India's Agricultural Crop Production Analysis (1997-2021)

Project Based Experiential Learning Program

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1. INTRODUCTION:

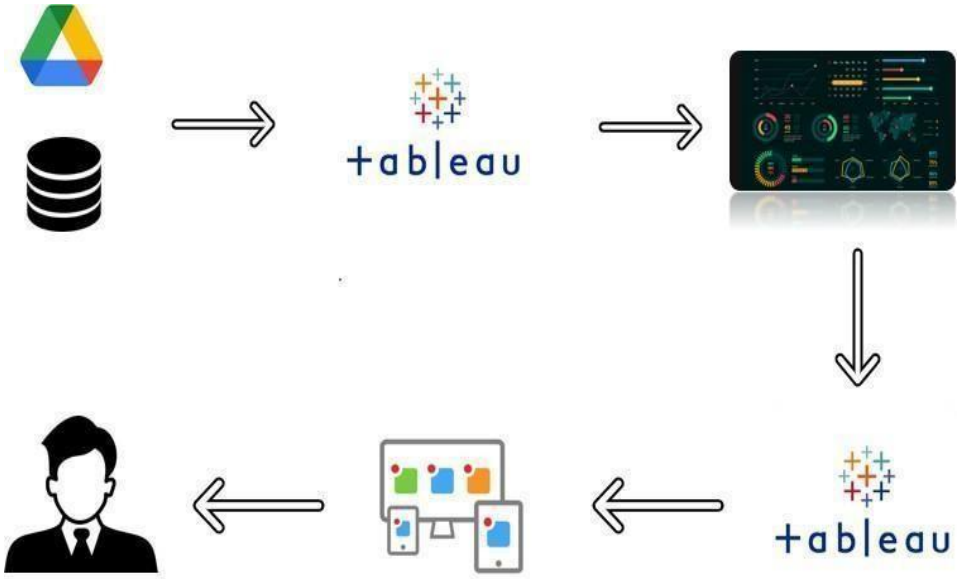
1.1 Overview

This report delves into the captivating realm of India's agricultural cultivation, providing a comprehensive visual exploration of key aspects and trends in the agricultural sector. Through the visual representations, readers can gain valuable insights into crop production, seasonal variations, regional distribution, and overall production trends. These visualizations enable intuitive analysis, allowing stakeholders to uncover patterns, identify areas of growth or concern, and make data-driven decisions. By harnessing the power of Tableau, this report not only presents the data in a visually appealing manner but also provides an interactive experience for readers to explore the intricacies of India's agricultural cultivation. To Extract the Insights from the data and put the data in the form of visualizations, Dashboards and Story we employed Tableau tool.

1.2 Purpose

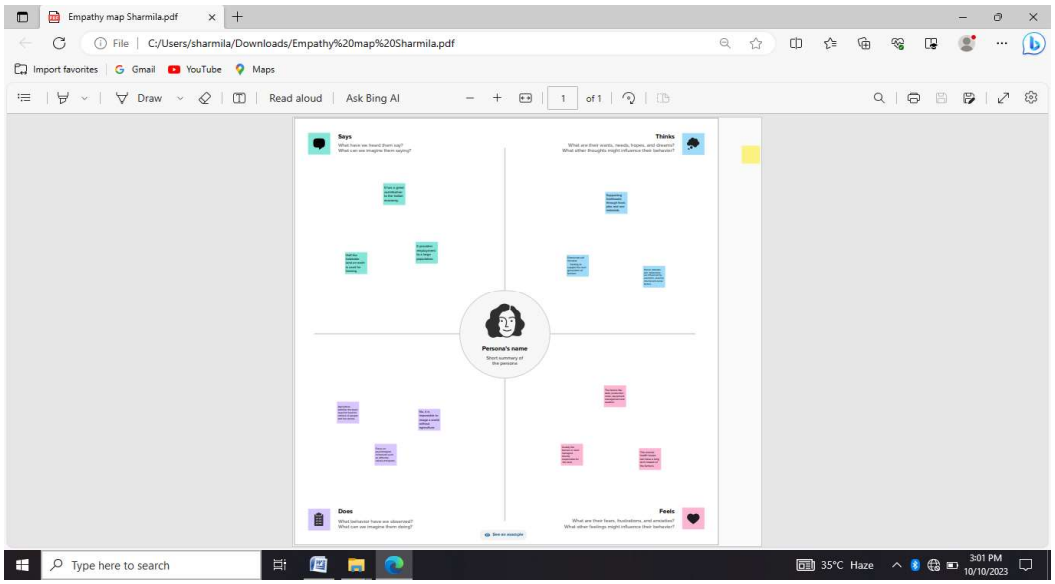
Crop production is a common agricultural practice followed by worldwide farmers to grow and produce crops to use as food and fibre. This practice includes all the feed sources that are required to maintain and produce crops. Crop production is the basis for providing the livestock industry with feed, and the population with food. Also, crop products are used in many industries as raw materials of plant origin, such as food, textile, pharmaceutical, fuel and others. the main purpose of agriculture supporting livelihoods through food, habitat, and jobs; providing raw materials for food and other products; and building strong economies through trade.

