

IMPACT OF DIGITAL TRANSFORMATION AND BLOCKCHAIN ON LEAN MANAGEMENT AND ENVIRONMENT PERFORMANCE OF AGRICULTURAL ENTERPRISES IN VIETNAM

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Abstract:

The goal of the article is to assess the current state of digital transformation and blockchain in the agricultural industry in Vietnam. From there, the author offers and analyzes casestudies in agriculture in Vietnam to assess the current situation of the agricultural industry. The paper also develops a theoretical framework on digital transformation in the agricultural industry and assesses the role of digital transformation in lean governance. and the environmental efficiency of agricultural enterprises in Vietnam. Finally, the article provides solution recommendations to improve the efficiency of Vietnamese agricultural enterprises in the ecosystem. global value chain attitude.

Keywords: Digital transformation, blockchain, agriculture, environmental efficiency, Vietnam

1. Introduction

Agriculture is an economic sector with a particularly important position in the Vietnamese economy. Although the share of agriculture in GDP is decreasing, agriculture still plays a strategic role in the long term, being an important support for the country's security, well-being and people's security. In the context of international integration, climate change, epidemics and especially the Fourth Industrial Revolution, digital transformation in agriculture is an inevitable trend, the "key" for the sustainable development of Vietnam's agricultural industry.

Digital transformation of the agricultural sector and rural development plays a particularly important role in restructuring the agricultural sector, developing large-scale, centralized commodity agriculture in the direction of modernity, high added value and sustainability, affirming the "support" role of the economy, becoming a "measure of national sustainability". Digital transformation is an important solution to help farmers and businesses produce quality agricultural products, with the lowest cost, but achieve the highest profit. This goal is also being promoted by industries, localities and businesses and people, with the expectation of creating a breakthrough in productivity, quality and competitiveness for agricultural products.

2. Literature review

2.1. Agricultural argument transfer

Agricultural digital transformation is the process of applying digital technologies from production to processing, distribution and consumption of agricultural products.

The fundamental difference between digital agriculture and traditional agriculture is in the application of digital technologies (big data, cloud computing, internet of things ...) to the entire operation of the industry, changing the way of managing, producing and consuming products from traditional to modern and smart.

Up to now, the concept of digital transformation in agriculture is also inconsistent, but it can be understood: digital transformation in agriculture is the process of integrating and applying digital technology (big data, cloud computing, internet of things ...) into the entire operation of the industry, changing the way of management, production and consumption of products from traditional to modern and smart.

Digital transformation will bring outstanding benefits and be an important contributor to the sustainable development of Vietnam's agricultural industry, which is reflected in the following key roles:

Digital transformation helps Vietnam's agricultural sector reduce risks and damage caused by climate change. Agriculture is a sector that is highly dependent on weather and climate. Vietnam is one of five countries heavily affected by climate change. In fact, climate change with the increase in temperature and extreme weather has been directly affecting all agricultural sectors, such as: reducing land area, reducing freshwater flow for agricultural production; increasing the intensity of storms, sea level rise and epidemics; reducing biodiversity ... The inevitable consequence is to reduce productivity, quality, even loss of revenue in agriculture. Applying AI technology (artificial intelligence), Data Analytics (data analysis) to risk management will help to warn early (72 hours before the storm passes)(1), from there, all levels, sectors and farmers will take timely response measures, limit risks due to climate change, more efficient and sustainable agricultural production. Digital transformation helps the agricultural sector improve productivity, quality, efficiency of production and consumption of agricultural products. Applying Internet of Things (IoT), Big Data, biotechnology technology has helped analyze data on the environment, soils, crops, and stages of plant growth. Based on the data provided, producers will make appropriate decisions (fertilizing, watering, spraying plant protection, harvesting ...), thereby, reducing costs, reducing water and land pollution, protecting biodiversity. In fact, the application of digital technology to agricultural production has reduced 1/2 of costs and labor, reduced greenhouse gas emissions by 50%, increased productivity by 30%, thereby increasing income for farmers(2). Moreover, the integration and application of digital technology into production helps consumers to retrieve and track these parameters in real time and be assured of the quality of agricultural products. In addition, the application of digital technology in agriculture helps to strengthen the connection between producers, consumers, between supply and demand, limiting the situation of "depreciating seasons, losing prices", thereby making agricultural production more efficient and sustainable. Digital transformation in agriculture helps to manage and operate the industry in general and businesses in particular more effectively. For the Ministry of Agriculture and Rural Development

