

The Digital Transformation Of Agriculture: Exploring E-Commerce Platforms And Their Impact On Farming Practices

Gaurav Sahu¹, Manharan Anant², Yashwant Kumar Patel^{3*}, Aastha Vithalkar⁴, Keshav Kaiwartya⁵

¹Assistant Professor, Department of CFS, UTD, Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur, Chhattisgarh

²Assistant Professor, Department of Commerce, Govt. Naveen College Jatga, Korba, Chhattisgarh, India

^{3*}Assistant. Prof. and Head, Dept of FPT, Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur, Chhattisgarh, India

^{4,5}Guest Faculty, Dept of FPT, UTD, Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur, Chhattisgarh, India

***Corresponding Author:** Yashwant Kumar Patel

^{*}Assistant. Prof. and Head, Dept of FPT, Atal Bihari Vajpayee Vishwavidyalaya, Bilaspur, Chhattisgarh, India

Citation: Yashwant Kumar Patel, et al (2024), The Digital Transformation Of Agriculture: Exploring E-Commerce Platforms And Their Impact On Farming Practices, *Educational Administration: Theory and Practice*, 30(1), 1546 - 1553,

Doi: 10.53555/kuey.v30i1.6407

ARTICLE INFO

ABSTRACT

One of the main sources of income for the majority of people in India is agriculture, which also contributes to practically all aspects of domestic production and nearly every sector of the economy. The fact that over 500 million tonnes of food and non-food commercial crops are produced each year, together with agricultural goods like dairy, poultry, horticulture, and floriculture, shows how important agriculture is to our nation's economic prosperity. In recent years, there has been a revolutionary synergy between the agriculture and e-commerce sectors, which has reshaped established practises and fostered innovation. Technological developments, precision farming, and data analytics have transformed agricultural production processes, maximised resource use, and increased crop yields. Meanwhile, the emergence of e-commerce has given farmers a dynamic platform to communicate directly with consumers, circumventing conventional distribution routes and enabling farmers to become agricultural entrepreneurs. the changing dynamics between e-commerce and the agriculture industry, emphasising the technological, logistical, and financial ramifications. It looks at how e-commerce sites make it easier for farmers to exchange agricultural goods with one another, opening up new markets and boosting their income. Furthermore, the incorporation of intelligent farming methodologies and digital technologies into electronic commerce platforms is being investigated as a strategy to improve sustainability and efficacy in the supply chain for agriculture. Symbiotic connection to satisfy the changing needs of a globalised, digitally linked market, foster transparency, and address issues in the agri-food industry.

Key-word: E-Commerce Application, Rural Agriculture, Farmers, Smart farming, Sustainable Agriculture.

INTRODUCTION

India's largest reliant sector is agriculture. Farmers are having difficulty meeting their demands, as we all know. The idea to employ digital technologies to assist farmers with our practical endeavour occurs to us. We are integrating farming activities with the newest technology. Farmers can learn about different growing methods. A straightforward, user-friendly layout makes it simple for visitors to access our website. Lucky and incredibly responsive, allowing it to function well on any kind of gadget. The website is available in several languages, including Hindi, English, and a few regional tongues. Farmers that cultivate crops in accordance with the seasons harvest them, pack them, and get in touch with the seller to inquire about the availability of stock. The farmer replies with the price he can deal at when the wholesale merchant asks for the price. In order to maximise his earnings, the vendor bargains with the farmer over the price; in most cases, the

