Chashbash.com:Empowering Smart Farming

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***Abstract*—Chashbash.com is an Agri-Tech web application, designed to revolutionize the management and analysis of agricultural demand and supply. The platform gives farmers, warehouse managers, food safety officers, and other stakeholders the tools they need to keep an eye on production numbers, keep track of inventory, and effectively handle logistics. It has tools for evaluating manufacturing and supply chain performance, dynamic dashboards that provide insights into market price patterns, and real-time and historical data visualization. Chashbash.com tackles major challenges in agriculture, like supply chain inefficiencies and market volatility, by promoting smooth communication and providing useful insights. Better results for the ecosystem as a whole are ensured by the platform's ability to empower stakeholders to make knowledgeable decisions, cut waste, and support sustainable agricultural practices.**

***Keywords*—Agriculture , demand , supply**

I. Introduction

Agriculture, one of the most significant sectors in the world, sustains economies, guarantees food security, and offers raw materials and work to millions of people. However, the agricultural market is influenced by a number of intricately intertwined factors, including seasonal variations, environmental considerations, and shifting consumer behavior. Price volatility, output oscillations, and supply chain inefficiencies are often caused by these factors. Understanding the links between supply and demand in this business is essential to addressing these problems, improving food security, and helping farmers create sustainable lifestyles. The agricultural industry is especially susceptible to outside factors including shifting global trade, erratic weather patterns, and variable material costs. Demand is influenced by internal factors like income variability, changing dietary choices, and population expansion. Both farmers and consumers suffer from supply shocks in the agricultural market, which is still fundamentally unpredictable despite its critical role. These difficulties show how urgently systems and instruments that support sustainable farming methods, help stabilize the market, and offer useful data are needed. Chashbash.com seems to be a ground-breaking solution to these issues. The goal of this Agri-Tech online application is to revolutionize the analysis and management of agricultural supply and demand. For food safety officials, farmers, warehouse managers, and other interested parties, This provides a single platform with tools to manage inventory, plan logistics, track output, and check market pricing in real time. Using the application's dynamic dashboards, real-time and historical data visualization, and advanced analytics, users can reduce supply chain inefficiencies, streamline procedures, and make well-informed decisions. As evidenced by its constituent parts, the system's architecture offers a thorough method of tackling the primary issues confronting agriculture. Supply chain performance analysis, manufacturing and inventory management, logistics scheduling, user identification, and market price tracking are all covered by the platform's components. All of these elements are intended to reduce risks, boost total output, and provide stakeholders with the information and resources they need to react to market developments. One of their unique features is the inelasticity of supply in agricultural markets, where production cycles are fixed and challenging to adjust in response to short-term price swings. Additionally, the seasonality and perishability of agricultural products present challenges not present in other economic sectors. It addresses these issues by promoting better stakeholder communication, providing real-time insights, and supporting data-driven decision-making. Through the provision of a platform that links production and market demand, it ensures a more efficient flow of commodities, reduces waste, and advances sustainability. The potential of this platform as a paradigm for utilizing technology in agriculture is examined in this study. It seeks to illustrate how instruments like as data-driven insights, dynamic dashboards, and integrated systems may enhance resource

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management, stabilize agricultural markets, and empower corporate executives and decision-makers to create more potent interventions. Overall, this study aims to provide a comprehensive under standing of how this platforms help to build a more resilient agricultural ecosystem by solving lowering market volatility and encouraging sustainable practices. The results of the study will help us better understand how technical advancements can enhance food security, raise production, and promote long-term stability in global agricultural markets.

II. Literature Review

- Modernizing agriculture is vital for economic growth, particularly in developing nations where it drives GDP and poverty reduction. The sector supports livelihoods and food security but struggles with limited financial services, poor market access, and outdated infrastructure. Effective supply-side (inputs, technology, finance) and demand-side (market access, value chains) interventions are key to boosting productivity and income. Access to farmer-level data helps evaluate modernization measures like financial inclusion and improved inputs. Combining data collection, frameworks like the Theory of Change, and comparative analysis enables policymakers to make informed decisions, fostering growth, poverty reduction, and food security [1].
- New Technologies and Supply Chain Methods in Agriculture Technologies like Big Data, IoT, and Blockchain are transforming agricultural supply chains by enhancing sustainability, efficiency, and transparency. IoT sensors enable real-time monitoring, Big Data provides predictive insights, and Blockchain ensures secure, transparent transaction records. However, broader adoption faces challenges such as data governance (ownership, privacy), high implementation costs, and connectivity issues in remote areas. Addressing these barriers is essential to ensure equitable benefits across the agricultural sector. [2]
- Technologies like Big Data, IoT, Blockchain, RFID chips, and sensors are revolutionizing agricultural supply chains by improving sustainability, efficiency, and transparency. IoT enables real-time monitoring, Big Data provides predictive insights, and Blockchain enhances traceability through secure transaction records. RFID and sensors optimize tracking, traceability, and automated data collection, helping monitor food quality, reduce waste, and stabilize supply chains. However, challenges such as high costs, data governance, and poor connectivity must be addressed to ensure smooth system integration and equitable benefits across the sector [3]
- Big Data, IoT, Blockchain, and RFID are revolutionizing agricultural supply chains by improving sustainability, efficiency, and transparency. IoT sensors enable real-time monitoring, Big Data provides predictive insights, and Blockchain ensures secure transaction records. In e-commerce, RFID and IoT enhance product quality and safety through real-time tracking, boosting consumer trust and after-sales support. RFID tags optimize storage, reduce costs, and improve service by tracking product history and quality. GPS and IoT further enhance package tracking and transit planning. However, challenges like high costs and ensuring consistent product safety and quality remain barriers to widespread adoption. [4]
- Technologies like Big Data, IoT, Blockchain, RFID, cloud computing, and AI are revolutionizing agricultural supply chains by improving sustainability, efficiency, and transparency. IoT enables real-time monitoring, while Blockchain enhances traceability, trust, and coordination among supply chain actors. In the grape wine supply chain, combining IoT and cloud-based systems with peer-to-peer (P2P) networks reduces intermediaries, boosts compliance, and improves cost and quality control. Data collection through market studies and surveys focuses on critical aspects like price, compliance, coordination, and trust, with conjoint analysis used to assess the value of various configurations [5]
- IoT technologies address food object complexity by using smart sensors to monitor temperature, humidity, and location in real time, ensuring food quality, reducing waste, and enhancing traceability. In food process control, IoT improves visibility, automates operations, and enables real-time responses to issues like spoilage and delays, ensuring safety compliance and streamlined processes. For data management and traceability, IoT facilitates seamless data collection and sharing. Cloud-based systems, like FI space architecture, support dynamic food networks and integrate stakeholder input to meet industry-specific needs. [6]
- Blockchain addresses key agricultural challenges, such as inefficient supply chains and data privacy concerns. When combined with IoT and decentralized storage systems like IPFS, it enables real-time data monitoring, enhancing decision-making and data security. IPFS ensures efficient, decentralized storage for the vast data generated in agriculture. Chain-to-chain communication fosters trust, ensures compliance, and enhances data privacy and integrity. The COVID-19 pandemic exposed supply chain vulnerabilities; blockchain solutions improve traceability, accountability, and bottleneck detection. Additionally, smart contracts automate farming processes, reducing errors and promoting sustainability in smart farming systems. [7]
- Globalization, technological advancements, and changing preferences have significantly influenced consumer behavior, particularly the rising demand for sustainable products among Gen Z and millennials, driven by digital transformation (Kumar et al., 2019; Nielsen, 2020). While economic convergence suggests faster growth in less wealthy economies, Piketty (2014) warns of persistent wealth gaps. Supply restrictions, highlighted by disruptions like COVID-19, play a key role in market dynamics (Baker et al., 2020). Reliable data from the World

