RESEARCH ARTICLE

DECISION SCIENCE TECHNIQUE FOR AGRI-BUSINESS IN INDIA

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ABSTRACT

Process optimization is a crucial process in organizations to maximize efficiency, minimize costs, and improve overall performance. AI plays a significant role in this optimization, enabling businesses to optimize their processes while adhering to certain limitations. By examining current procedures, identifying areas for development, and implementing plans, organizations can increase productivity, lower costs, and boost customer satisfaction. This journal explores how AI can be leveraged for business process optimization in agriculture.

A vital component of the world's food production, agriculture is progressively adopting new technologies to boost output and efficiency. Artificial Intelligence (AI) is a technology that has the potential to revolutionize the agricultural industry by helping farmers and agricultural enterprises optimize their operations. This journal investigates the different applications of AI to agricultural business process optimization. The agriculture sector has immense capability and potential to generate jobs by implementing business process optimisation. It is because many of the service have been emerged due to modern agriculture. Technological changes in agriculture such as evolution of high yield variety seeds and mingling of technology started with the invent of artificial intelligence and business optimisation process.All process leads to optimal usage of resources. Growth of Agro-based industries in India helps in agricultural marketing and improvement of the existing products in the market. Decision support system and image recognition system techniques are helpful in pest control.The role of decision science is huge in agricultural marketing with immense potential.

INTRODUCTION

Introduction:Business process optimization (BPO) with the help of artificial intelligence aims to increase firms' productivity by the focused, and adoption of new technology. The food business in India has enormous potential for value addition, especially in the food processing sector, and is therefore well-positioned to grow significantly, contributing more to global food commerce each year(Indian Agriculture Sector, Farming in India | IBEF, n.d.).AI is revolutionizing agriculture by utilizing optimization techniques to analyses vast amounts of data. This data-driven decision-making empowers farmers to make informed decisions about crop yields and resource allocation. This data-driven approach reduces risks, increases resilience against market fluctuations, and enhances the efficiency of crop production. The decision science not only helps in forecasting and pest control but also make new plan for crop and farming related issues. The farmers, supplies govt agency and entrepreneur are interacting technologist and scientists for several issues. Decision science plays important role in planning and organizing marketing practices. Farmers and stakeholders seeking the solution of many issues related to the farming and crop cultivation.

Supply Chain Management:Every step of the supply chain, from production to consumption, depends on supply chain management. It entails monitoring shipping, delivery, and production to make sure businesses maintain tight control over internal inventory, manufacturing, distribution, internal development, and sales. Supply chain management ensures the seamless movement of goods and services by enabling businesses to operate successfully at every step of the chain via the use of a variety of strategies and methodologies(Admin,

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2021).The two main techniques for projecting future market demand on the basis of previous data are demand forecasting and logistics optimization. These techniques also optimize delivery routes, cut down on transportation costs, and speed up delivery times.Big Data and digital technologies are revolutionizing agribusiness by optimizing production processes, reducing costs, and improving product quality. Process automation and precision farming are key tools in this process. Artificial intelligence aids in predicting yields and optimizing agricultural processes. These advancements enhance agribusiness efficiency, adaptability to changing circumstances, and enhance the quality of goods and services. A well-defined plan is essential for achieving objectives and fostering better cooperation and staff involvement in agribusiness.Any agribusiness that wants to meet industry challenges, make sure natural resources are used properly, and maintain regulatory compliance has to optimize management. Technology is advancing at an accelerating rate to keep up with this expanding trend, offering notable improvements in performance and sustainable development (Niehues, 2024). Precision farming utilizes AI algorithms to analyses vast amounts of data from various sources, including satellite imagery, weather forecasts, and soil sensors. This approach allows for more precise management of resources.An improved and efficient system of agricultural productivity with the help of demand forecasting, crop management, data analytics. New techniques and technology requires huge investment and marketing with good supply chain management.Decision science encompasses various analytical methods and tools that aid in making informed choices, particularly in complex environments like agriculture. Here are some key decision science techniques applied in the agricultural sector:

Approaches of Decision Science:Decision Science involves many techniques which is related to behaviour, prediction, forecasting and predictive modelling, Stimulus modelling, Multicriteria decision analysis, optimisation technique, decision tree approach.