desperate farmer will accept the seller's offer at a loss. The farmer will sell their goods at the low rates set by the market because of their financial situation and the lack of available suppliers. Due to a number of other issues, including weather variations, seed flaws, and infertile soil, farmers continued to grow their harvest. They so anticipate making some money off of their goods. Farmers are not receiving the necessary earnings because of wholesale suppliers and their marketing tactics. The product is sold to retail vendors by wholesale vendors after they have purchased it from farmers at the price they have given. The final consumers are sold it by the store vendors (Gomathy et al., 2021). E-commerce is growing quickly and has impacted practically every industry. Agriculture's high degree of fragmentation makes it an attractive sector (Balasubramanian et al., 2018). E-commerce has several advantages, including increased agricultural product circulation and development (Cai et al., 2015), improved communication and experiences (Xiong et al., 2016), and price discovery and market transparency (Pool, 2001). In conclusion, e-commerce supports the agriculture industry in a number of ways that have been optimistically projected to contribute to the area of AE. A crucial component of e-commerce is customer relationship management (Schoder et al., 2004). As raising purchase intention is a crucial objective for e-commerce success (Delone et al., 2003), customer relationship management offers the chance to develop devoted e-commerce customers who make recurrent purchases (Ade et al., 2020). The primary conclusions of studies looking at the relationships between customers and e-commerce point to an interaction effect. E-commerce has, on the one hand, improved customer interaction efficiency (Fauska et al., 2013). Moreover, it gives businesses the chance to connect with both new and existing clients in novel ways (Henderson et al., 2000). However, e-commerce is a more practical means of acquiring goods and services (Salehi et al., 2012); it also improves customer satisfaction (Porter, 2001); and it is anticipated to draw in more customers and raise demand for a business's offerings (Montealegre et al., 2007). Smallholder farmers in developing nations are viewed as being at a disadvantage in the agri-food supply chain, and governments frequently face difficult decisions about income development (Wiggins et al. 2010). Smallholders have several challenges, yet it is crucial that they are able to enter the market. Unit transaction costs are significant in nearly all transactions because of their small scale (Poulton et al. 2010). Smallholders frequently find it extremely difficult to take advantage of market opportunities due to the pervasive imperfections of developing country markets, which include lack of information about prices and technologies, lack of connections to established market actors, distortions or absence of input and output markets, and credit constraints (Markelova et al. 2009). Two main strategies have been proposed to assist smallholders in addressing market access obstacles and inefficiencies. Establishing farmer organisations like agricultural cooperatives is the first step towards adopting collective action (Markelova et al. 2009; Hazell et al. 2010). When smallholders band together, they could have more negotiating power with suppliers and middlemen, lower input costs, and get access to more market data and governmental support. Promoting contractual agreements between smallholders and agribusiness companies is the second strategy (Key and Runsten 1999; Guo and Jolly 2008; Abebe et al. 2013). In contract farming, smallholders set up their production and sell the main products to distribution or processing companies at a predetermined price as specified in the written agreement.

TRADITIONAL MARKETING

Traditional marketing is any kind of marketing that was done before digital technologies were developed. Print ads, billboards, radio and television commercials, direct mail, and event sponsorships are a few examples of what this includes. Typically, conventional marketing channels are one-way means of communication via which businesses pitch their products or services to a broad audience in an attempt to pique interest and close deals. One of the main advantages of traditional marketing is its ability to quickly and efficiently reach a big audience. A billboard situated in a popular area, for example, may be viewed daily by thousands of people. Additionally, consumers tend to regard traditional marketing as more authentic and reliable than digital marketing, which they may find intrusive or impersonal. But traditional marketing may also be more costly than digital marketing, and evaluating its efficacy can be challenging. For example, figuring out how many people really see a print or hoarding advertisement before they buy might be difficult. On the other hand, using digital marketing channels like social media and email marketing, client behaviour may be precisely targeted. It is more important than ever to include digital marketing techniques into a comprehensive marketing plan, even while some businesses and industries might still profit from traditional marketing (Sahu et al., 2023)

ORIGIN OF E-COMMERCE

The 1990s saw the emergence of electronic commerce, and its use has quickly expanded. The vast majority of businesses have an internet presence. These days, conducting business online is essential. You may purchase food, clothes, and entertainment items online. The two biggest businesses that use e-commerce for business are Amazon and E-bay. These businesses enable clients to buy a variety of products and services online. Customers will be able to choose how they want their things delivered and have many payment methods (Madhu et al., 2018).

Issues and challenges facing Agri-retailing

India's agribusiness industry has the capacity to become the country the world's most advanced agribusiness. However, the industry must overcome a few early obstacles, such as:

- Insufficient supply chain coordination.
- Removing intermediaries (arhathias) from the value chain.
- Difficulty recovering credits and farmers' hesitation to contact banks.
- The low adoption of "one stop shops" (because of their high capital requirements).
- A buy-back programme that is effective (buying agricultural production).
- Effective mechanism for delivering compensation in the event that a product fails.