Bank and IMF underscore the importance of emerging economies in global GDP growth, emphasizing tailored policies. Consumption trends are shaped by technology, demographics, and income levels, where current income (Friedman, 1957) and future expectations (Mankiw and Reis, 2002) drive demand. As digital economies grow, businesses and policymakers must understand these interconnected factors to navigate evolving consumer patterns and economic landscapes effectively. [8]

- Value chain adaptation is vital for businesses to respond to shifts in markets, consumer preferences, and technological advancements. Innovative businesses leverage operational flexibility, innovation, and strategic alliances to outperform competitors. Vernon's Product Cycle Framework (1966) highlights the progression of products from developed to emerging markets, though globalization and technology can disrupt this cycle, fostering continuous innovation.Government policies, particularly in developing nations, play a critical role by supporting trade and investment, enhancing local business competitiveness, and enabling value chain integration. While emerging markets face challenges like resource scarcity, they offer opportunities for growth, especially in sectors like agriculture. Outsourced agricultural services provide farmers with technology and knowledge, boosting productivity and adaptability to meet market demands.Emerging markets also create opportunities for local businesses to collaborate with large corporations, fostering competitiveness, knowledge exchange, and sustainable development. [9]
- Blockchain adoption faces barriers such as high infrastructure and training costs, particularly for smaller businesses. The complexity of blockchain technology, including cryptography and consensus processes, can lead to resistance and slow implementation. Scalability is a major challenge, especially with proof-of-work systems that struggle with transaction delays and rising costs. While alternative consensus methods like proof-of-stake are being explored, they still need refinement. Smart contracts, though automated, can be inefficient, leading to higher costs and longer processing times.bTo drive broader adoption, blockchain technology must address issues related to cost, complexity, scalability, IoT integration, and smart contract efficiency. [10]
- Big Data Analytics (BDA) is transforming Supply Chain Management (SCM) by enhancing operational efficiency and decision-making. Companies like Walmart use real-time sales data and external factors to predict demand and optimize inventory. Procter Gamble leverages predictive analytics to reduce costs and improve service, while Amazon applies BDA to enhance logistics through dynamic pricing and tailored marketing. Data from sources like ERP systems and IoT devices is collected and managed securely using blockchain and cloud services. Analytical tools are used to extract insights, which are then integrated into strategic decisions, improving overall performance. By categorizing supply chain data into financial, operational, and market segments, BDA helps businesses respond effectively to market demands and gain a competitive edge. [11]
- Web application developers must adhere to best practices to enhance quality, maintainability, and user satisfaction. However, small software companies, particularly in developing nations like Jordan, face challenges such as limited funding and experience (Boehm et al., 2001). These companies often prioritize speed over quality, potentially compromising results. Research suggests that integrating measurement procedures is crucial for improving software quality and understanding process performance (Fenton and Pfleeger, 1997). Using hierarchical clustering techniques like Ward's algorithm (Halkidi et al., 2001) helps identify trends in practice adoption. A study found that small Jordanian businesses only implement three of the seventeen recommended practices, highlighting a gap in adopting best practices. [12]
- For those involved in agricultural markets, particularly in the fresh fruit and vegetable (FFV) industry, market intelligence (MI) is crucial. It assists with risk mitigation, trend monitoring, and opportunity identification. By integrating many data sources, a layered MI framework makes it possible to analyze market trends effectively. To detect patterns and opportunities, Chatterjee et al. (2021) stresses the use of big data analytics for real-time data collecting and visualization. Predicting market disruptions requires the use of leading indicators, such as weather patterns and price variations. According to Duflo et al. (2019), machine learning techniques can be used to improve forecasting accuracy, which would enable stakeholders to react proactively to changes in the market. Finding abnormalities requires constant observation of the data sources. According to Badran et al. (2022), advanced analytics can offer early warning indicators, enabling stakeholders to successfully modify their strategy. Zhou et al. (2023) describe how identifying the reasons behind these anomalies' aids in the development of preventative strategies. The operational efficiency of FFV supply chains is improved by integrating MI. Growers can enhance planting and distribution plans by taking market trends into account. The suggested paradigm places a strong emphasis on useful information for data-driven decision-making. To uncover market opportunities in agriculture, enable stakeholders to respond to disruptions and optimize operations, a tiered MI framework is essential. Supply chain actors are better equipped to make strategic decisions in a changing market when MI is integrated into the system. [13]
- High-Performance Computing (HPC), Big Data analytics, and the Internet of Things (IoT) are examples of cutting-edge technologies that are becoming more and more important to precision agriculture and livestock management. Stakeholder decision-making is improved by these technologies, which assist in addressing major infrastructural and data management concerns. Data management

is a difficulty for stakeholders, who emphasize the necessity for affordable, scalable systems that provide quick analytics. According to interviews, improving efficiency and sustainability in agriculture requires effective data processing. Data engineers, analysts, and HPC specialists have worked together to create usage scenarios based on the first findings from interviews. These scenarios make sure that technology solutions meet user needs by ranking frequent user stories according to their technological complexity and business effect. Future studies should concentrate on creating integrated platforms that bring together cloud computing, big data, IoT, and HPC to improve data accessibility and offer useful insights. These kinds of developments are critical to solving the particular problems that stakeholders in livestock management and precision agriculture face [14]