1. Data Analytics and Big Data

Big data and cloud computing have completely changed agriculture by giving farmers access to enormous amounts of processing capacity. Better farming decision-making is made possible by the integration of knowledge repositories holding data on plant nutrient requirements, weather, irrigation methods, and other farming procedures, made possible by the democratization of computing power(Talend, n.d).

2. Predictive Modelling: When it comes to choosing which crop to grow each season, farmers have a number of alternatives. Taking many aspects into consideration, their main goal is to enhance agricultural productivity. The state of the soil in the field, which can be evaluated by testing for elements like potassium and nitrogen, is one important aspect that influences crop development. Every crop has the perfect soil conditions for healthy growth and optimum output(Germec, 2024).

3. Simulation Modelling: Crop modelling forecasts crop growth, minimizes yield gaps, and helps with decision-making. It determines the varieties and planting dates for crops in a sustainable manner by weighing the effects of various choices on yield and soil health. Climate impact studies and agricultural rotation simulations are examples of applications.Crop sim-

ulator development aims to reduce the requirement for field tests at various sites by predicting the growth, development, and yield of agricultural crops.

4. Decision Analysis Using Multiple Criteria (MCDA)

This method of decision-making is highly structured and assesses negotiable strategies. Many variables, including yield potential, market price, and environmental impact, are taken into consideration while choosing the best crop from a decent variety in carefully chosen geographical areas. A balanced economic growth with a variety of internal and external influences is provided by sustainable practices.

5. Optimization Techniques: This method offers the finest answer for the agribusiness and is quite mathematical. The efficient use of water and other resources in agriculture provides new information about how to optimize supply chain operations to save costs and boost productivity. Depending on the weather, choosing the right crops for a given plot of land might boost the crop's net return. Applying the right amount of fertilizer encourages crop yield and growth as well. In this work, the issue of maximizing net crop benefit while decreasing fertilizer use is modelled as a multi-objective optimization function. The researchers working on this project require a variety of data types in order to construct and provide the data analytics model(Jain et al., 2021).

6. Decision Trees and Risk Analysis: Risk Analysis and Decision Trees The decision-making process is visually represented, including potential results, risks, and benefits. An investment choice assesses the technological risk. A contingency plan evaluates the risk's effects on the agriculture industry as well.Building the decision tree, which is utilized to consider new options and potential outcomes, is difficult. At least as useful as the decision tree itself is the methodical approach taken in its creation. It compels the person making the choice to consider a future road map that is condensed into branches where the individual can either exert control over the chosen course of action or where fortuitous circumstances can transpire.

When numerous individuals' actions determine the outcome of a complicated and competitive scenario, the game theory is a mathematical approach that is utilized. In order to maximize pricing and commercial discussions, it comprises negotiating strategies and market competition. When making decisions with two or more rivals, game theory might be helpful. Farmers need to weigh the possible benefits of various management systems against the dangers of loss. The way people perceive risk and uncertainty affects how they produce and invest. This work uses game theory concepts to control farmers' crop selection in both favourable and unfavourable circumstances. The objective is to maximize expected income, minimize expected outcome, and maximize output in the shortest amount of time and with the least amount of investments.

Relation between Decision Science and high Productivity in Agri-business:

A revolutionary synergy results from the intersection of stakeholders and decision science. Businesses hoping to offer individualized and frictionless services must comprehend the

needs, preferences, and sentiment of farmers. Organizations can use decision science to study the market, predict customer demands, and customize products to suit individual tastes. The agricultural industry may increase consumer loyalty, engagement, and profitability by utilizing decision Science(Raja, 2024).