Opportunities ahead

Retailing in the agribusiness industry offers several options concurrently.

- The push from the government for commercial extension services.
- One-stop stores have the potential to serve as microfinance facilitators.
- FMCG and consumer durables can leverage the newly developed channel.
- Customer database can function as a source of accurate and easily accessible information.
- Can function as an accreditation agency for certifying farmer's produce.

E-COMMERCE PLATFORMS IN AGRICULTURE IN INDIA

Model legislation on agricultural marketing was created by the Ministry of Agriculture to implement marketing changes that were in step with new developments. In addition to promoting public-private partnerships (PPPs) for the administration and growth of the nation's agricultural markets, this model legislation permits the formation of private markets/yards, direct purchase centres, and consumers'/farmers' marketplaces for direct sale. Additionally, it has special markets for flowers, fruits, vegetables, and onions. To encourage agricultural produce grading, standardisation, and quality certification, a State Agricultural Produce Standard Bureau is to be established. To reap the rewards of market reforms, 15 States and 5 Union Territories have modified their Agricultural Produce Marketing Committee (APMC) Act thus far (Gupta et al., 2018).

1. **E-National Agriculture Market** - In order to establish a single national market for agricultural commodities, the National Agriculture Market (NAM), an electronic trading site that spans all of India, connects the current APMC mandis. Commodity arrivals and pricing purchase and sell trade offers, the ability to reply to trade offers, and other services are all included in this portal, which gives a single point of contact for all things APMC.
2. **Desta Mart and Desta Talk-Desta Mart** delivers agri-inputs to agribusiness operators, whereas DestaTalk focuses on farmers by disseminating knowledge about the agricultural industry. The startup DestaMart, an e-commerce platform, seeks to supply the rural market with seeds, fertilisers, insecticides, and agri-input supplies.
3. **E-Chaupal-E-Chaupal** is a commercial platform that links farmers to international markets through a number of organisational subsystems and interfaces. The International Tobacco Company (ITC) started it. It is composed of three layers, each with a distinct degree of spatial aggregation, and is distinguished by three essential components.
 - a. The organisational or physical framework that facilitates transactions.
 - b. The party (individual or group) coordinating the deals.
 - c. The layer's geographic coverage. The first layer is made up of village-level internet-connected kiosks, or "e-chaupals," that are within walking distance (five km) of each target farmer and are run by a local farmer with ITC training. India's rural areas have a low population, which justifies the e-Chaupal system for each cluster of five villages. The second tier is made up of physical infrastructure called hubs that are within tractorable distance (25–30 km) of the targeted farmer and are overseen by a traditional middleman known as a Samayojak, who possesses local knowledge and abilities.
4. The first e-governance initiative, AGMARKET, was launched in 2000 with the goal of bolstering India's agricultural marketing sector. It has become an important national gateway. It keeps up-to-date databases on daily minimum and maximum modal prices for over 300 commodities and their 2,000 variants, which it publishes in a variety of regional languages.
5. **Agricultural Commodities Exchanges** - Two commodity exchanges were established in 2003 to facilitate future trading in agricultural commodities in India. These include Multi Commodity Exchange of India Limited (MCX) and National Commodity & Derivatives Exchange Limited (NCDEX). The primary commodities traded on these marketplaces are agricultural goods. To reduce the farmer's price risk, they engage in forward trading.
6. **Big-Haat an agri-commerce start-up** is to assist farmers in taking use of e-commerce and saving money and time in the process. Raj Kancham, S. Kumar, and Sachin Nandwana founded it in January 2015. By giving farmers access to high-quality agro-inputs and accessories via a marketplace platform, they want to empower farmers.