- Literature Review: XAI-CROP and Its Impact on Sustainable Agriculture XAI-CROP uses explainable AI to improve crop suggestions' transparency and give farmers a reliable tool for making decisions. It achieves better crop output predictions than conventional models, with a high R-squared value of 0.94152 and a low Mean Squared Error (MSE) of 0.9412. To provide accurate, data-driven insights, the model makes use of an extensive dataset from India that includes variables like location, seasons, and production indicators. High interpretability and dependability are guaranteed by XAI-CROP, which was developed with Python and modules like LIME, Pandas, and Scikit-learn. Precision farming is made easier by its scalable and flexible design, which enhances crop yields and resource efficiency while promoting sustainable agriculture and global food security. All things considered, XAI-CROP is a prime example of AI integration in agriculture, providing farmers with substantial advantages and encouraging data-driven solutions to problems pertaining to food security. [15]
- Technical Complexity: Although relational databases are sometimes easier to use, they can get complicated when dealing with big volumes. Because blockchain databases are decentralized, they come with extra complexity. Data Quality and Access: Relational databases are excellent at validating and maintaining data integrity. Although blockchain databases are immutable, updating and accessing data may be challenging. Security Risks: Blockchain databases employ cryptographic techniques for increased security, yet they are not immune to common risks like SQL injection. Cost savings: While blockchain databases may have greater initial costs, they can save long-term expenses by doing away with middlemen, relational databases often have lower operational costs and resource requirements. Risk Mitigation: Blockchain databases lower the risks of fraud and data tampering through transparency and immutability, while relational databases offer efficient backup and recovery alternatives. [16]
- Systems for monitoring agriculture are essential for supplying data that supports the stabilization of agricultural prices and improves food security. These systems collect information on environmental factors, market trends, and production. The main objective is to stabilize prices by facilitating coordinated information exchange so that interested parties may make wise judgments. Satellite remote sensing technology and ground-based data are used by current monitoring systems, such the FAO's GIEWS and the USDA's National Agricultural Statistics Service (NASS), to gather agricultural data. A comparative study reveals differences in efficacy. While there are times when remote sensing yields more comprehensive and accurate data than conventional techniques, inefficiencies can sometimes result from problems with system integration. Better predictions of agricultural output and market patterns are now possible thanks to recent developments in satellite photography and machine learning, which have improved data accuracy and predictive capabilities. Lack of information on yields and planting/harvesting dates is one of the main shortcomings. Strict reliance on satellite photos might overlook regional agriculture methods. An even more extensive data framework for monitoring can be obtained by combining expert surveys with remote sensing. By filling in data gaps and increasing accuracy using gaps and comparative analysis, the aim is to improve agricultural monitoring. Improved Coordination: Increase system cooperation for consistent data. Enhanced Accuracy: Make an investment in cutting-edge technologies to gather data in real time. Finding Data Gaps: Continually check for weaknesses in monitoring systems. [17]
- This analysis looks at a two-phase pricing determination system designed to improve supply chain coordination for fresh agricultural products. Data Collection: To collect data on freshness-preserving initiatives and related profitability, the system makes use of mathematical modeling and simulations. Goal: To maximize revenues while preserving product freshness, the best decision-making models for pricing and inventory management are to be developed. Principal Results: Higher overall revenues are the result of increased efforts to preserve freshness. To reduce waste, the framework calculates the ideal order quantities. Improved coordination raises the performance of the supply chain. Situations with centralized decision-making result in higher revenues. To sum up, this two-phase structure provides a data-driven strategy to raise the fresh agricultural supply chain's profitability and efficiency [18]
- Biogeochemical cycles depend on soil ecosystems, and it's critical to comprehend how these ecosystems behave across elevation gradients. Variations in microbial community structures, soil organic matter (SOM), nutrient cycling processes, the impact of dissolved organic matter (DOM), and climate impacts are highlighted in this review. Temperature, moisture, and vegetation all have an impact on the composition and concentration of

SOM, which change with elevation. Due to slower rates of decomposition, higher elevations frequently exhibit higher levels of organic carbon. Different community architectures result from the shift in microbial diversity with altitude. High-elevation soils frequently support microbial species that improve the effectiveness of nutrient cycling. Because of the colder temperatures and specially adapted microbial communities that maximize nutrient uptake, nutrient cycling is generally more effective at higher elevations, Dissolved organic matter (DOM) has a major effect on the microbial community and soil chemistry. Elevation affects its bioavailability, which has an impact on the composition of microbial communities and the general health of the soil. [19]

- Agricultural systems are intricate, accurate modeling is necessary to guide sustainable practices. This assessment calls attention to the inadequacies of current models, stresses the need for improved data sharing, and pushes for varied modeling platforms and cultural changes. Many times, complex linkages within ecological and socioeconomic systems are oversimplified in current agricultural models. Garnett et al. (2013) and Dawson et al. (2018) have pointed out that many lack integration with modern data sources and neglect to account for regional variability and the implications of climate change. These restrictions may result in out-of-date and less useful models. Initiatives promoting open data are essential for resolving data issues in agricultural modeling. Improved data sharing encourages academics to work together by providing access to a variety of datasets and leading. Collaboration-focused culture change is necessary. Public knowledge and support for agricultural policy can be improved by fostering collaboration among researchers and efficient communication of modeling results [20]
- Unpredictable factors are posing an increasing threat to agricultural supply chains, necessitating effective management. Decision-making is greatly impacted by uncertainty, which is influenced by variables like the weather and changes in the market (Hobbs, 2021). Operations research methods, especially optimization and stochastic programming, are frequently used to manage uncertainty and enhance decision-making when navigating these complexity (Bhaduri et al., 2020). According to Ogunmola et al. (2023), current research focuses on developing sophisticated uncertainty models to improve forecast accuracy and implementing focused programming techniques for crucial supply chain operations like production and distribution. Future studies will concentrate on: making use of sophisticated uncertainty models. utilizing methods from operations research. applying efficient programming techniques.promoting structures for cooperation among interested parties. Enhancing agricultural supply networks' responsiveness, efficiency, and market competitiveness is the goal of these initiatives. [21]
- Supply Chain Risk: It refers to important risks such as transportation disruption due to pandemic restrictions, market instability, lack of inputs such as seeds, fertilizers and labor . Risk mitigation strategies: Provides practical ways to manage these risks, including supply chain diversification, adoption of digital technologies for prediction and quality control , have improved export efficiencies, and foster collaboration among stakeholders. Performance implications: Addresses how management can adapt by increasing productivity in supply chain management, focusing on sustainability, and networking to build a stronger and more resilient building to meet future problems. The case provides valuable insights into the need for structural adjustment in agricultural supply chains to deal with unexpected shocks such as epidemics, making it relevant and useful for academic research which will be used in the project. [22]
- The research examines the relationship between global agroforestry trade and deforestation emissions in the tropics. it highlights however global deal inch commodities such as arsenic kick soybeans handle anoint, and quality Adds importantly to hot disforestation and examines the efficient and environmental implications twin results exploitation associate in nursing organic Check to gauge emissions from disforestation joint with these products. The authors compiled deal information and disforestation information along c emissions focus along hot countries that employ inch mass rural forestry exports, and that search shows negatively of disforestation comes from countries whose rural products are oversubscribed and consumed. The end is that global agroforestry deal is amp great device driver of hot disforestation highlights the take for sustainable environmental deal if stern environmental regulations are emphatic world. [23]
- This paper investigates how green consumer demand affects supply chain decisions and how cost-sharing agreements between supply chain partners can lead to environmentally friendly production our environment has improved. the read presents amp possible Check that explores key interactions between manufacturers and retailers inch the look of environmentally sentient consumers. Important factors include perceived consumer demand for environmentally sustainable pricing policies and cost-sharing mechanisms for green technology adoption. The authors develop a balanced position that examines the impact of cost-sharing agreements and argues that such agreements can lead manufacturers and retailers to invest in practices that green research reveals will be shared the cost of green products increases the profitability of the entire supply chain and satisfies the demand for sustainable products — The findings provide useful insights for companies seeking to balance profitability with environmental responsibility. [24]
- The paper offers an in-depth analysis of the feed/food debate, a pressing issue in global food security. It emphasizes the trade-offs between using crops to feed livestock versus feeding people directly. The authors provide new

