

# Chapter 24

## Empowering Agribusiness with Digital Innovation for Emerging Market



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**Abstract** This article discusses the adoption process of B2B market in agriculture business. The current challenges in today's agriculture business provide a holistic view on better implementation of B2B market opportunities using e-commerce platform. Electronic commerce has the potential of improving the efficiency and productivity of any economy. Currently, there are still a limited number of studies on e-commerce adoption by developing countries. This article is meant to identify factors that could influence proper implementation and adoption of e-commerce in developing countries focusing towards B2B market. Factors affecting the adoption of e-commerce and the condition of emerging market in relation to e-commerce adoption were also discussed.

### Introduction

The power of Internet increased the connectivity, efficiency and productivity across various industries. The developed countries have taken this technology advantage much early and benefited a lot. Internet usage empowered the connectivity of end-to-end supply chain and provided remote monitoring and controlling and excellent customer experience in e-commerce business. The cost of Internet, faster data transaction and people trust factors in buying online shopping were the success factor of e-commerce penetration in developed countries. However, the case in developing countries is quite different. Past few years, countries like India are showing interest in mobile Internet especially in social media, online shopping, etc. The key barrier in e-commerce platform in agriculture sector is slow penetration of Internet in rural India particularly in the farming community due to high Internet cost, poor infrastructure and high implementation cost and lack of awareness of Internet usage.

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Government and other institution initiatives (Digital India) encouraged small player in market to support and launch start-ups to tap the potential market opportunities. The concept of open innovation can create novel products, services and business models which can be a paradigm shift in farming industries. To realize the end-to-end benefits in agriculture business requires a new approach of integration compete supply chain and clear understanding of future customer requirement and emerging technologies.

The objective of this article is first it provides an overview of potential B2B market opportunities in agribusiness in developed and developing countries (Kaplan et al. 2000). Later, it details the barriers and various challenges in implementing e-commerce platform in developing countries and finally proposes a business model for future agribusiness shifting with Bi-Modal agriculture.

## **Strategic Marketing Issue**

### ***International Trade—Restrictive Policies***

Developing countries are facing unfair trade competition, victims of subsidy policies and dominated by developed countries. More than 70% of all export subsidies in agriculture is controlled by developed countries, and this makes extremely difficult for developing countries to compete in the export market. However, World Trade Organization (WTO) controlled the situation and structured the proper governance system, regulated tariff, export regulation and reduction in agricultural subsidies system to address the problem faced by developing countries.

## **Infrastructure Gaps in Emerging Market**

Agriculture business using e-commerce platform can transform into digital age business model compared to the traditional way of doing business. The way supplier interacts with customer, logistics and communication channel, distributions will be more digital via mobile networks, Internet and social media, network devices and sensors and satellite communication systems. However, the supported infrastructure, hardware system compatibility and data connectivity are the major barriers in developing countries.

A study on the network coverage as per TRAI shows low percentage of coverage, more drop call and network utilization in India (emerging countries). Tamil Nadu, an agriculture state in India, was taken for study for this case. The increase in the mobile Internet rural users is rapidly growing in state, but the necessary cellular infrastructure in state is still very low. This is one of the key drawbacks in expanding the e-commerce opportunities in agribusiness, especially in B2B market.

## **Need Centralized Interface**

Farming community in developing countries continues to follow traditional farming practices due to lack of access to centralized knowledge base repository system. Most of the farming best practices were not stored or shared across farming community to increase the productivity. Farmers in small region do not use technology and fail to connect with agro-input companies (**agriculture product suppliers**) for buying quality fertilizer, seeds and pesticides which can yield better results. In fact, this is one of the major challenges for agro-input companies to reach small community farmers segment. These companies struggle to predict market demand and sales due to lack of market information and miss the opportunities for making profit.

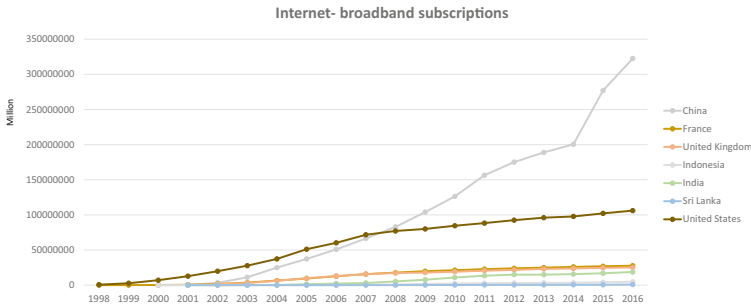
## **Weak Smart Farming Technique Adaptation**