7. **Indian Farmers Fertilizer Cooperative Limited (IFFCO)** is the biggest fertiliser cooperative federation in the world, with over 40,000 member cooperatives. It has revealed its intentions to create an e-commerce platform in order to attract a huge cooperative market.
8. **RML free Mobile application** offers incredibly captivating content forms, including as podcasts, images, and videos, along with cutting-edge features like the ability to communicate with agricultural specialists. This encourages farmers to create a social network on the app and positions it as the go-to digital platform for interacting with agri-communities and agri-stakeholders. Features of this programme include a 6-day weather prediction at the Taluka level, historical market combinations data for 6-crop combinations, warnings and alarms for erratic weather, and direct communication with district-level merchants. Additionally, comprehend the trend in supply and demand, timely inputs from planting to harvesting, higher productivity, policies, subsidies, schemes, health and financial data, important updates pertaining to agriculture, actionable agri-information, a higher standard of living, district-level interactions with farmers, and the sharing and learning of various agricultural practises.
9. **“I Say Organic” (ISO)** website launched in 2012 by an organic food store with headquarters in Delhi, with the goal of normalising organic foods nationwide. Every day, the Stock is sold over the ISO website. Within a few hours, orders placed online or through mobile devices are delivered. Clients have the option to pay with cash, credit card, or online upon delivery.

FOUR BUSINESS MODELS OF FRESH FOOD ECOMMERCE

- **Pre-warehouse model.**

In the pre-warehouse concept, many local community organisations build up a tiny warehouse that integrates warehousing, sorting, and distribution; there is no physical shop. The community users are surrounded by a small warehouse layout that efficiently improves distribution efficiency, reduces product loss, and makes it easy to fulfil the one- or even half-hour home commitment requirement. The pre-warehouse concept is being employed by a number of well-known new e-businesses, including Dingdong, Missfresh, and Meituan.

- **Community retail model.**

The model mostly consists of a community inn and group. Wechat and other communication apps are used for the release and purchase of the items, and a community group leader is chosen to serve as the convener. The items are dispersed evenly when a predetermined amount is purchased. Meituan Optimisation and Melon Ripening are two examples of community group approaches. Small physical businesses will be opened in the neighbourhood by the community fresh station. Vending machines, tiny physical operators, and mobile sales vehicles are available in small physical stores like Meat Federation and Direct Marketing of Xinfadi.

- **“To home + To store” model.**

In recent years, this approach has become more prevalent and novel. This mode offers internet and brick-and-mortar shopping. Customers may enjoy a range of purchasing experiences that can be delivered to their homes and stores with prompt delivery, one-hour delivery, or even appointment-based delivery. This is the approach taken by Wumei, Dmall, Convenience Bee, Fresh Hema, and so forth.

- **Platform model.**

Utilising the current platform sales advantages, the platform model expands the fresh sales distribution service and accomplishes the goal of fresh sales. The platform mode uses the current platform as the marketing window and does not store fresh goods; instead, it offers distribution services to offline supermarkets and fresh vegetable stores. This is the primary distinction between the general platform mode and the front warehouse or "to store" mode. For instance, the platform of the new sales model is Jingdong to Home (Xi Sun, 2021).

Challenges Of E-commerce and Agriculture Digitization in India

India has several obstacles in the digitalization of agriculture and e-commerce. When it comes to e-commerce, problems including low digital literacy in rural regions, poor internet access, and the ubiquity of cash transactions impede the general adoption of online platforms. Concerns about security and trust, in addition to complicated regulations, provide additional challenges to the smooth running of e-commerce companies. Furthermore, there are difficulties for both new businesses and established ones due to the competitive environment and market saturation. The high cost of digital instruments, uneven access to technology, and inadequate awareness and education among farmers are some of the issues facing the agricultural sector. The complexity of agriculture digitalization is exacerbated by inadequate internet access, the blending of ancient knowledge with contemporary technologies, and the lack of a supporting legal framework. In order to close these gaps and establish an atmosphere that supports the expansion of e-commerce and the successful digitalization of agriculture in India, several stakeholders must work together.

E-AGRIBUSINESS: INDIAN PROSPECTIVE

India's agro-based economy gives it a competitive edge over other countries because to its diverse biological, geographical, and climatic conditions. This helps India satisfy the ongoing demand for agricultural products by allowing it to cultivate a diverse range of crops even during the off-season. India's contribution to the global e-agribusiness scene is negligible. In the nation, e-agribusiness is still not a way of life. Ninety percent of businesses currently solely provide information online. According to Dash and Mohapatra (2017), just 10% sell items.