Engaging with farmers and stakeholders on knowledge sharing platform fosters innovation and adoption of best practices contributing overall productivity. Collaborative platforms that utilize decision science can lead to more holistic approaches to challenges, enhancing collective productivity.
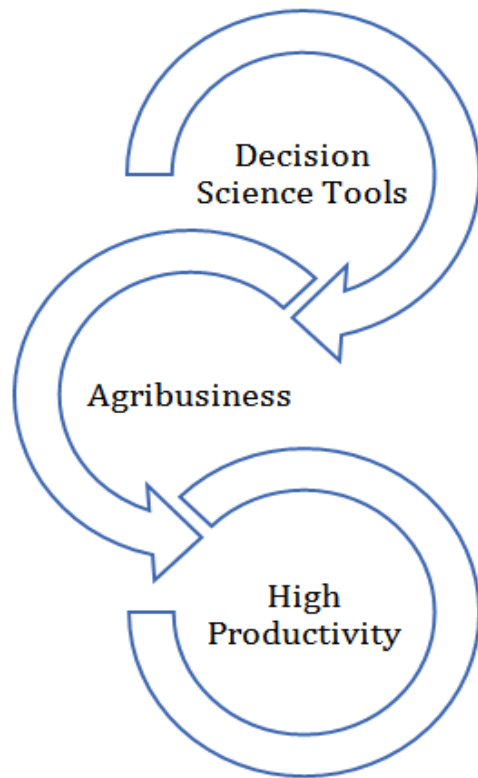

Figure 1 Relation Between Decision Science Tool and High Productivity

DISCUSSION

These models of Crop Simulation replicate agricultural growth and development by utilizing the basic mechanisms of vegetation, soil, and process. This is an invaluable resource for academics seeking to comprehend how climatic factors affect crop output. Because simulation models are unbiased, quick, and economical, they also give farmers and researchers a worldwide advantage. The Agri-business is a new concept in India.Agribusiness can benefit greatly from the application of decision science, since it can lead to increased productivity, better resource management, and reduced risk. The agriculture sector is facing numerous difficulties such as climate change and changing market dynamics. In order to guide strategic decisions that promote sustainable growth, decision science will be essential. The worldwide goal of guaranteeing food security and sustainable agricultural practices will be supported by the continuous investigation and application of decision science approaches in agribusiness, which will help optimize operations.

Recommendation: Acquiring the skills that farmers need to apply AI in agriculture effectively is a critical component of business process optimization. Increased productivity, dependability, and profitability are possible outcomes of this approach. Strategies include emphasizing sustainability in AI applications to safeguard the environment, encouraging cooperation between tech businesses and agricultural stakeholders, and providing education and training. Business Process optimization

Technique helps inventory management where vertical marketing system works with supply chain managers. The national and international market of agriculture heavily depends on local trading system. It is important to incorporate technologies in agribusiness environment because many micro and macro factors are held responsible for optimality and productivity.Using decision science approaches in agriculture enables stakeholders and farmers to make data-driven, well-informed decisions. The agricultural industry may increase output, make the most use of its resources, and adjust to shifting market and environmental situations by utilizing these technologies. Incorporating sophisticated decision science approaches will be essential for sustainable agricultural production as technology advances. For long-term goal optimization processes, forecasting and decision-making are crucial.

CONCLUSION

Informed, data-driven decisions are made by farmers and businesses with the assistance offered by decision science in agribusiness.Agribusiness can increase output, maximize resources, and make better use of limited resources by utilizing decision tools. A relationship between productivity and agribusiness, the integration of modern decision science approaches will be essential for the development of sustainable agriculture as technology advances. The problem of farmers cannot be settled without the help of Decision Science. Every techniques of Decision model play a remarkable role in the field of agriculture. The dimension of Data Science is huge in every field including Agriscience. We cannot imagine our life without food and crops. Production is an important economic activity which directly or indirectly satisfies the billions of people.

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How to cite this article:

Shazia Shaheen.(2024). Decision Science Technique for Agri-business in India. *Int J Recent Sci Res*.15(09), pp.4952-4955.

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