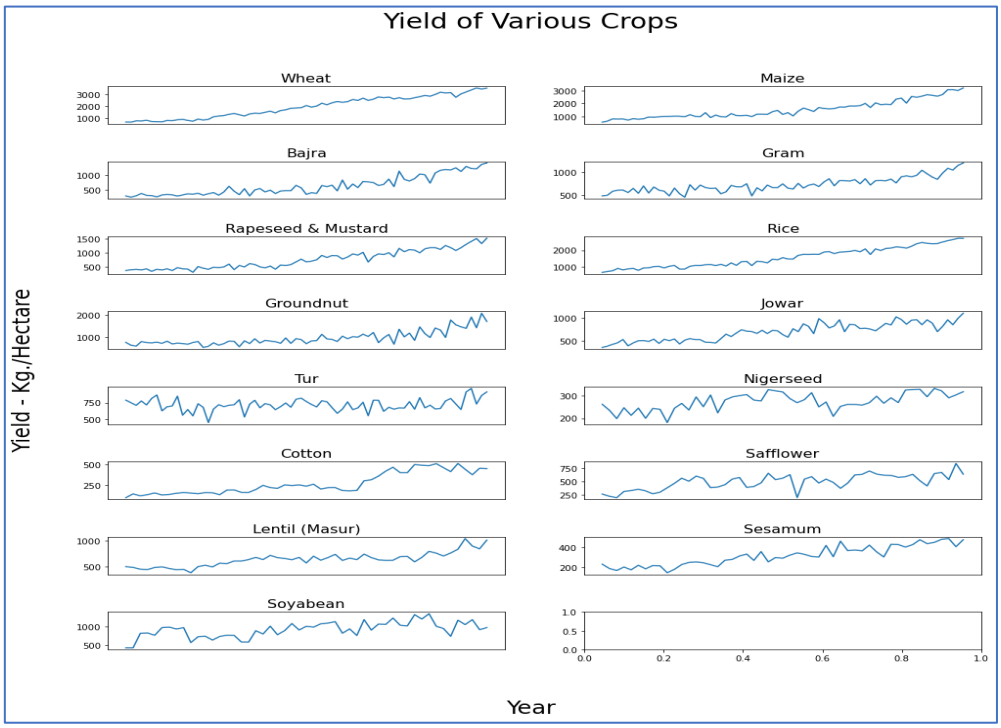


Figure2 Selected Crops - Mean, Min and Maximum Value of Yield

Production of yield (minimum, average and maximum) per hectare for all selected crops has been shown in the fig 2. It is clearly seen that yield of every crop has increased. There are few crops showing high increase in yield per hectare like Wheat, Rice, Maize and Groundnut and other side Nigerseed is a crop which is showing lowest increment.

6. Crop wise MSP

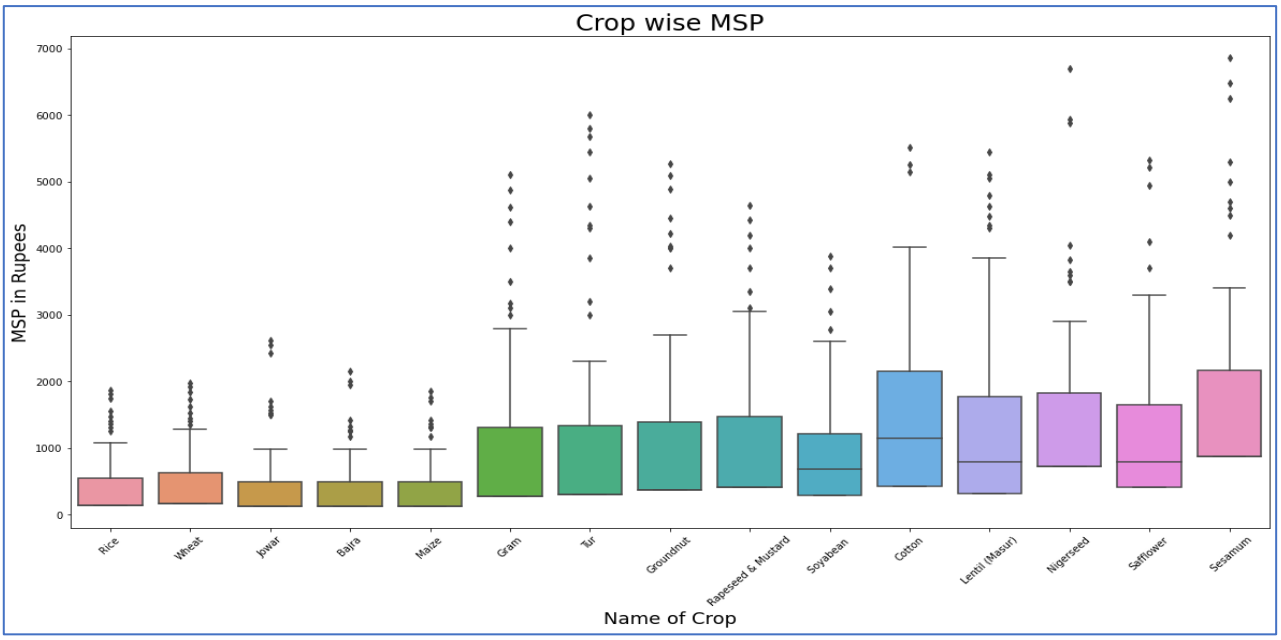


Figure 2 MSP of Selected Crops

No trader can by crop below MSP, which is the price of a crop fixed by the government. Keeping MSP in view, farmer at the time of sowing can select the crop, so that the crop which has higher MSP can be sown in more area.

In the fig 3 and fig 4, last 50 years MSP data of selected crops for the paper has been analyzed. In this, it was found that there is a good increase in the MSP of few crops (Groundnut, Gram, Tur, Lentil, Rapeseed, Cotton, Nigerseed, Safflower and Sesamum) but the MSP of other crops (Rice, Bajra, Wheat, Sorghum, and Soyabean) has not increased much.

Conclusion

Significance crop sowing pattern is helpful for Government agencies, farmers, various institutions, traders and policy makers. There is some importance finding is as follows:

- The area of few crops like Groundnut, Sesamum, Nigerseed, Lentil (MasurRapeseed) & Mustard, Safflower and Tur has not increased as much as other crops. The area of Wheat, Rice, Soyabean and Maize has increased a lot.
- There is a significant growth in the yield of many crops like Wheat, Rice, Soybean, Safflower, Bajra, Rapeseed & Mustard, Cotton and Maize. On the other hand, the yield of crops like Nigerseed, Gram, Tur and Jowar has not increased to the same extent like other crops.
- The MSP of few crops like Sesamum, Lentil (Masur), Cotton, Gram, Safflower, Groundnut, Nigerseed, Rapeseed & Mustard and Tur has increased more than other crops.

- When we see most profitable crop as per yield and MSP, then its order from increasing to decreasing will be like Groundnut, Rapeseed & Mustard, Wheat, Gram, Maize, Tur, Lentil (Masur), Soyabean, Rice, Safflower, Sesamum, Bajra, Jowar, Cotton, Nigerseed.

Although Groundnut, Rapeseed & Mustard, Gram, Tur and Lentil (Masur) are more profitable crops but their area has been decreasing year by year. In future we can also predict crop yield using predictive machine learning technique, we can also analyze combination of crops as per season.

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