(MARD), the application of information technology and digitalization in administration and management will help make decision-making faster and more accurate thanks to a timely smooth reporting system, increasing management effectiveness and operating efficiency. For agribusiness enterprises, digital technology also helps to increase operating efficiency, cut operating costs, and reach more customers. As a result, the operational efficiency and competitiveness of the business are improved. Therefore, digital transformation in agriculture is defined as creating an environment, agricultural digital ecology as a foundation, creating institutions, promoting the transition from "agricultural production" to "agricultural economy" whose ultimate goal is to develop an efficient and sustainable agriculture.

On September 29, 2019, the Vietnam Digital Agriculture Association (VIDA) was established. The Digital Agriculture Association has the task of perfecting the technological infrastructure for agriculture, connecting internationally and expanding markets; search and select technologies suitable for each farming and processing model in Vietnam; attracting investment for deep processing, training and development of digital agricultural human resources in Vietnam. The Association has gathered enthusiastic and responsible businesses and entrepreneurs to realize the goal of bringing Vietnam's agriculture to the right position and importance in the economy.

On 3-6-2020, the Prime Minister issued Decision No. 749/QĐ-TTg approving the "National Digital Transformation Program to 2025, oriented to 2030", in which agriculture is identified as one of 8 priority sectors for digital transformation, with a clear orientation of digital transformation of the industry. Specifically: (i) Develop high-tech agriculture in the direction of focusing on smart agriculture, precision agriculture, increasing the proportion of digital agriculture in the economy; (ii) Digital transformation in agriculture must be based on data (land, crops, livestock, fisheries). Building an integrated observation and monitoring network in the air and on the ground for agricultural activities. Promote the provision of information on the environment, weather and soil quality for farmers to improve crop productivity and quality, support the sharing of agricultural equipment through digital platforms; (iii) Applying digital technology to automate production and business processes; manage and supervise the origin and supply chain of products, ensure speed, transparency, accuracy, safety and food hygiene; ... training in the application of digital technology in production, supply, distribution, forecasting (price, seasonality, ...) agricultural products, promoting the development of e-commerce in agriculture; (iv) Implement strong digital transformation in management to have timely policies and administration of agricultural development such as forecasting, market warning, harvest management.

On the basis of the Government's orientation to digital transformation in agriculture, on June 18, 2021, MARD cooperated with the Ministry of Information and Communications to organize an online conference on Digital Transformation in the field of agriculture and rural development. At the conference, MARD set a goal for the period 2021-2025: Building 80% of the database on agriculture, updated on the basis of big data. Basically complete crop, livestock and aquatic data; building agricultural digital maps ready to connect, share and provide open data to serve people and businesses; building a blockchain technology application platform to provide environmental, weather and land quality information(3).

The above orientations and goals have gradually prepared conditions and created motivation for Vietnam to actively shift from traditional agriculture to digital agriculture.

2.2. Digital transformation activities in agriculture

Digital transformation of the agricultural sector includes basic activities such as applying modern technology in farming, linking value chains and changing management methods. As follows:

Application of modern technologies in agricultural cultivation

Currently, there are many modern technologies applied in agricultural cultivation. Typical are IoT and sensors in the field, machine learning and analytics, drones (MBKNL) monitoring crops. IoT and sensors in the field When applying this technology, the machinery system around the field will be equipped with sensors and connected to the internet. The location of the sensor installation is carefully calculated so that it can cover the entire field. As a result, growers can capture the condition of the plant and make appropriate changes. The equipment system will automatically water, provide nutrients to the plant under the control of the grower. The sensor is integrated with image recognition technology to help growers monitor and observe the condition of plants from afar. The information about the plant is collected by the sensor, constantly updated in real time to send to the grower.