PARTICIPATORY APPROACH

Understanding how to introduce e-commerce application systems and associated ICT infrastructure, such as VSAT, the internet, and RIIC, to intended users, or participants, such as farmers, buyers, traders, suppliers, and even extension staff, through participatory approaches is crucial. The stages of a participatory approach to e-commerce application system introduction are as follows: working in tandem with the community, raising awareness of e-commerce, offering perspectives on how the community managed without it, and returning the benefits of e-commerce to the communities. It could be necessary to establish a "training team" that works with the community to identify its e-commerce needs. To encourage a broader use of e-commerce, the training team may include lead farmers, extension agents, and even non-governmental organisations (Joseph, 2010).

Participatory Information and Communication Technology Development (PICTD), which has four components, is one strategy (Joseph, 2008).

1. **Participatory Video (PV)** - When farmers—especially women—are reluctant to join in group conversations and meetings, video may serve as the greatest medium for disseminating information about e-commerce applications and their features. It can also serve as a feedback mechanism and inspire the participating communities.
2. **Participatory Communication (PC)** - Diverse forms of communication, including SMS, MMS, email, teleconference, and phone calls, to facilitate information sharing between participants and system administrators; to enhance online portals and communication techniques; to ask questions about agriculture and training initiatives.
3. **Participatory Learning and Action Research (PLAR)** - Engaging with the rural farming community is essential for comprehending their socio-economic structure and tracking changes as they implement e-commerce; farmers are able to assess their own operations, identify issues, and look for solutions. Creative training methods are required.
4. **Farmer Participatory Research (FPR)** - a cooperative approach that will deal with farming concerns, give farmers greater influence over the outcome, and enable them to make decisions; essential for community engagement and rural development; also promotes empowerment; Participatory Rural Appraisal (PRA), which has been applied in the assessment of Cambodian agriculture, is a great technique (Nadarajan et al., 2013).

RELATIONSHIP BETWEEN AGRICULTURE AND E-COMMERCE

The symbiotic link between e-commerce and agriculture is changing how agricultural goods are delivered to consumers and how conventional farming methods are carried out. Farmers now have more options to market and sell their goods directly to customers across the world thanks to e-commerce platforms. The lack of middlemen in this direct-to-consumer business model lowers expenses and boosts farmers' profit margins. Furthermore, e-commerce connects farmers and consumers across geographic borders, enabling the effective distribution of agricultural products. These days, farmers may use internet channels to display their goods, offer comprehensive product details, and even set up electronic payment systems for easy transactions. From the convenience of their homes, consumers may easily acquire a wide variety of fresh food, agricultural goods, and specialised items through e-commerce. In addition to providing financial benefits to both sides, this direct relationship between farmers and customers promotes supply chain transparency. The efficiency and sustainability of agriculture are further improved by the integration of data-driven solutions and smart farming techniques into e-commerce platforms as technology develops. This mutually beneficial relationship blurs the boundaries between the farm and the online marketplace.

E-COMMERCE AFFECT AGRI-BUSINESS MODEL AND ITS ROLE

The agri-business model has been profoundly influenced by e-commerce, which is also essential to its development. Here are a few ways the industry has been impacted:

1. **Information Access:** E-commerce has the potential to reduce the limitations on farmer information. This makes it easier for farmers to obtain market pricing, weather predictions, and best agricultural practises, which helps them make more educated decisions. (Yan et al., 2023)
2. **Sales and Profit Margins-** E-commerce increases profit margins and sales of agricultural products. Farmers might possibly enhance sales and earnings by expanding their consumer base and selling their products online. (Yan et al., 2023).

3. **Farmer Income:** E-commerce usage has the potential to significantly increase farmer income¹. This is due to the fact that farmers may increase their revenue by selling their goods directly to customers, doing away with the need for intermediaries.
4. **Two-way Circulation of Goods:** E-commerce encourages the two-way flow of consumer items and agricultural products. This implies that rural dwellers will have greater access to consumer goods in addition to farmers being able to sell their produce to urban customers (Yan et al., 2023).
5. **Government Support and Competitive Pressure:** E-commerce adoption is positively impacted by both competitive pressure and government backing. Incentives from governments and competitive pressure from other farmers who have already embraced e-commerce are two factors that may encourage farmers to use it (Liow et al., 2022).
6. **Business Model Considerations:** Agri e-commerce platform providers should think about the effects of working with different farmer types (smallholder, cooperatives, or large scale), whether farmers have access to formal buyers already, the location of farms and buyers, the perishability and seasonality of produce, and other factors when determining their business model (Jobe, 2019).