Technical Architecture:

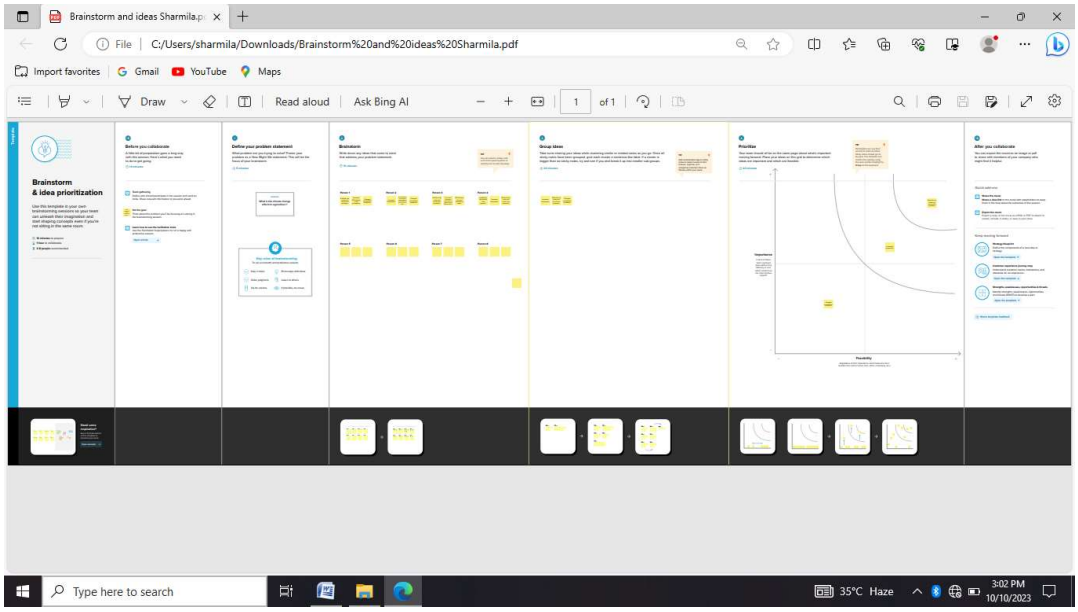


2. Problem Definition & Design Thinking

2.1 Empathy Map screenshot :



2.2 Ideation & Brainstorming Map screenshot :

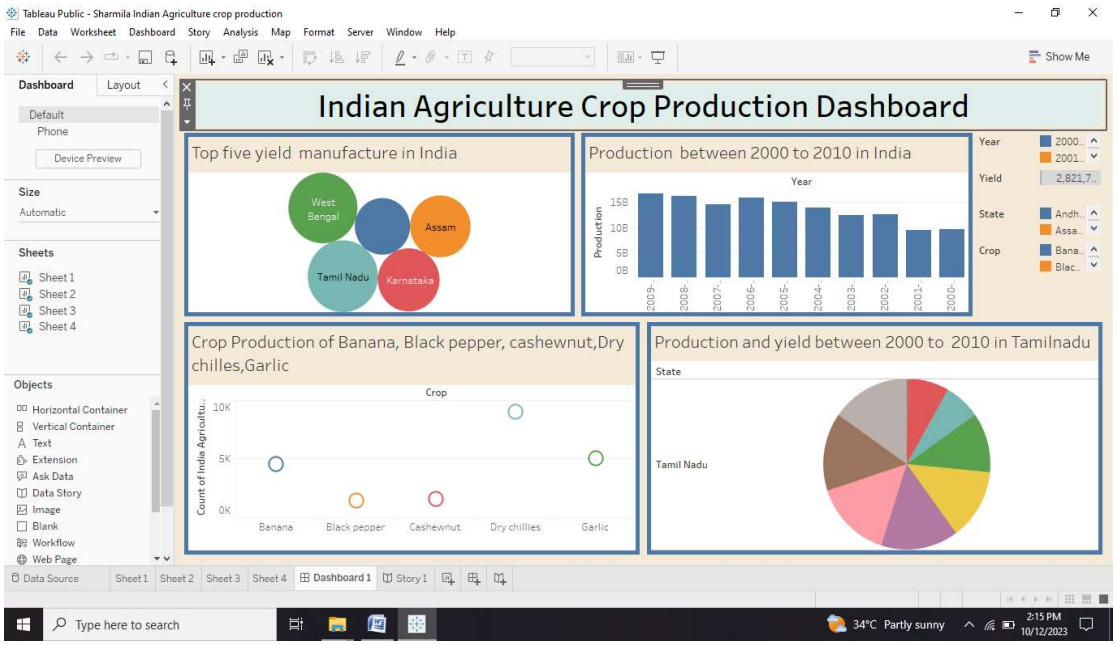


3. RESULT

3.1 Dashboard :

Link:
https://public.tableau.com/app/profile/sharmila.k1771/viz/SharmilaIndianAgriculturecropproduction/Dashboard1

Tableau Public Screenshot for Dashboard :

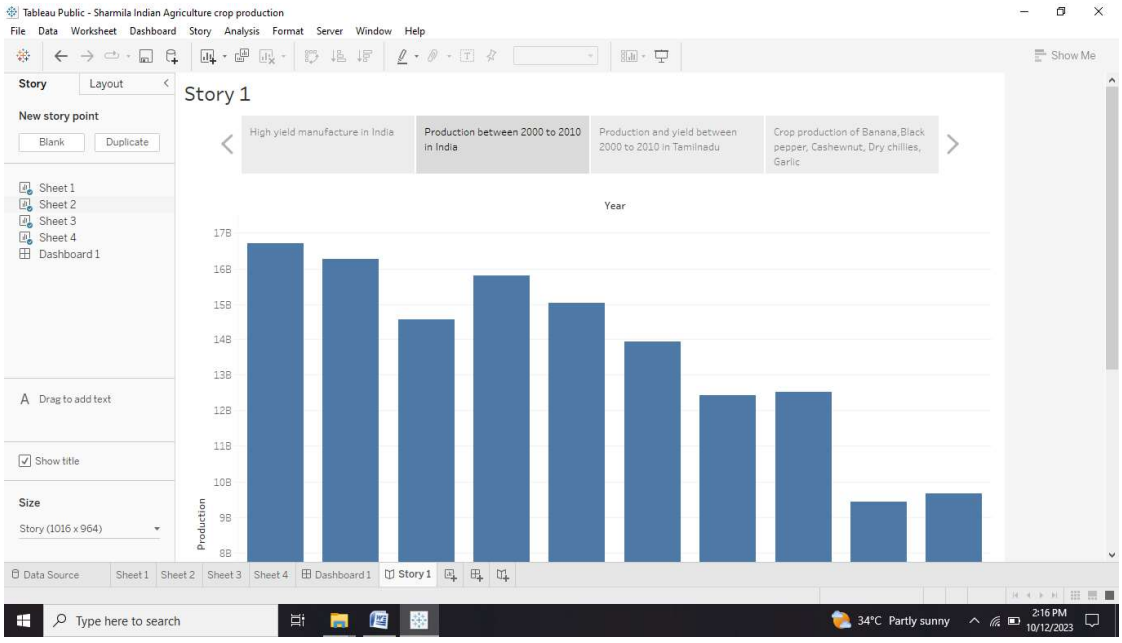


3.2 Story

Link:

https://public.tableau.com/app/profile/sharmila.k1771/viz/SharmilaIndianAgriculturecropproduction/story1

Tableau Public screenshot for Story:



3.3 Web Application

HTML Template Screenshot:

4. ADVANTAGES & DISADVANTAGES

4.1 Advantages of Crop Production

1. Increases Soil Fertility

Prolonged planting of the same crop type leads to the depletion of specific nutrients in the soil. Each crop type has a different nutritional interaction with the soil, and each releases and absorbs different types of nutrients. It also increases and improves soil organic matter caused by the micro-organisms left behind by each crop planted.

2. Increases Crop Yield

Crop rotation increases the harvest obtained from a single seasonal harvest. Because of the incorporation of different crop types, one gets not only a variety of crops after each season but also a general bounty harvest. The availability of nutrients from the soil provides abundant nourishment to all plants, ensuring success in the yield produced.