Unpredictable weather, weak infrastructure, volatile prices and little support are universal challenges facing smallholder farmers. Despite all these challenges, millions of farmers, traders, service providers and other micro-entrepreneurs still manage to deliver fresh food to urban consumers daily, export produce to distant markets, and stay in business. This reveals gaps in the current value chain in farming industries and its dependent business sectors. Smallholder farmers do operate in isolation today and struggle from the point of production, processing, marketing of a particular product, from inception to the finished product. A greater opportunity of leveraging technological advancement with the right strategic vision can be used to eliminate the non-value added practices in Agriculture industry (farming-production-marketing-buyer). The lack of awareness, infrastructure and economy situation is the current challenge in developing countries to leverage technology advancement in agriculture industry.

The detailed market opportunities of smart farming in emerging and developed countries are discussed in later stage in this article.

## **Need Data-Based Operational Decisions in Agriculture Industry**

Availability of markets and market information data gives farmers the potential to bargain, seize market opportunities through the adjustment of production plans and better allocation of production factors, and lack of information on right time to make choices about marketing to improve their income. Not many predictive quantitative models are available in agribusiness to predict the right market demand and assist farming community to make profit.



**Fig. 24.1** Growth of Internet-broadband subscriptions in Developed vs Developing countries, Prepared by Author

Opportunities for data science and machine learning technique can be used in the field to predict crop pricing, weather forecast and investment decision. Crop failure scenario, soil nature for best case farming, crop growth rate, Internet of Things (IOT)-based smart irrigation and many more can be achieved.

### Modernizing Agriculture Using Digital Innovation

The adoption of e-commerce in agriculture is increasing in the recent years, and penetration is faster in developed countries than developing countries. Also, the food habits of the consumers are changing and the demand of agricultural commodities is on a rise. The emerging challenges and opportunities call out for a paradigm shift in the innovation-driven field of agriculture. The subsistence agriculture in the state is shifting to a high-value commercial enterprise.

The cultivation of high-value crops is gaining importance due to the better returns, lower risk and tolerance of these crops for part-time farming. The penetration of mobile technologies has evidently proven more productivity in agribusiness. The usage of mobile Internet is seen quite high and matured in developed countries.

At the same time, report from ICT shows<sup>1</sup> the mobile cellular and Internet (broadband) users in developing (emerging) countries are rapidly growing when compared to developed countries (Fig. 24.1).

<sup>1</sup>ICT report, *Growth of Mobile & Fixed broadband in Developed & Developing countries*.

## **Precision Farming Technology—A Comparative Study on Developed and Emerging Countries**

Precision farming technology, also called precision agriculture or satellite farming, is defined as an information technology-based farm management concept that involves the observation, measurement and response to intra-field variability in crops, with the aim of optimal production, sustainability and protection of land resources.

Use of precision farming is not only expected to help increase crop yields, but also aids in the monitoring of crop health, which in turn helps in improving soil property, soil fertility, moisture, etc. The proven advantage of precision farming is driving agricultural companies and large farm owners to adopt precision farming technologies and solutions.

### **Market Adaptation Rate Developed Versus Emerging Countries**

See Table 24.1.

### **Developed Countries: Farming Technology**

The farming technique is more scientific and technology-supported system available in developed countries. In USA, even small farmers are empowered and have better access to market information, sponsorship from leading companies to promote technological innovation, availability of Internet of Things-based system such as solar powered water pumps, smart harvesting techniques and market information. GPS-based automatic vehicles are used in agricultural land for seed planting, water spraying and even LED light-based planting. Thanks to advantage technology, knowledge of farming practices can be socialized across region using Internet and mobile phones.

Due to widespread modernization in developed countries in the agriculture sector, farming communities have started employing connected technology, big data and by enabling self learning models in various domains of cultivation like tillage, sowing, irrigation, transplanting, plant protection and threshing.<sup>2</sup>

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<sup>2</sup>Rolf A.E. Mueller, *E-Commerce and Entrepreneurship in Agricultural Markets*, *American Journal of Agricultural Economics*.