By enhancing information access, raising sales and profit margins, enhancing farmer income, encouraging the two-way flow of goods, and pushing for its adoption through competitive pressure and government support, e-commerce has the potential to completely transform the agri-business model (Jobe, 2019; Yan et al., 2023; James 2019; Liow et al., 2022).

Beneficial factors of E-commerce in Agriculture

1. The majority of farmers in the state or nation are unaware that they may do business and obtain information using mobile phones. To give the majority of farmers in the state or nation access to up-to-date knowledge on agriculture, mobile phone charges should be reduced.
2. The country's farmers are not aware of e-agriculture, and new farmers lack knowledge about the industry, so e-agriculture may offer them helpful information about the plantations they have established. This is why e-agriculture has not been introduced.
3. The government ought to carry out sensitization campaigns to educate farmers on the most effective ways to employ information technology in their agriculture operations.

Moreover, a few assessment indices are often difficult to understand. A set of trustworthy assessment systems is needed, given the evaluation issues with agricultural e-commerce sites that exist today. A method like this can scientifically represent the quality of the website service, which may help with decision-making when developing agricultural e-commerce sites (Sambhudas et al., 2018).

E-COMMERCE SITES AND HOW THEY AFFECT FARMING METHODS

E-commerce platforms have revolutionized farming practices by reshaping the dynamics of agricultural commerce. These platforms offer farmers a global marketplace, extending their reach beyond local communities and allowing them to diversify their product offerings. Direct-to-consumer sales facilitated by e-commerce eliminate intermediaries, providing farmers with a direct link to consumers and potentially increasing profitability.

The streamlined logistics and supply chain management systems inherent in these platforms enhance efficiency and reduce waste in the agricultural supply chain. Additionally, e-commerce platforms offer valuable market intelligence through data analytics, helping farmers make informed decisions about production and marketing strategies. Financial inclusion is fostered by platforms that provide access to financial services, empowering farmers who may face challenges in traditional banking systems. Technology adoption is another facet, with digital tools and innovations introduced to enhance farm management practices. However, challenges such as the digital divide and dependency on e-commerce platforms underscore the need for a balanced approach to ensure equitable benefits for farmers in the evolving landscape of agricultural commerce.

SOME E-COMMERCE SITES AND THEIR IMPACT ON FARMING

1. **Amazon (Amazon Fresh, Amazon Pantry):** Farmers now have the chance to reach a wider audience thanks to Amazon's e-commerce infrastructure, particularly through offerings like Amazon Fresh and Amazon Pantry. These platforms allow local farmers and producers to list their goods, giving customers access to a large selection of packaged and fresh agricultural items.
2. **Alibaba (Taobao, Tmall Fresh):** Taobao and Tmall Fresh are two of the Chinese e-commerce behemoth's platforms that allow farmers to reach direct customers. With the use of these platforms, farmers may offer their produce, speciality goods, and agricultural products to a large internet consumer market directly, doing away with the need for middlemen.
3. **Walmart (Walmart Marketplace):** Farmers and food producers may display and market their goods on Walmart Marketplace, the retailer's online store. Small and local farmers may be able to access a larger client base and expand their market reach as a result, which will help their agricultural companies develop.

4. **Farmers Web:** FarmersWeb is an online marketplace created exclusively for farmers. It establishes direct connections between farmers and supermarkets, chefs, and other food sector buyers. FarmersWeb is a digital platform that streamlines the supply chain and helps farmers sell their goods more effectively and competitively.
5. **Agri Webb:** AgriWebb specialises in farm management software and provides farmers with tools to automate and optimise their processes. Despite not being a conventional e-commerce platform, AgriWebb's technology helps farmers increase productivity, manage inventories, and optimise their production processes.
6. **Big Haat:** BigHaat is an Indian e-commerce site that specialises in providing services to the farming industry. It provides farmers with access to a variety of agricultural supplies, including as insecticides, fertilisers, and seeds. This platform makes it easier for farmers to obtain the resources they need for their crops by streamlining the procurement process.
7. **Mercaris:** Mercaris is an online marketplace catering to the non-GMO and organic farming industry. It offers a market place for the purchase and sale of non-GMO and organic products, assisting farmers in these specialised markets in connecting with consumers who value certain product characteristics.