perspectives on how livestock production impacts land use, food availability, and environmental sustainability. By evaluating the efficiency of feed conversion and the potential land that could be redirected to human food production, the paper challenges the current trajectory of global food systems. It calls for more efficient livestock management and resource allocation, underscoring the importance of shifting towards sustainable practices to ensure food security for future generations.This analysis is crucial for understanding the broader implications of livestock farming on global nutrition and resource use. The research highlights a delicate balance between economic benefits from livestock production and the ethical considerations of feeding a growing human population. [25]

- The authors examine a pressing problem: food security in China and managing declining water levels. Due to developmental concerns over scarcity of sweatshops and individual effects from mindset changes, Taiwan faces huge challenges inch to reconcile rural employment with conventional sweatshops .The report highlights strategies for implementing better rural sweatshops as arsenic impairs effective irrigation systems Yield and sweat better guidelines. Combining research findings with real-world practice, the study highlights the role of policymakers, farmers and researchers in modifying agricultural systems to make them more resilient to environmental pressures emphasize. Finally, the study not only highlights the importance of technological innovation but also recommends policy change and farmer participation as an important strategy in a sustainable way approach to whole water production Findings Agricultural production provides valuable insights for addressing global food security challenges through water. [26]

  The paper investigates online pre-market purchase intentions of new agricultural products using a technology acceptance model (TAM). It examines how perceived usefulness, ease of use, and risk affect purchase decisions, as well as examining external factors such as product quality, customer attitudes, and Building platform attributes model based on TAM The study collects information about consumers through surveys and surveys on the relationships of these variables using structural equation modeling (SEM). show that product quality is significantly influenced by perceived benefits and risks, customer characteristics are influenced by ease of use and risk, and platform characteristics are influenced by ease of use will positively influence usage and profitability, which in turn creates buying intent in the pre-sales environment. [27]

  This paper presents a blockchain-based agricultural commodity tracing system that aims to improve security, reliability and efficiency in tracking agricultural commodities from farm to consumer Using MVC (Model-View-Controller) model, System decentralizes data collection and storage System product origination, Gathers key information such as usage, delivery, security issues (e.g. authentication and inspection), uses regional blockchains and bilateral codes to accelerate The results show that this approach for customers increases reliability, improves product security, and provides practical design insights for use in complex diagnostic systems [28]

  This paper explores the transformative role of Information Technology (IT) in reshaping the business models (BM) of Chinese agricultural products, particularly focusing on how the internet has revolutionized the circulation, sales, and branding of these products. By analyzing IT-driven changes, the study gathers data from industry reports and case studies to compare traditional business models with those driven by IT advancements. The results show that IT has significantly improved efficiency and market reach, enhancing branding and consumer engagement through digital platforms. The paper also proposes strategies for future business model innovations, underscoring the importance of digital transformation in China's agriculture sector. [29]

  This conference paper discusses the design and development of a mobile-based traceability system for agricultural commodities in China, aimed at ensuring the safety and quality of these commodities throughout the supply chain The system facilitates to rapidly recall security concerns through reverse traceability and cultivation - Collects data on inputs, manufacturing and distribution through mobile terminals allowing code scanning at various stages of life Whereas targeted at the agricultural supply chain, the system processes tracking-data to monitor trends and identify risks As a result, it captures important information and effectively displays from from planting to sale, enabling consumers and regulators to verify product safety and quality and providing a quick way to recall problematic agricultural products. [30]

III. Problem Statement and Solutions

- Lack of information
- Complex supply chain
- Lack in infrastructure:
- Time-Intensive:
- Prone to Human Error:
- Limited Data Processing:
- Challenges with Complex Variables:
- Inability to Handle Regional Variations:
- Market syndicate:
- price hiking.
- Farmers are not getting fair price for their produce.
- The primary challenge farmers face is the lack of access to information on advanced agricultural techniques that could improve productivity. Instead of consulting government agencies or industry experts, farmers typically rely on informal sources like neighbors, prominent farmers in the community, and seed retailers, This reliance on informal networks leads to the continued use of traditional farming methods, which limits productivity.

Consequently, the low productivity exacerbates the gap between supply and demand, negatively affecting the overall supply chain.

- The second major issue identified was the complexity of the supply chain, which involved multiple layers and intermediaries, leading to inefficiencies. Informal relationships between intermediaries further disrupted the supply chain, allowing them to exploit both producers and buyers. These intermediaries often set prices for farm products without considering quality, which left farmers with low returns despite investing in quality improvements. For instance, in both aquaculture and the dairy industry, producers struggled to receive fair prices based on the quality of their products.
- Additionally, the complexity of the supply chain made it difficult to trace the origin of produce. The informal nature of transactions between intermediaries and farmers meant that mapping produce back to its source was nearly impossible, hindering efforts to promote safe food across the supply chain. The extended supply chain also increased the time it took for products to reach consumers, especially perishable items, leading to longer lead times and potential degradation of the produce.
- At the farm gate level, the absence of adequate storage and packaging facilities creates significant challenges that directly impact the quality, marketability, and profitability of agricultural produce. When farmers lack proper storage options, they are often forced to sell their products immediately after harvest, regardless of prevailing market conditions. This can lead to oversupply in local markets, resulting in reduced prices and income losses for farmers. Without storage infrastructure, perishable produce, such as fruits, vegetables, and dairy products, deteriorates quickly due to exposure to unfavorable environmental conditions like high humidity, temperature fluctuations, and pests. Spoilage not only wastes a significant portion of the harvested crops but also devalues the produce that reaches the market, lowering the returns on farmers' efforts and investments.