**Table 24.1** Comparative study on emerging market vs. developed market, “Prepared by Author”

Country/region	Current market	Current growth	Future market	Future growth	Challenge	Growth driver
USA	Mature	Moderate growth	Mature market, moderate potential	Slowdown of growth expected	Declining growth rate	New entrants and innovation
UK	Moderately high developed market	Low growth rate	Moderate growth potential	Slow growth due to weak economic condition	Slow economic and overall growth	Innovation and new product introduction
Europe	Moderately developed	Low to moderate growth	Moderate growth potential	Slight decline in growth rate	Weak economy	Innovation, certain unpenetrated regions
<i>Emerging countries</i>						
China	Moderate market	Strong growth potential	Opportunistic view	Strong expected growth	Government regulations, presence of duplicated products	Huge penetration opportunity
India	Low and underdeveloped market	Strong growth potential	Opportunistic view	Strong expected growth	Low technical knowledge, high initial implementation cost	Huge penetration opportunity
Brazil	Underdeveloped market	Strong growth potential	Opportunistic view	Strong expected growth	High initial implementation cost	Huge penetration opportunity

## **B2B Market Opportunities**

The hardware market is the largest segment and is expected to continue its dominance through to 2020. However, this category is projected to achieve slower growth than for software, which will hit a CAGR of 14.4% from 2016 to 2020.

As per the research study, the developing markets, the precision farming technologies (European Union 2014) market in North America, and particularly the USA, are already a mature market. While the software segment is still developing in other regions, it has already witnessed strong adoption in the US market. In the software segment, farm management software is the largest category. Farm management software is already an established market in the developed countries.

## **Developing Countries: Farming Technology**

The traditional agriculture societies in developing countries have been taking attempt to transform into informative societies and hence require good change management process, support from government or private institution for infrastructure and funding. The development of innovative technologies, precision farming in agriculture emphasizes knowledge intensity; hence, the agricultural paradigm in the developing countries needs to remould to take advantage of available knowledge bank from developed countries and adopting quickly for income generation, food and nutrition sustainability and employment generation.

The connected information communication technology will play a major role in adding value to our agriculture growth in developing countries and with better design and implementation can recast existing overall appearance of challenge into opportunities in the agriculture sector.

## **B2B Market Opportunities**

The opportunities in developing countries face prominent challenges such as a lack of technological knowledge and high initial implementation costs. In many countries in the region, the farms are generally smaller in size and unorganized compared to those in developed nation, and breakeven period is longer and remains challenge to farmer's community to shift from traditional farming practices to technology-based smart farming techniques.

As per the research study, the market of hardware is estimated to grow more than \$700 million in 2020.

While the market is witnessing strong growth across all regions, developing countries are expected to show the greatest increase over the period. Most growth is expected to come from relatively technologically advanced countries like India,

which still has a large agricultural presence. But these countries are likely to remain slow in adopting precision farming, partly due to low technical and scientific farming technique, and unorganized way for functioning.

## Strategic Challenges in Developed Versus Emerging Countries

### GDP Growth Rate

Among the emerging market, China and India are the fast growth economy in the world. The below report which clearly shows the GDP forecast growth rate till 2018 of both developed and developing countries.

Developed markets such as USA, Canada and UK are matured and statured (OECD 2012). The opportunities of agribusiness in these countries will be low when compared to emerging countries (Fig. 24.2 and Table 24.2).

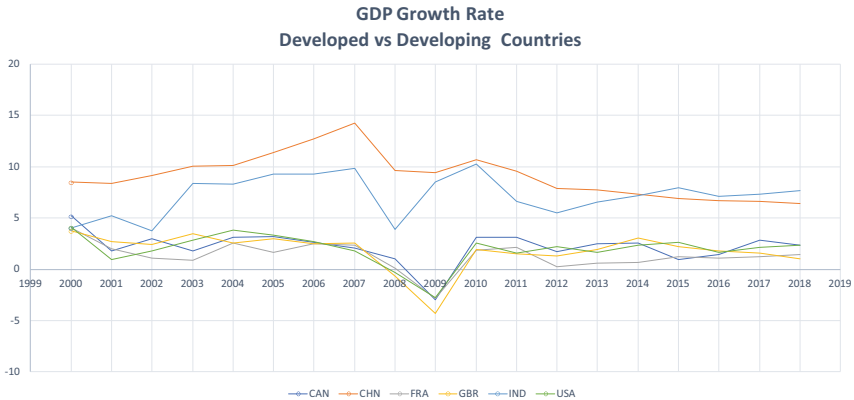


Fig. 24.2 GDP growth rate for Developed vs Developing countries, Prepared by Author

Table 24.2 Challenges in implementation—developed vs. developing countries, Prepared by Author

	Developed countries	Emerging countries
Market and growth	Matured, slow	High growing
<i>Other challenges</i>		
Arable land	Low	High
Technological acceptance	High	Low
Integration issues and challenges	Moderate	High
Implementation cost	Low	High
Maintenance issues and cost	Low	High



## Arable Land

Arable land is the percentage land used for agriculture and farming purpose. The trend clearly shows the developing countries arable land is saturated and has come down over the decade whereas the emerging countries China and Brazil showing high growth and production.