CONCLUSION

In summary, the analysis of the interaction between the e-commerce and agriculture sectors demonstrates a dynamic interplay that has drastically changed customary methods and created new opportunities for expansion and sustainability. Precision farming, data analytics, and technology have all been integrated into agriculture to improve production processes and enable farmers to take advantage of e-commerce platforms. E-commerce-enabled direct-to-consumer business models have given farmers more leverage by decreasing their reliance on middlemen, increasing their profitability and opening up new markets. In addition to satisfying the changing needs of a globalised market, the effective distribution of agricultural goods through online platforms has promoted supply chain transparency and traceability. The evaluation also emphasises how e-commerce platforms and smart farming practises may be used to improve the efficiency and sustainability of the agri-food industry. The cooperation between e-commerce with agriculture is expected to be vital in tackling issues like environmental sustainability, traceability, and food security as both sectors develop further. In conclusion, this research paper's analysis of the mutually beneficial interaction between e-commerce and the agriculture industry highlights how technology is transforming established businesses. In addition to providing financial advantages to farmers and consumers, this partnership paves the way for the agri-food industry to become more robust, transparent and technologically sophisticated in the future.

REFERENCES

1. Abbie Phatty-Jobe Considerations and challenges of agri e-commerce business models, 2019.
2. Abebe, G.K., Bijman, J., Kemp, R., Omta, O. and Tsegaye, A. 2013. Contract farming configuration: smallholders' preferences for contract design attributes. *Food Policy* 35(12): 14-24.
3. Ade Surya, T.; Silalahi, S.A.F. The effect of e-commerce quality on consumer's satisfaction and loyalty: Case study of small and medium enterprises. *Int. J. Adv. Sci. Technol.* 2020, 29, 1404-1414.
4. Balasubramanian, G.K.; Balakrishnan, M.; Ch, S.; Soam, S. Status and scope of e-commerce in agribusiness in India. *Int. Res. J. Manag. Commer.* 2018, 5, 400-413.
5. Cai, Y.; Lang, Y.; Zheng, S.; Zhang, Y. Research on the influence of e-commerce platform to agricultural logistics: An empirical analysis based on agricultural product marketing. *Int. J. Secur. Its Appl.* 2015, 9, 287-296.
6. Debasis Dash and Ashabikash Mohapatra E-commerce and agribusiness, *International Research Journal of Commerce and Law*, Vol.04 Issue-8 (August, 2017)
7. Delone, W.H.; McLean, E.R. The DeLone and McLean model of information systems success: A ten-year update. *J. Manag. Inf. Syst.* 2003, 19, 9-30.
8. Dr. C. K. Gomathy, V. Jaswanth Reddy, P. Venkatesh (2021) A Study on Ecommerce Agriculture, *International Journal for Research in Applied Science & Engineering Technology (IJRASET)* ISSN: 2321-9653; IC Value: 45.98; SJ Impact Factor: 7.429 Volume 9 Issue X Oct 2021- Available at www.ijraset.com.
9. Fauska, P.; Kryvinska, N.; Kryvinska, N.; Strauss, C. The role of e-commerce in B2B markets of goods and services. *Int. J. Serv. Econ. Manag.* 2013, 5, 41-71.
10. Gaurav Sahu, Sanjay Singh and Yashwant Kumar Patel (2023) Digital Marketing: An Overview, *Zeichen Journal*, Volume 9, Issue 04, 2023, pp: :209- 220
11. Guo, H. and Jolly, R.W. 2008. Contractual arrangements and enforcement in transition agriculture: theory and evidence from China. *Food Policy* 33(6): 570-575.
12. Hazell, P., Poulton, C., Wiggins, S. and Dorward, A. 2010. The future of small farms: trajectories and policy priorities. *World Development* 38(10): 1349-1361.