  Similarly, the lack of proper packaging facilities exacerbates these challenges. Packaging plays a vital role in protecting produce during handling, transport, and distribution. Poor or nonexistent packaging can lead to physical damage, bruising, and contamination, further reducing the quality and shelf life of the produce. This affects both farmer income and consumer satisfaction, as buyers may reject substandard produce or pay significantly lower prices.

  When these issues are coupled with the continued reliance on traditional farming methods, such as outdated irrigation practices, low-yield crop varieties, and minimal mechanization, farmers often struggle to achieve optimal productivity. Traditional practices are labor-intensive and less efficient, limiting both the quantity and quality of the harvest.
- Inadequate infrastructure also affects intermediaries and buyers. Poor transportation and storage facilities lead to spoilage during transit to terminal markets or buyers. At the marketplace, a lack of proper drainage and hygiene systems further degrades the quality of produce, lowering returns for both intermediaries and buyers. Additionally, the absence of effective waste management systems can harm the local environment around the marketplace, worsening the ecosystem's condition.
- Manually processing agricultural data takes considerable time, slowing decision-making and responsiveness to market changes. This delay can prevent farmers from identifying optimal planting and harvesting periods, leading to missed opportunities for maximizing yield. Additionally, outdated or incomplete data can result in inefficient resource allocation, such as improper use of water, fertilizers, and pesticides. The lack of timely insights also hampers farmers' ability to adapt to market demands, affecting pricing strategies and profitability. Streamlining data collection and analysis through digital tools can enhance efficiency.
- The manual approach is highly susceptible to mistakes in data collection, analysis, and interpretation, which can lead to inaccurate predictions and poor outcomes. The system struggles to handle large datasets and cannot process real-time data efficiently. This limitation makes it difficult to capture current market dynamics, price trends, and supply chain disruptions.Factors such as weather conditions, crop yields, pest infestations, and global market fluctuations are highly complex and difficult to model manually. As a result, important influences may be overlooked or inaccurately assessed. Agricultural production and demand vary significantly by region, and the current system is unable to accommodate these geographical differences effectively.Now a days price hiking is one of the major issues in Bangladesh.Due to a lot of middleman in agricultural supply chain sometimes they create an artificial market demand by controlling the supply and this is the main reason for price hiking.

A. *Existing System (Rich Picture As Is)*

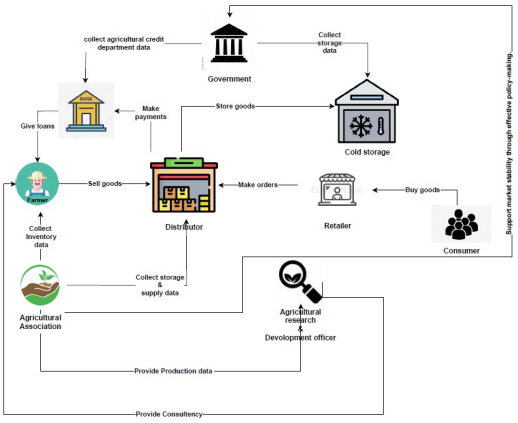

Figure 01 : Rich picture (As-Is)

TABLE I
GAP ANALYSIS

Scenario	User role	Existing system	Future work
Product information	Crop manager	Manually taken from the farmer	Develop a detailed product database with type, variety, and seasonality. .
Historical Production Data	Production data officer	Limited and inconsistent data on yields, acreage, and costs.	Collect and centralize missing historical data, and develop trend analysis tools for production insights..
Consumer Demand Data	Market Analyst, Agricultural Market Regulation Officer	Accurate data is unavailable	Partnering will data providers will yield more accurate information.
Supply Levels	Warehouse Manager	Supply data updated manually with no real-time tracking of inventory or logistics	Implement real-time inventory tracking, and build tools for supply chains monitoring.
Market Price Data	Agricultural market regulation officer	Manually provided	Analyzing historical data and farmers offer price automatically suggest market price
Analytical Tools	Analyst	Basic charting capabilities with no advanced forecasting or scenario analysis.	Develop AI/ML-based forecasting tools and scenario analysis features for predicting future trends.

B. *Proposed System (Rich Picture To Be)*

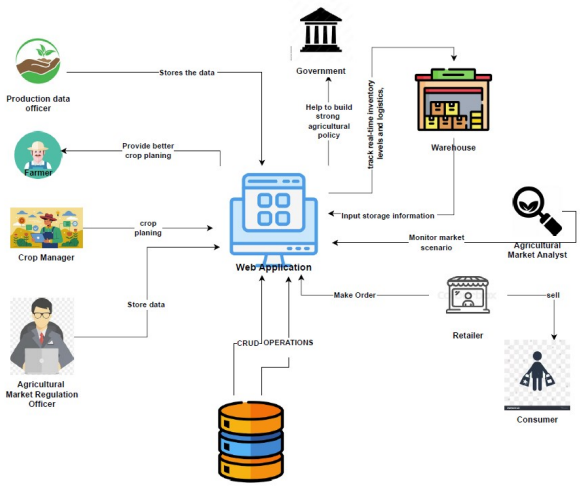

Figure 02 : Rich Picture (To Be)

IV. DESIGN AND METHODOLOGY

Our system revolves around a centralized cloud database where all agricultural data is systematically recorded and monitored by the government for enhanced transparency and oversight. This ensures that every stage of the supply chain—from the farm gate to the market—is tracked, evaluated, and optimized for efficiency. The process begins with farmers submitting product information and physical samples, which are promptly evaluated by our quality control team. This team performs a detailed analysis of the submitted samples, generating a comprehensive quality report that highlights key parameters such as grade, moisture content, size, and overall suitability for market standards. This report is passed on to the crop management team for further action. Simultaneously, the market price analysis team reviews the quality report alongside key economic indicators like production costs, historical market prices, and current demand trends—all of which are stored and updated in the cloud database. By utilizing this information, the team determines a fair and competitive price for the products. If the farmer agrees with the proposed price, our system facilitates direct and prompt payment while coordinating the collection of crops.Once the crops are collected, the management team assigns a unique barcode to each batch. This barcode is systematically logged into the centralized database, enabling full traceability of the products throughout the supply chain. At the processing facility, this barcode is retrieved for tracking purposes, ensuring that all activities—such as cleaning, grading, and packaging—are recorded in real-time. After processing, the goods are transferred to a warehouse, where their storage conditions are continuously monitored using Internet of Things (IoT) devices, such as humidity and temperature sensors. These devices ensure that products remain in optimal conditions, minimizing spoilage and maintaining quality before distribution to marketplaces for sale.By integrating IoT devices, machine learning, and centralized data storage, our system creates a cohesive, transparent, and data-driven agricultural process. Farmers, government agencies, and market stakeholders benefit from improved visibility, enhanced decision-making, and streamlined operations. This approach reduces delays, enhances product quality, and ensures that goods reach mar-

ketplaces efficiently, ultimately empowering farmers and creating a more responsive and sustainable agricultural supply chain.