It is very surprising to see India arable land percentage stands close to the developed countries from the year 1960 onwards. Various Green Revolution Initiatives after independence are key reason behind India’s high percentage of arable land but unorganized and low productivity in production (OECD Data 2016). However, India is able to sustain the arable land over past five decades, whereas decline is observed for developed countries (Fig. 24.3).

## Implementation Cost

The key challenge in adopting the precision farming technology in the emerging regions is high initial implementation costs. The developed regions are technology-intensive and have established precision farming set-up. This means that the only cost to farms in developed regions is for new additions and maintenance. However, farmers in emerging regions are more cost-sensitive. Precision farming equipment comes at significantly high cost and sometimes can have a long turnaround time. This makes it difficult for users from emerging regions to measure the benefits immediately after installation.

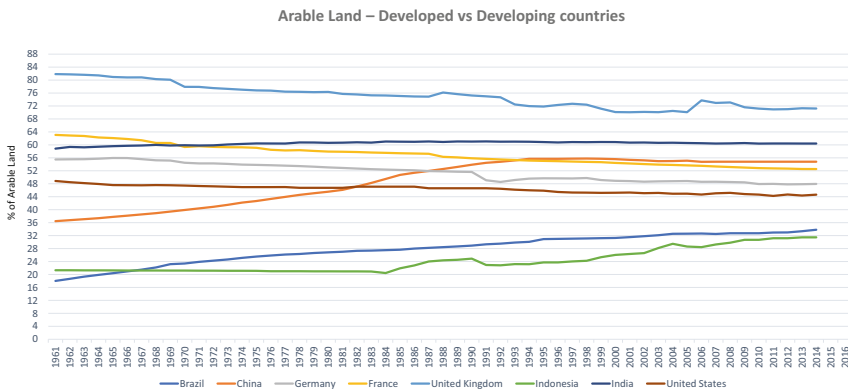


Fig. 24.3 Arable land report (1960–2017) for Developing vs Developed countries, Prepared by Author

Although the initial implementation cost is expected to come down with increasing penetration of large vendors, this is still expected to remain as a key hindrance to market growth in some regions.

## **Farming Technologies—E-Commerce Solution in B2B Market**

The global smart farming technologies market can be categorized into software and hardware markets.

Software market accounts high growth rate compared to hardware market. The developing countries' investment in software is most expected over the next 3–5 years, and technologies such as big data, Internet of Things, artificial intelligence and blockchain will be the most interest of area for farming-related software e-commerce platform.

Hardware market involves higher prices of hardware equipments along with experienced engineering skill for designing and integration. The developed countries are highly matured in manufacturing hardware parts with low cost (European Union 2014). Another important factor to be considered in this market is compliance in Hardware manufacturing standard, i.e manufactured components need to compliance with international standards for easy assembling, avoid hardware compatibility issues, provide high equipment performance with long duration.

The hardware market will be dominated by developed countries for next 3–5 years, the primary advantages are availability of cheap hardware components, Design and Engineering knowledge and most of developed nation are member of International committee who defines standards of hardware and software component and interoperability such as International **Electrotechnical Commission** (IEC).

Software applications include productivity analysis, advanced analytics and decision support and crop management. The global smart farming software technologies market mainly consists of farm management software, which accounted for 72% of the market in 2017–2020. The market can be broadly categorized into the following two segments:

- Farm management software.
- Others, which includes all other forms of software involved in precision farming such as control software, location software.

## Empirical Study on Transforming Agriculture and Agro-Based Industries in India

A research study from developing countries (India) has seen extreme increase in mobile Internet usage in rural population. The farmer community in rural India started adopting the technology, government initiative such as “Digital India” and “Make in India”, and foreign direct investment has encouraged many start-up companies and organization to launch and support new digital platforms for farmer and focusing towards agriculture industries. Crop Insurance, e-Choupal, mKisan and KrishiMitr platforms aim to support farmers and established connectivity with various value chains in agriculture platform.

As per study report,<sup>3</sup> the number of request in crop management is high. Nearly 1 billion request has been reported under advisory/information/service (2013–2016) across India. This graph is evident to show there is a huge business opportunities in crop management market. To bridge these gaps, there is need of e-commerce platform using mobile Internet (Fig. 24.4).