13. Henderson, J.; Dooley, F.; Akridge, J. Adoption of E-commerce strategies for agribusiness firms. Selected paper at the American Agricultural Economics Association Annual Meeting, Tampa, FL, USA, 30 July–1 August 2000.
14. James Joiner, E-commerce in agriculture: new business models for smallholders' inclusion into the formal economy, 2019
15. Key, N. and Runsten, D. 1999. Contract Farming, smallholders, and rural development in Latin America: the organization of agroprocessing firms and the scale of outgrower production. *World Development* 27(2): 381-401.
16. Li H, Liow G and Yuan S (2022) E-commerce adoption among micro agri-business enterprise in Longsheng, China: The moderating role of entrepreneurial orientation. *Front. Psychol.* 13:972543. doi: 10.3389/fpsyg.2022.972543.
17. M. Joseph, Using Participation and Participatory Approaches to Introduce ICTs into Rural Communities, IST Africa Conference Proceedings IIMC, 2010, 1 - 10.
18. M. K. Joseph and T. N. Andrew, Participatory Approaches for the Development and Use of Information and Communication Technologies (ICTs) for Rural Farmers, IEEE, 2008.
19. Markelova, H., Meinzen-Dick, R., Hellin, J. and Dohrn, S. 2009. Collective action for smallholder market access. *Food Policy* 34(1): 1-7.
20. Mayuresh Kailas Sambhudas, Prof. Altaf Taher Shah, Prof. Shabnam Sharma, Integrating E-commerce in agricultural sector for promotion of organic farming, *IJIRMPs* Volume 6, Issue 5, 2018 (SOIT – ADYPU) ISSN: 2349-7300
21. Montealegre, F.; Thompson, S.; Eales, J.S. An empirical analysis of the determinants of success of food and agribusiness e-commerce firms. *Int. Food Agribus. Manag. Rev.* 2007, 10, 61–81.
22. P. Madhu Kumar Reddy & Dr. SK Shamshad Ahamed (2018) ROLE OF E-COMMERCE ON AGRICULTURAL DEVELOPMENT IN INDIA, *International Journal of Pure and Applied Mathematics*, Volume 118 No. 24 2018 ISSN: 1314-3395 (on-line version) url: <http://www.acadpubl.eu/hub/> Special Issue
23. Pool, B. How Will Agricultural e-Markets Evolve? United States Department of Agriculture: Washington, DC, USA, 2001.
24. Porter, M.E. Strategy and the internet. *Harv. Bus. Rev.* 2001, 79, 62–78.
25. Poulton, C., Dorward, A. and Kydd, J. 2010. The future of small farms: new directions for services, institutions, and intermediation. *World Development* 38(10): 1413-1428.
26. Ranu Gupta and Pawan Kumar Sharma Scope of E-Commerce in Agri-Business in India: An Overview *International Journal of Advanced Scientific Research and Management*, Special Issue I, Jan 2018. ISSN 2455-637.
27. Salehi, F.; Abdollahbeigi, B.; Langroudi, A.C.; Salehi, F. The impact of website information convenience on E-commerce success of companies. *Procedia-Soc. Behav. Sci.* 2012, 57, 381–387.
28. Schoder, D.; Madeja, N. IS Customer relationship management a success factor in electronic commerce? *J. Electron. Commer. Res.* 2004, 5, 38–53.
29. Shanmuga Vivekananda Nadarajan, Roslan Ismail and Lor Lytour, E-Commerce Application Model for the Development of Rural Agriculture Sector and Empowerment of Farmers in Cambodia, *Business & Entrepreneurship Journal*, vol.2, no.1, 2013, 21-34 ISSN: 2241-3022 (print version), 2241-312X (online) Scienpress Ltd, 2013.
30. Wiggins, S., Kirsten, J. and Llambí, L. 2010. The future of small farms. *World Development* 38(10): 1341-1348.
31. Xi Sun 2021, New E-Commerce Model and Development Strategy of Fresh Food E-Commerce Platform Based on ReTech E3S Web of Conferences 251, 01004 (2021) <https://doi.org/10.1051/e3sconf/202125101004> TEES 2021
32. Xiong, W.; Zhao, Z.; Fang, J. Influence of internet plus to international business development. *Am. J. Ind. Bus. Manag.* 2016, 6, 541–549.
33. Yan, B.; Liu, T. Can E-Commerce Adoption Improve Agricultural Productivity? Evidence from Apple Growers in China. *Sustainability* 2023, 15, 150. <https://doi.org/10.3390/su15010150>