- **– ENTITY RELATIONSHIP DIAGRAM**

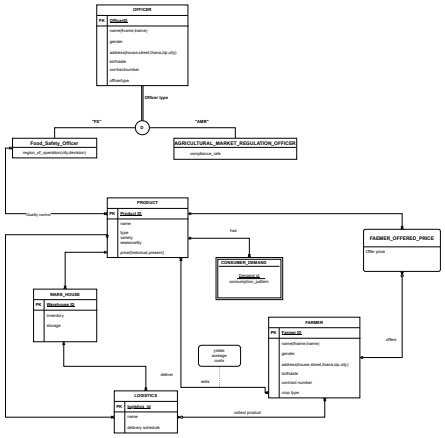

Fig. 1. Figure 04: Schema Design

EXPLANATION : In our system, there are two types of officers Food safety Officer and the Agricultural Market Regulation Officer. Each officer has attributes such as officer ID (identifier), name (first name, last name), gender, address (house, street, sub-district, postal code, city), birthdate, and contract number and food safety officer has a additional attribute of region of operation and Agricultural Market officer has an addition attribute of compliance rate.We also have en entity called farmer. The system tracks various products, each with a unique product ID, type, variety, seasonality, and price (historical and present). A product can be produced by multiple farmers also a farmer can produced multiple products.Also there could be multiple consumer demand related to one product. Here the consumer demand data recognized as weak entity and there is also an associative entity called farmer offered price The AMR Officer will control the product price. Products can also be linked to warehouses, and each warehouse can store several products. A product can be managed by one or more managers. Warehouse attributes include warehouse ID, inventory, storage capacity. There is also an entity for logistics which have logistics id as primary key,logistics provider name and delivery schedule.Each logistics can collect crops from farmers and deliver them to warehouses.A product can carried by multiple logistics.Production data officers manage production-related data, which includes yield, acreage, and costs.

- **– SCHEMA**

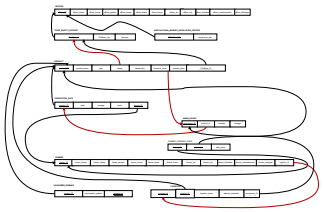

Fig. 2. Figure 04: Schema Design

EXPLANATION

- This schema provides a appears to represent a relational database structure for managing an agricultural and market regulation system that connects farmers, products, officers, warehouses, logistics, and consumer demand. It demonstrates how different entities and their characteristics work together to manage products.
- **Primary key (PK)** ***1. Officer:*** Officer in the system is identified by their officer-ID. ***2. Food Safety Officer:*** (FS Officer) is identified by their FSofficer-ID. ***3. Agricultural Market Regulation Officer-ID :*** Agricultural Market Regulation Officer is identified by AMRofficer-ID ***4. Farmer:*** farmer-ID used to identify certain farmers. ***5. Product***: product-ID identifies each product separately. ***6. Warehouse:*** Storage locations are identified by the warehouse-ID.
  7. Logistics: Operations or schedules related to logistics are identified by the logistics-ID.
- **Foreign Keys(FK)** ***1. Farmer Offered Price:*** In farmer table logistics id act as a foreign key. ***2.logistics:*** Warehouse id is a forein key here AMRofficer-ID associates price regulation with a specific officer. ***3.warehouse:*** product-ID is a foreign key here.
- **Composite Keys** ***1. Farmer Offered Price:*** Composite Key: farmer-ID and -ID Stands forproduct the special fusion of the price a farmer offers and the officer in charge of it. ***2. Production data***: Composite Key: product-ID and farmer-ID worked as composite primaykey here
  3. Consumer Demand: Composite Key:PRODUCT ID and Demand Id Stands forproduct the special fusion of the price a farmer offers and the officer in charge of it.
- Farmers, products, officers, warehouses, logistics, and customer demand are all included in the schema, which depicts an agricultural and market management system.expenses. In orderto drive system actions, products are characterized using qualities such as name, price, variety, seasonality, and consumption patterns.

– **NORMALIZED SCHEMA**

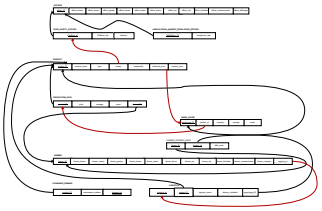

Fig. 3. Figure 04: Normalized Schema

The relational schema provided above is already in normalized form as it complies with the normalization **1NF:** The schema needs to be set up so that there are no repeated groups and a primary key for every **2NF:** No non-key attribute in the schema may depend entirely on the composite main key. **3NF:** There cannot be any transitive dependencies in the schema. **BCNF:** A non-key in the schema cannot identify a candidate key or a portion of it. Our schema complies with all the normalization protocols mentioned above.

- **SOFTWARE ARCHITECTURE**
  - A very comprehensive and interactive process used in creating the agri-tech web application that aimed to revolutionize the management of agricultural supply and demand. The platform provides farmers, warehouse managers, food safety officers, and other stakeholders with the resources they need to effectively maintain inventory, manage logistics, and monitor production indicators. With features like performance evaluation tools, dynamic dashboards that offer insights into market price fluctuations, and real-time and historical data visualization, data-driven decision-making and seamless communication. The platform ensures a scalable and user-friendly experience that supports the efficiency and sustainability of agriculture. It is constructed with a reliable MySQL database and integrates front-end technologies (HTML, CSS, and JavaScript) with a PHP back-end.
  - Front-End Development: HTML and CSS is used to structure and style the platform some JavaScript(JS) is also used for dynamic user interaction.
  - Back-End Development: For back-end we've used PHP for server side operations. For collecting data and storing data we've used MYSQL database.
  - Database Implementation: After implementing database we used MySQL to store essential information such as user identity, production data, inventories, logistics, and other crucial elements of agricultural management. This method guarantees a reliable and effective database structure that underpins the platform's operation.
  - Back-End Logic: Wrote SQL queries for implementing multiple function alities such as updating dashboards, production data from database etc.

V. IMPLEMENTATION

  - The Chashbash.com platform includes dashboards tailored for different user roles.
- **Home Page** The home page of Chashbash.com serves as

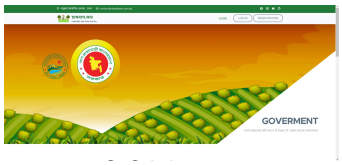

Fig. 4. Home Page

an introduction to its mission of modernizing agriculture through digital tools. With a vibrant design featuring agricultural imagery and official government seals, it highlights the platform's credibility and collaboration with the Department of Agricultural Extension. The page provides easy navigation to various features, ensuring farmers and stakeholders can explore demand and supply analytics, connect with resources, and enhance productivity in the agricultural sector.