### Crop Management System—E-Commerce Platform

The crop management system provides the e-commerce solutions for B2B market in emerging countries. The key stakeholders of this platform are

- Farmer,
- Supplier,
- Buyer.

To increase the yield, agricultural products such as seeds, fertilizers and end-to-end farm management of smart farming solution are recommended. Enabling the technology, **connected agriculture solutions** and processes data from multiple sources—including weather forecasts and water supply, electricity usage and machinery, logistics—need to store in a centralized system. Further, all these data from various source can be pushed into a data centralized layer and can be used for estimating or forecasting demand, product recommendation based on soil condition, equipment lifespan prediction by applying data analytics and machine learning techniques (Fig. 24.5).

The connected agriculture solution uses a hand-held/smartphone application to connect cloud-based analytics engine and facilitate the better utilization of resource. With this agriculture e-commerce solutions field’s land and crop details, as well as a farmer’s planting plan can be sent to agriculture product supplier. A mobile application with personalized recommendation features can provide crop

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<sup>3</sup>State of Indian Agriculture 2015–16, report published from India Agriculture division.

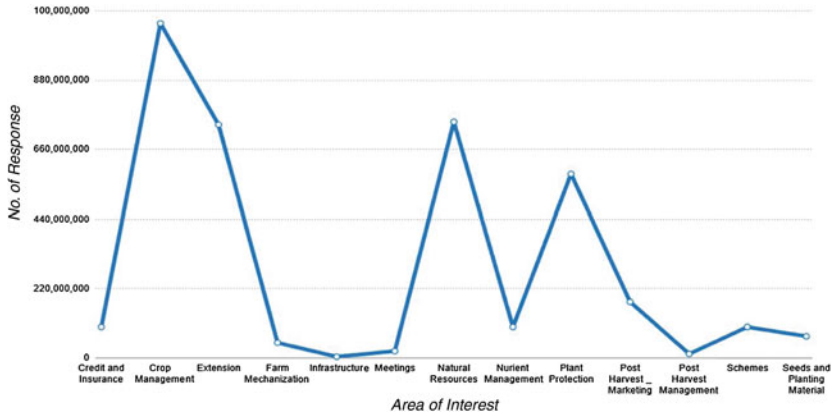


Fig. 24.4 Topic-wise query report by Indian farmer, “Prepared by Author”

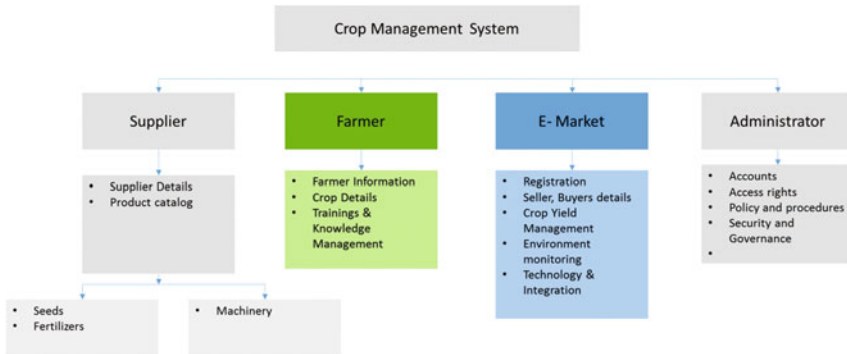


Fig. 24.5 Crop management system, “Prepared by Author”

management tips, smart irrigation connectivity to pumps, seed quality and yield performance-based on different conditions of soil and weather. This mobile app can connect the farmers’ community with agro-input product supplier and other system like banking, cold storage warehouse, insurance and recommend pricing of crops based on market information.

## Digital Scorecard System for Agriculture Performance

Growing demand, limited resources, huge productivity gap, need for sustainability —agriculture faces all these problems. Farmers and firms have to produce more from less land, protect the environment, ensure food security and answer legal quality and safety requirements at the same time.

Productivity measurement for framers to manage their resource better and earn more returns of looked into business point of view. Using the e-commerce platform, data patterns and other environmental factors, supply and demand can be studied using data analytics and modelling and framer community can plan the resource accordingly. And digital scorecard as shown in figure can be used for tracking on the productivity and performance (Fig. 24.6).