Machine learning and analytics

Besides IoT and sensors in the field, farmers can also apply machine learning and analytics in agriculture. Machine learning and analytics are considered one of the most innovative digital transformation technologies in agriculture. Because this technology helps to mine existing data to forecast future trends. Machine learning can rely on local production and climate realities to best predict traits and genes. Moreover, this algorithm also predicts best-selling and sluggish products in the market. As a result, farmers can choose the right crop for cultivation.

Crop Monitoring Drone The drone looks like a remotely controlled miniature aircraft. This equipment can be used for many different purposes such as: Crop monitoring; Spraying plant protection from above with great performance; Export 3-D images to forecast soil quality and analyze and model crops.

Value chain links

In addition to applying modern technology, digital transformation in agriculture must also link the components of the agricultural ecosystem naturally along the value chain. In particular, the technology solution development center must be centrally located. Other components interact with each other, motivating the center to develop technology solutions and enjoy the benefits that the center offers. At the same time, the price chain link is also the connection between units, including:

Connection between people, businesses and markets

Connecting people, businesses, state management agencies with the market.

Thus, solving the digital transformation problem here is solving the problem of connectivity.

Change in the management of agricultural activities

Digital transformation in agriculture is not only reflected in the application of technology in production, linking value chains but also in changing the way businesses manage operations. As a result, agricultural enterprises can operate efficiently, increase productivity in back off

departments and save costs. To change the mode of operation management, agricultural enterprises need to:

Process digitization: Digitization must be done at all stages, from production, harvesting to warehousing, distribution. At the same time, businesses need to strengthen communication with stakeholders in the agricultural system. This will help increase visibility along the supply chain. The agricultural operation process of enterprises is also more transparent and efficient.

Optimizing administrative – human resources: Businesses need to use management software to optimize operations. As a result, managers can grasp key information, assets, warehouses; sales management at branches, stores ... everywhere. Accountants can work remotely, connect data to CRM systems, connect electronic invoices, declare taxes online ...

Modernizing the way farming is carried out: The application of new technical technologies to farming helps farmers achieve higher productivity and efficiency. At the same time, all stakeholders in the ecosystem also benefit.

2.3. Case studies

In Vietnam, FPT Corporation has cooperated with Fujitsu, the Fruit and Vegetable Institute, and Japanese experts to build a new vegetable growing model. In this model, Akisai technology is applied to connect and control elements in the farm remotely. The environment inside the greenhouse is monitored, managed by computer to create the best environment for tomato and lettuce plants to grow. Another typical example of successful digital transformation of the agricultural industry is Vinamilk. The company has applied IoT technology to livestock monitoring. From diet to all stages of care is carefully monitored according to smart agricultural standards. As a result, the volume of milk obtained is up to 23 liters / animal / day. The farm has also been certified as an organic farm according to European standards. Bayer's Made in Farm online platform connects smallholder farmers directly with consumers or merchants. This platform helps farmers and buyers meet, negotiate, trade online. The platform already has more than 10 million euros in transactions and connects 13 million consumers.

Based on the above orientations, up to now, most basic digital technologies have been gradually applied in the fields of agriculture in localities. Some large enterprises such as VinEco, Hoang Anh Gia Lai, Nafod, Dabaco, Vinamilk, TH True milk ... have applied digital technology to production, distribution and consumption of products. Currently, the country has over two million agricultural farmers trained in digital transformation skills, nearly 50 thousand agricultural products are put on e-commerce products with thousands of transactions made(4). It is estimated that by the end of 2021, nearly 12% of the total number of agricultural enterprises applying digital technology to production(5). Considering the whole industry, up to now, digital technology has been applied in all areas of the industry, from management to production and consumption, specifically:

Firstly, digital technology is applied in the management and administration of the industry.