- **Login Page** The login page of Chashbash.com offers a

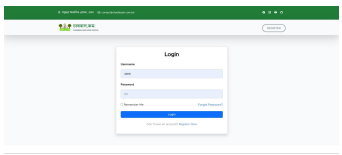

Fig. 5. Login Page

simple and secure way for users to access their accounts. With fields for username and password, it includes options like "Remember Me" and "Forgot Password" to enhance user convenience. New users can easily register using the provided link, ensuring accessibility for all. The clean design ensures a smooth and professional user experience, aligning with the platform's goal of empowering farmers through technology.

- **Admin Dashboard**
  The Chashbash.com Admin Dashboard is a well-organized and efficient interface designed for seamless management and analysis. It features:
  - **Home**: Your central hub for quick insights and updates about ongoing activities and notifications.
  - **Product**: Manage and view your product catalog, track inventory, and add new products effortlessly.

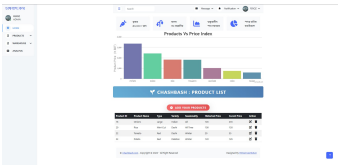

Fig. 6. Admin Dashboard

- **Warehouse**: Monitor warehouse stock levels, organize inventory, and streamline logistics for better efficiency.
- **Analysis**: Dive into detailed reports and visualizations to track performance, trends, and growth.

A bar graph dynamically displays product details such as sales trends, stock levels, and performance metrics, offering a clear visual understanding of your data.

- **Farmer Dashboard**

Fig. 7. Farmer Dashboard

The Farmer Dashboard is a practical and user-friendly platform tailored for farmers to manage their operations. It includes:

- **Home**: A central hub for updates, notifications, and an overview of ongoing activities.
- **Logistics**: Monitor and manage transportation and delivery schedules.
- **Current Price**: Stay updated with real-time market prices of crops for informed selling decisions.
- **Offer Price**: Manage special price offers for products to remain competitive.

At its center, a product table provides a comprehensive overview of all produce, including product names, quantities, current prices, and offer prices. It ensures farmers have all essential details at a glance.

- **Warehouse Manager Dashboard** The Manager Dashboard is crafted to optimize warehouse operations and ensure efficient management. Key features include:

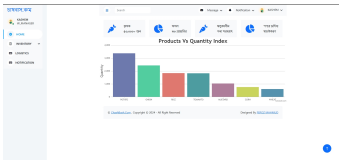

Fig. 8. Warehouse Manager Dashboard

- **Home**: A centralized hub providing a quick overview of warehouse activities and critical metrics.
- **Inventory**: Monitor stock levels, track incoming and outgoing items, and manage replenishment efficiently.
- **Logistics**: Manage transportation, delivery schedules, and shipment tracking in real time.
- **Notification**: Receive alerts about stock shortages, incoming shipments, or other key events.

A product bar chart provides a clear visualization of product quantities in stock, making it easy to identify low-stock or surplus items.

- **Agricultural Market Regulation Officer Dashboard** The Agricultural Market Regulation Officer Dashboard is a practical and user-friendly platform tailored for officers to manage their operations. It includes:

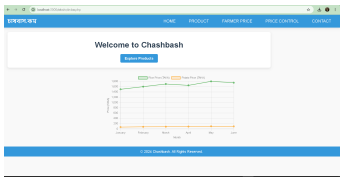

Fig. 9. Agricultural Market Regulation Officer Dashboard

- **Home**: A central hub for updates, notifications, and an overview of ongoing activities.
- **Product**: Monitor and manage available products.
- **Farmer Price**: Stay updated with farmers offerd price for their products.
- **Price Control**: Manage the products price.

At its center, a product table provides a comprehensive overview of all produce, including product names, quantities, current prices, and offer prices. It ensures farmers have all essential details at a glance.

- **Food Safety Officer Dashboard** The Food Safety Officer Dashboard ensures efficient monitoring of food production processes and compliance with safety standards. Core features include:

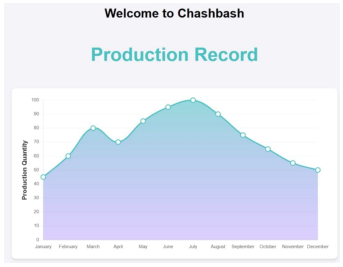

Fig. 10. Food safety officer Dashboard

- **Home**: An overview of production activities, updates, and alerts.
- **Production**: Monitor production data, track food safety protocols, and review product-specific metrics.

The dashboard includes two informative line charts:

– **Product Name vs. Acreage**: Displays cultivation area allocated to each product.
– **Product Name vs. Cost per Hectare**: Shows production costs for each product, helping evaluate cost efficiency.

With its intuitive design and data visualization tools, the dashboard empowers officers to maintain compliance and support sustainable, safe production practices.

- **Input Design**

ADD Products: The Add New Product page allows users to efficiently enter and manage agricultural product details. It includes the following fields: product name, type, variety, seasonality, historical price, and current price per kilogram. After entering all the necessary information, users may quickly complete the form and submit it, keeping records current and allowing them to track price patterns.

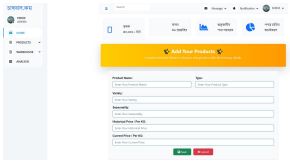

Fig. 11. add product

Price Control: Price Control page allows Agricu;tural Market Regulation to chaange the product present price in the product table.The officer by entering the Product ID and the New Price (TAKA) in the form fields. By clicking the Submit button we can put the changes in the product information table.In the table the present price will update with the new price The website's top contains navigation links to the Home, Product, Farmer Price, Price Control, and Contact areas.

Fig. 12. Product price

- **Output Design**
  – **PRODUCT INFORMATION:** This page shows a product management interface, with a table containing details like "Product Name," "Type," "Variety," "Seasonality," and "Current Price." Examples include Onions, Rice, Tomato, and Brinjal, with associated attributes. The system allows adding new products and accessing detailed product information.

  – **Production Information:** This page focus on agricultural production data. It includes information like "Product Name," "Acreage (hectares)," "Yield

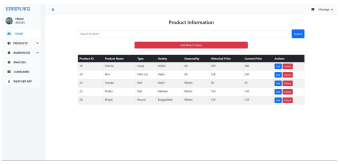

Fig. 13. Product Information

(tons)," and "Cost per Hectare." Examples include Garlic, Onion, Rice, and Tomato. The system supports record addition and search functionalities.

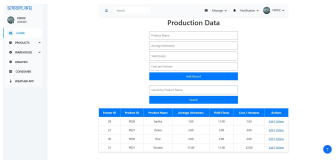

Fig. 14. Production Information

– **Consumer Data:** This page showcase a dashboard related to the consumption rate of products. It includes fields for "Demand ID," "Product ID," and "Consumption Rate," along with options to add or delete data entries. Also we can track and manage consumer demand statistics.