3. Increases Soil Nutrients

As stated earlier, crop rotation allows the land to regenerate and rejuvenate its nutrients without fertilizers. Leaving the land bare for a season enables the land to restore the soil nutrients lost through absorption by plants harvested in the previous season. Moreover, by planting crops like legumes,

4. Reduces Soil Erosion

Soil erosion is the carrying away of the most important topsoil layer, either by wind or water. Crop rotation also helps reduce raindrop impact on the soil and general erosion by water because the roots of the plants hold the top layer of soil together. Trees planted together with crops on the farms also assist in preventing soil erosion.

5. Limits the Concentration of Pests and Diseases

Plus, as a farmer, when you know the kinds of pests and diseases that break out at a given time of the year and the crops affected, you can plant the host plant at a different season when the chances of infestation are low.

4.2 Disadvantages of Crop Production

1. It Involves Risk

In crop rotation, investing in a season involves a lot of money to buy different seedlings of the different types of crops to be planted.

2. Improper Implementation Can Cause Much More Harm Than Good

Improper implementation of this technique causes much more harm than good. If one lacks the technical know-how, there is no need to experiment with it. Otherwise, it can result in nutrient buildup that will take longer to correct.

3. Obligatory Crop Diversification

For crop rotation to work, one has to plant different crops every time. Nonetheless, it does not allow a farmer to specialize in a single crop type. The farmer cannot produce a single crop on a large scale over a long period because of the damage it will do to the soil.

4. Requires More Knowledge and Skills

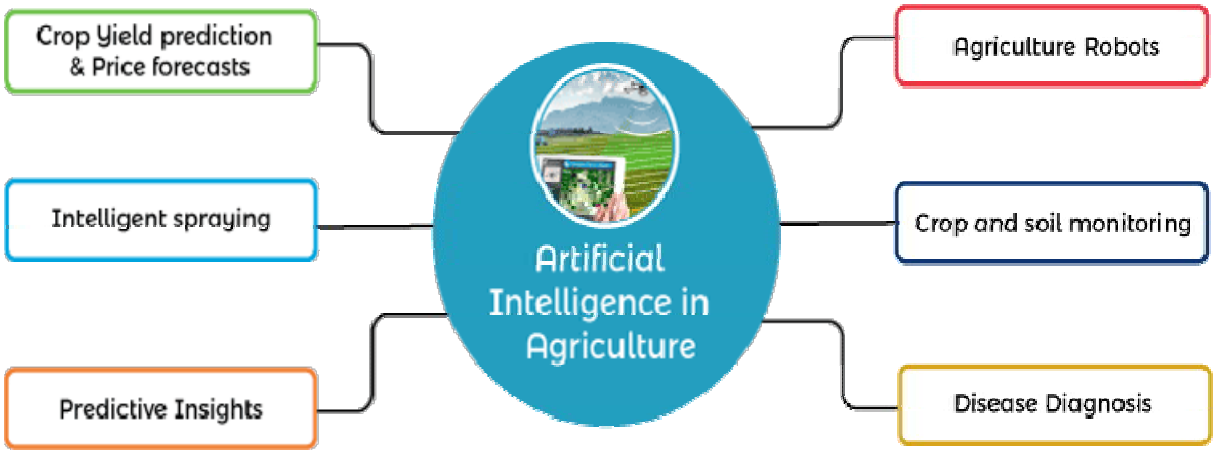
Crop rotation means a variety of crops; therefore, it requires a deeper set of skills and knowledge regarding each type of crop harvested. It also necessitates working with different types of machinery, and operating them also requires knowledge. Hence, farmers must invest more time and resources in learning and mastering this agricultural practice.

5. APPLICATION

Applications of artificial intelligence in agriculture:

Agriculture plays a crucial role in the economic sector for each country. Population around the world is increasing day by day, and so is the demand for food. The traditional methods that are used by the farmers are not sufficient to fulfill the need at the current stage. Hence, some new automation methods are introduced to satisfy these requirements and to provide great job opportunities to many people in this sector. Artificial Intelligence has become one of the most important technologies in every sector, including education, banking, robotics, agriculture, etc. In the agriculture sector, it is playing a very crucial role, and it is transforming the agriculture industry. AI saves the agriculture sector from different factors such as climate change, population growth, employment issues in this field, and food safety. Today's agriculture system has reached at a different level due to AI. Artificial Intelligence has improved crop production and real-time monitoring, harvesting, processing and marketing. Different hi-tech computer-based systems are designed to determine various important parameters such as weed detection, yield detection, crop quality, and many more.