In order to apply digital technology to the management and administration of industry activities, MARD has digitized the direction document, providing data to connect, connect and share with localities and enterprises participating in the agricultural sector. Up to now, MARD has 113 types

of databases and 32 specialized software for management and expertise in the fields of agriculture, forestry, fisheries and irrigation that have been digitized for the digital transformation of the agricultural sector. In addition, MARD also applies digital technology to organize and chair online briefing conferences of the sector; Online conference between ministry leaders and relevant ministries and sectors and 63 demand points nationwide to promote agricultural product consumption in the context of the Covid-19 epidemic. Thereby, the management and administration of the consumption of agricultural products is more convenient, timely and effective.

Secondly, digital technology is applied to the fields of cultivation, forestry and aquaculture. In farming, Internet of Things (IoT) technology, big data (Big Data) is applied to help analyze data about the environment, soils, plants, and growth stages of plants. In the south, some cooperatives and businesses in the south have tested drone technology to spray plant protection and fertilize; using robots for automatic seeding, using photovoltaic cells to produce electricity from solar energy for agricultural production.

In animal husbandry, IoT technology, Blockchain, biotechnology are widely applied in large-scale livestock farms. In particular, the dairy industry applies digital technology the most, notably the modern farms of TH True Milk Group and Vinamilk Company. The use of digital technology in animal husbandry has made an important contribution to disease surveillance, consumption output, traceability of cattle and poultry, livestock management according to scientific processes, disease safety, so the livestock sector is becoming more efficient and sustainable.

In the field of forestry, barcode DND technology is applied in forest seed management and forest products; GIS technology (tools used to collect, manage and analyze data from geospatial) and remote sensing images used to build forest fire warning software from satellite images, monitoring software in forest management, early detection of forest degradation or loss, thereby, contribute to the effective assessment of forest resources as a basis for sustainable forest management, protection and development.

In the field of fisheries, digital transformation is strongly implemented through the application of ultrasonic wave systems, flow meters, net capture and drop systems, GIS technology, global positioning equipment (GPS) to manage offshore fishing fleets that have helped aquaculture and fishing, effective seafood. In addition, the application of artificial intelligence technology in shrimp farming has helped analyze data on water quality and feed management of shrimp. Automation technology is used in seafood processing from sorting, steaming, packaging ... has also reduced costs, saved manpower, time, quality assurance, so it increases efficiency and sustainability.

Third, digital technology is applied in the consumption of agricultural products.

Currently, digital technology has been used in connecting agricultural product consumption. Especially during the Covid 19 pandemic, social distancing must be implemented, disrupting the supply chain of agricultural products, digital technology has been used by localities to promote and promote trade, promote distribution and consumption of agricultural products, helping the agricultural industry overcome difficulties during the epidemic season. Typically, Hai Duong

province has organized a conference to connect and promote the consumption of Thanh Ha lychee and key agricultural products of the province through online form with provinces and cities in the country and with 60 demand points in 22 countries, territories and hundreds of other link points at home and abroad(6). As a result, it has brought positive results for agricultural products in the province: prices are much higher than before and consumption is easier. In Bac Giang, the lychee season in 2021 at the time when Bac Giang is the largest epidemic center in the country, with the help of the Department of E-Commerce and Digital Economy, the Ministry of Industry and Trade, local minority fabric products have been consumed online at the 6 largest e-commerce platforms of the country such as: Sendo, Shopee; Tiki; Postmart, ViettelPost (Voso), Lazada. In addition, it is also sold online on online platforms: facebook, zalo, youtube ... Applying digital technology, it has helped to consume 215 thousand tons, an increase of 50 thousand tons compared to the plan, of which, exporting 89,300 tons, the rest domestic consumption, stable prices from the beginning to the end of the season, sometimes even higher than the years without the epidemic and earning VND 6,821 billion, equivalent to revenue in 2020(7). The connection of agricultural product consumption on digital platforms has facilitated, transparent information, reduced intermediary costs. Thereby, creating a close and multi-dimensional "link - cooperation" between management agencies and businesses and farmers, overcoming the bottleneck of a "fragmented, small and spontaneous" production; create products that ensure quality, safety, responsibility, meet the increasing needs of the market and consumers.