Fig. 15. Consumer Demand Information

– **Logistics Data:** The file displays a logistics management system interface. It includes a table listing logistics providers, their names, and associated actions or dates, such as "Axis Cargo" and "Apex Cargo." The system provides functionalities for searching, adding logistics, and managing inventory.

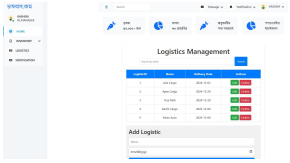

Fig. 16. Logistics Information

– **Inventory Data:** This page is an Inventory Management System designed to manage warehouse stock efficiently. It features a navigation menu for accessing different sections like products, warehouses, analysis, and consumers, along with tools for searching and managing inventory items. The

main interface displays a searchable table of inventory details, including product ID, name, warehouse ID, and storage quantity, with options to edit or delete entries. Additionally, a form is provided to add new inventory items, ensuring a streamlined and user-friendly experience.

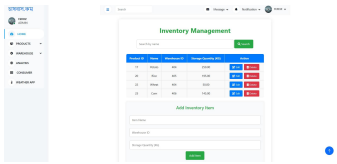

Fig. 17. Inventor Information

VI. RESULT ANALYSIS

- **Improved Supply Chain Efficiency** The platform's capacity to streamline supply chain processes is one of its main advantages Chashbash.com provides efficient distribution and management of agricultural products by providing solutions for logistical coordination and real-time production monitoring. Common supply chain inefficiencies including delays, overstocking, and resource underutilization are immediately addressed by this.
- **Enhanced Decision-Making:** Stakeholders can gain important insights into production patterns and market pricing trends via the dynamic dashboards and real-time data visualization tools. These capabilities assist policymakers, warehouse managers, and farmers in minimizing waste and optimizing resource use by facilitating data-driven decision-making. Furthermore, having access to past data improves their capacity to foresee developments and make strategic future plans.
- **Market Volatility Mitigation:** By encouraging improved stakeholder communication and offering insightful information about market dynamics, Chashbash.com lessens the impact of market volatility. In agriculture, where erratic price swings and fluctuating demand can have a big impact on both producers and consumers, this is especially crucial. Users can anticipate changes and modify their plans accordingly because to the platform's sophisticated analytics.
- **Technological Advancement in Agriculture:** A prime example of agricultural technology innovation, Chashbash.com integrates cuttingedge capabilities including supply chain performance measurement, historical data analysis, and real-time tracking. These features not only update conventional agricultural methods but also establish a standard for upcoming Agri-Tech product.
- **Stakeholder Empowerment:** One notable achievement is Chashbash.com capacity to empower stakeholders along the agricultural value chain. Whether they are farmers monitoring output, warehouse managers overseeing inventory, or food safety inspectors ensuring quality, the platform provides the tools they need to be more productive in their roles. This collaborative and inclusive approach strengthens coordination and increases overall production.

VII. SECURITY CONCERN

- Security is a crucial part of the Chashbash.com platform's functionality and design since it handles sensitive agricultural data and procedures. Considering the files and abstract that have been supplied, the following security concerns need to be fixed:
- **Data Confidentiality:** • User Data Protection: The platform manages inventories, production logs, and sensitive farmer data. Encryption must be utilized both in transit and at rest to stop unauthorized access to user data. • Preventing illegal Modifications: The platform, which manages crucial production and market data, should be protected from illegal changes by using digital signatures and checksums.
- **Authentication and Authorization:** • Secure Login Systems: Strong password regulations, multi-factor authentication, and defense against brute force attacks must be implemented by modules like LoginPage.php and RegisterPage.php. • Role-Based Access Control (RBAC): To stop data exploitation, information and system capability should be limited based on user roles (farmers, warehouse managers, administrators, etc.).
- **System Resilience:** • Protection Against Attacks: The platform needs to protect against typical vulnerabilities found in online applications, such as cross-site scripting, SQL injection, and cross-site request forgery (CSRF). Examples of modules that require proper input validation and sanitation are AddNewProduct.php and edit.php. • Server Hardening: In order to prevent assaults and unauthorized access to the platform, server hardening entails the use of firewalls and secure server configurations.
- **Third-Party Integration Risks:** • Database Security: To ensure secure connections to the database, modules like db.php should employ the proper authentication and encryption. • Third-Party Tools and APIs: If external services or APIs are utilized, they need to be integrated via secure protocols and carefully examined for security threats.

VIII. CHALLENGES

- **PROBLEM FACED** During the development of this project ,we had several challenges that required our flexibility and perseverance. One of the primary issues was the need to constantly update and improve the entity-relationship diagram (ERD), database schema, rich picture to be, and in order to meet changing project objectives. This approach needed a lot of testing and careful attention to detail to ensure that everything was accurate and consistent. Setting up XAMPP and establishing a reliable connection between the database and the platform were among the technical issues we encountered. It requires time and effort to configure the

server, resolve compatibility issues, and ensure smooth database interactions. Additionally, database integration was difficult since we needed to regulate the flow of data between different parts of the system and ensure that data

- **SOLUTION** To overcome this challenges, we used an iterative strategy to update the entity-relationship diagram (ERD), schema, and rich picture to be in order to solve project problems. Regular reviews ensured alignment with project requirements. In order to create a reliable environment, we consulted instructions for XAMPP setup and database connection problems and made necessary configuration adjustments. Issues with database integration were fixed via thorough testing, guaranteeing accurate and seamless data flow. Through feedback and usability testing, we enhanced the user interface to make it more user-friendly and accessible for farmers. We debugged and refined data for accurate visual representation using tools like Chart.js to handle chart-related difficulties. Git for version control improved collaboration, and effective problem-solving and time optimization were made possible by effective task management and teamwork.

IX. Conclusion

In conclusion, Chashbash.com serves as a transformative solution in the agricultural sector by addressing critical challenges such as supply chain inefficiencies, market volatility, and resource mismanagement. Our platform effectively utilizes php for back-end, MySQL for database, and HTML and CSS for front-end. Chashbash.com aims to empowering stakeholders with real-time data and analytics to make informed, sustainable decisions and revolutionize the agricultural sector by optimizing supply chain management. The platform bridges the gap between production and market demand, enhancing efficiency, reducing waste, and supporting food security. This platform establishes a new benchmark for the digital transformation of agriculture by fusing technical innovations with agricultural practices. A stable, robust, and future-ready agricultural environment is ensured by its capacity to link production data with market intelligence. Consequently, Chashbash.com promotes food security, global agriculture's long-term sustainability, and improving financial outcomes for all stakeholders.

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