Artificial Intelligence in Agriculture:



As with the traditional methods of Agriculture, there are so many challenges that farmers would face. To solve these challenges, AI is being widely used in this sector. For agriculture, Artificial Intelligence has become a revolutionary technology. It helps the farmers by yielding healthier crops, control pests, soil monitoring, and many more ways. Below are some key applications of Artificial Intelligence in the Agriculture sector.

6. CONCLUSION

Agriculture has given so much to society. But it has its own pros and cons that we can't overlook. Furthermore, the government is doing his every bit to help in the growth and development of agriculture; still, it needs to do something for the negative impacts of agriculture. The agriculture industry is one that needs to be preserved in order to sustain life. Without agriculture there would be no food, and without food there would be nothing.

7. FUTURE SCOPE

New Technologies needed for the future of agriculture:

Technological advancements are today integral to attaining sustainability goals in agriculture. Satellite and GPS technologies, sensors, smart irrigation, drones, and automation, to list a few, provide the means for precision agriculture, which further aids in effective resource utilization. On the one hand, they reduce the use of harmful agrochemicals and, on the other, they help conserve non-renewable resources. They also help agriculturists to prepare days in advance for unseasonal or extreme weather events, thereby reducing crop losses during such events.

Digital Agriculture in India:

Increasing farmer income has been the focus of Indian Agriculture. India is a world leader in production of milk, pulses and jute, and ranks as the second largest producer of rice, wheat, sugarcane, groundnut, vegetables, fruit and cotton.

Increasing income through digital technologies has been realized as an opportunity for farmers, industry and the government. It can increase the efficiency of the agricultural production processes as well as the entire value chain. The use of digital technologies in a variety

of fields, are being developed including networks of implements and data-generating sensors, image recognition to assay and grade crops and commodities and AI applications.

Future of AI in agriculture

The future of AI in agriculture will need a major focus on universal access because most cutting-edge technologies are only used on large, well-connected farms. Increasing outreach and connectivity to even small farms in remote areas across the world will cement the future of machine learning automated agricultural products and data science in farming.

Artificial Intelligence (AI) techniques are widely used to optimize the production and operation processes in the fields of agriculture, food and bio-system engineering and also solve a variety of problems in the farming industry.

- Fruit Picking Robot
- Crop analysis by using drone and satellite imagery
- Soil defects
- Real time weather forecasting
- Identifying and eradicating weeds

8. APPENDIX

8.1 Cropping Pattern and Crop Production

The proposed cropping patterns for the three (3) development plans were examined considering efficient use of irrigation water, effectiveness of rainfall, maximization of crop profit, farmers willingness / attitude and available labor-force. The major items considered are as follows:

i) To plant HYV paddy in about 30 % of irrigated paddy area in due consideration of attainment of food sufficiency in the Study Area, increase of ratio of double cropping of paddy with diversified crops, and the farmers willingness and attitude to HYV varieties.

ii) To carry out land preparation during the heavy rainfall period from July to October, because the highest water demand is for land preparation period,

iii) To avoid planting diversified crops during the heavy rainfall period to prevent flood or water-logging damages,

iv) To plant and irrigate diversified crops before or after paddy cropping within the extent of available irrigation water,

v) To plant high-profitability crops (vegetables) in the irrigation area taking due consideration on available labor force, marketability, technical level of farming and available supporting system of guidance on farming technique and marketing of products. In particular, for the Small Pond Development (PDP), such high-profitability crops are proposed for the whole irrigation area because one farmhouse operates only 0.07 ha of irrigation area on average.

8.2 Unit Yield and Production of Crops

Proposed cropped area, unit yield, production, and incremental production are shown in Table in comparison with present condition.

1) Unit Yield at Present Condition Unit yields under present conditions in the Study Area were estimated on the basis of field interview survey and statistics.

Unit Yield under Present Condition

Crop	Yield		Crop	Yield	
	Average	Range		Average	Range
Paddy (medium/late)	1.3	0.75-2.5	String-bean	3.0	2.5-4.0
Paddy (early/dry season)	1.3	0.75-2.5	Tomato	3.0	2.5-4.5
Maize	0.9	0.8-1.1	Watermelon	4.0	2.0-6.0
Groundnut	0.45	0.4-0.5	Pumpkin	4.5	4.0-5.0
Soybean	0.5	0.4-0.6	Cassava	4.0	3.0-5.0
Mung-bean	0.5	0.4-0.6	Sweet potato	2.5	2.0-3.0
Cucumber	4.0	3.0-5.0	Sugarcane	12	10-15