The proactive application of digital technology to the management, production and consumption of agricultural products shows that Vietnam's agriculture is gradually shifting from traditional agriculture to modern agriculture and agricultural production is becoming more efficient and sustainable.

In addition to some of the above achievements, the application of digital technology to the agricultural industry also has limitations such as: asynchronous, quite fragmented, mainly under the individual initiatives of some businesses and localities and still seems to follow the old thinking, there is no digital connection chain, there is no new and comprehensive approach required by digital transformation. The application of digital technology to agriculture is still modest, by the end of 2021, the country will have about 2,200/19,000 agricultural cooperatives implementing digital transformation, with nearly 2% of the total number of agricultural households being trained in digital technology. These restrictions stem from the following barriers:

The application of digital technology to agricultural production and business in Vietnam is quite new, so the awareness of most localities, businesses and especially farmers is limited. Most subjects have not seen the role, importance and pressure to apply digital technology to production and agribusiness. This makes it difficult to access and apply digital technology in the agricultural industry.

Digital technology infrastructure is outdated and high cost. Implementing digital transformation in the agricultural industry requires a synchronous and modern digital infrastructure and data systems (crops, livestock, digitized policy documents). However, the connection infrastructure of our country is still outdated, asynchronous and the cost of 3G and 4G is still high, not creating

opportunities for agricultural products in remote areas to connect directly with the e-commerce system. This makes it difficult to access and apply digital technology to production and agribusiness.

Data systems for integration and sharing are almost nonexistent or do not meet the requirements of connection, interconnection and integration. The ministry's data system is not yet compliant with the E-Government Architecture Framework, which still mainly stops at version 1.0. Information technology application of enterprises and households has largely not met the requirements of digital transformation due to the lack of large databases for production, lack of transparency of product origin, lack of information sharing connection of all stages from production, management, logistic, trade in agricultural products. It can be said that this barrier is a major obstacle to implementing digital technology in Vietnam's agricultural industry in the following years.

The level of farmers - the labor force directly bringing digital technology into production is still low. In digital agriculture, in addition to traditional means of production, farmers also have to use digital data and digital technology. Therefore, in addition to production skills, farmers must have more knowledge and skills in trade, technology in general, digital technology in particular and biotechnology... However, the level of science and technology of farmers in our country is still low, in 2020, the whole country has only 16.3% of workers in rural areas who have undergone technical training(8), particularly agricultural, forestry and fishery workers in the age group only 10.03% (9) are trained. Besides, most farmers have not been well trained in digital transformation, so they have difficulty in manipulating as well as evaluating efficiency. It can be said that this barrier is the biggest obstacle in agricultural digital transformation in the coming period.

Policies for digital transformation in agriculture are not suitable and untimely. The promulgated policies are not suitable for practice, for example, the new high-tech agricultural support credit policy is mainly aimed at businesses, but businesses are also difficult to access due to cumbersome procedures, and farmers - direct producers hardly benefit. Besides, there is no policy to encourage e-transactions to reach international customers...

3. Solutions to promote digital transformation in Vietnam's agricultural sector

Digital transformation in agriculture is a necessity. In order for digital transformation in agriculture to be favorable, it is necessary to participate and coordinate with agencies and departments from the central to local levels and especially farmers must be ready to change their thinking and approach science and technology. Therefore, in order for digital transformation in agriculture to develop strongly in the coming years, it is necessary for the State, MARD, relevant ministries and agencies and especially localities, to focus on synchronous implementation of the following solutions:

Firstly, raising awareness of localities, businesses and especially farmers about the role and importance of applying digital technology to production and business in the agricultural industry. This is a prerequisite in digital transformation. Only when aware of the role and importance of implementing digital technology in the agricultural industry, localities, businesses and farmers will actively learn and apply digital technology to agricultural production and business. In order to do

so, it is necessary to promote information and communication on information media, conferences, seminars, agricultural extension models on the need as well as the role and benefits of applying digital technology to management, production and consumption of agricultural products in the context of climate change, technology 4.0 and international integration. On that basis, raising awareness for agricultural production and business entities, especially farmers - the main and direct actors of the agricultural industry, creating a foundation for digital transformation in the agricultural industry.

Second, upgrade and proceed to build a modern and synchronous digital technology infrastructure at a competitive cost. Implementing this solution will facilitate the access and application of digital technology to the agricultural industry. In order to do so, MARD coordinates with the Ministry of Information and Communications to develop high-quality broadband internet infrastructure and connectivity (4G, 5G mobile network infrastructure, IoT connection infrastructure) to communes, villages and villages; improve the quality and capacity of access to telecommunications services for people; improve access to telecommunications services, support farmers to use information technology equipment (providing wireless internet) for free at commune centers, community cultural activities, rural tourist spots; moving forward, universalizing digital infrastructure in the direction of each farmer with a smartphone, a universal fiber optic line for farmers.

Third, accelerate the construction of an agricultural data system, especially data on land, trees, children, growing areas, growers, the number of agricultural products and services, and digitize the ministry's executive documents. It can be said that implementing this solution creates data for the agricultural industry to integrate and promote the application of digital technology. First of all, MARD cooperates with the Ministry of Information and Communications to build and standardize industry databases, build agricultural digital maps on a synchronous big data platform to connect, share and provide open data; develop software for managing, monitoring, evaluating and classifying agricultural products, especially products typical of each locality; urgently build a database of land, environment, weather ... provide people and businesses in accordance with the set goals. In addition, encouraging people and businesses to digitize production processes, proceed to product integration and transparency with QR code scanning systems.

Fourth, improve the level and capacity to access and bring digital technology into agricultural production for farmers. First of all, the Ministry of Information and Communications cooperates with the Ministry of Education and Training to compile and disseminate digital transformation content, exploit safe digital services in cyberspace into the curriculum of high school levels. In addition, the Ministry of Agriculture and Rural Development, the Ministry of Information and Communications and the Ministry of Industry and Trade coordinate in implementing training and training to improve the level of information technology, digital transformation, support traceability, exploit digital services for farmers and farm owners. From there, producers will improve product promotion skills, livestream skills, create conditions for farmers to directly approach customers, understand and understand the needs and consumer trends of the market to organize production effectively and meet the needs of the market, overcoming the situation of "tight planting". In addition, launching technology enterprises to serve agriculture and rural areas

through the dissemination of a number of important digital transformation platforms, applying digital technology to care, traceability, connecting supply and demand between people and businesses.

Fifth, develop and perfect policies for digital transformation in agriculture appropriately and in a timely manner, creating a driving force for the digital transformation of the agricultural sector in the right focus and efficiency. First of all, the Ministry of Agriculture and Rural Development shall assume the prime responsibility for, and coordinate with relevant ministries and sectors in, advising the Government to develop a system of policies for digital transformation that are appropriate, focused and focused in the direction of creating favorable conditions for digital transformation of the sector; support agricultural entities to have sufficient resources to apply digital technology, develop digital human resources, link the digital business community; review and amend and supplement the contents and norms of state support for the application of high technologies and digital technologies to agriculture; simplify procedures for accessing technology infrastructure, land and capital sources; review and supplement policies to encourage organizations and enterprises to provide digital services in the fields of economy, trade, health, education... investment in agriculture.

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