**Fig. 24.6** Scored system for productivity measurement, “Prepared by Author”



## Business Model for Crop Management System

A revenue generation model is carefully designed to improve the lifestyle of farmer and support their resources. Proposed business model ensures high efficiency in production, better utilization of agriculture machinery, logistics and provides opportunities to leverage technology services for smart farming. With this model, now a small farmer will have easily access to land, required machinery for particular landscape and supply of electricity, water and transportation from nearby rural society. This model will also help the rural society to earn profit by lending their resources, typical example of **Infrastructure as a services** model (Fig. 24.7).

### E-Commerce Business Opportunities

#### Agriculture OEM

Agricultural OEMs are the large traditional players with established presence in the market. These companies provide hardware and software and have a strong geographic presence as well as an established customer base. In addition, these companies typically make acquisitions in order to expand their reach into other regions, as well as to gain ownership of competitors' technology.

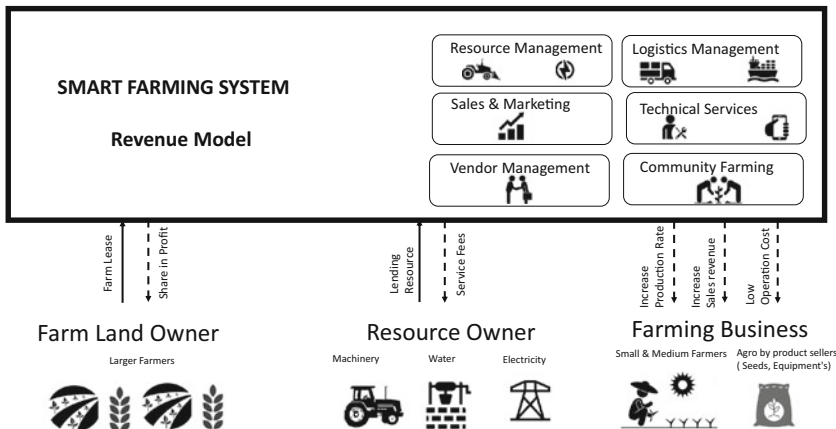


Fig. 24.7 Business Model for Crop Management System, Prepared by Author

### ***Supplier***

These are traditional suppliers that mostly are not aligned to any specific sector. Along with agricultural products and solutions, these companies are also involved as suppliers in other industries that may not be involved with precision farming. Most of these companies are well established in their respective space and already have a strong customer base.

### ***Seed Companies***

Seed companies are mostly the traditional well-known large agricultural products (such as seed) manufacturers. Although these companies were not typically involved in precision farming or other agricultural technology, they have slowly moved up the value chain to extend their product portfolios. Seed companies can also have a foothold in advisory and insurance services, meaning they are able to offer a wider portfolio of solutions and services. Mainly due to their large established presence, seed companies are well equipped to acquire smaller technology suppliers.

### ***IT/Big Data Companies***

These are purely technology companies that are well known for their big data, analytics and other technology offerings. Along with the agriculture space, these companies serve a large number of other industries as well. Due to the constantly changing nature of this field, this remains one of the most dynamic fields in the precision farming space with frequent launches by new companies. In addition, this space sees large number of acquisitions and joint ventures.

### ***Connected Farming/Hardware—Internet of Things (IoT) Companies***

These providers offer high-tech solutions such as drones, sensors and control systems and automation systems. Advanced solutions providers are both established companies, as well as new entrants. These companies directly support the application of precision farming technologies.

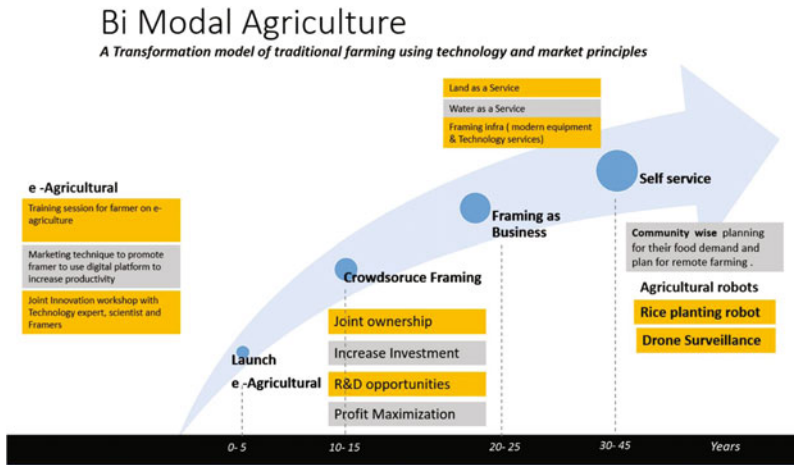


Fig. 24.8 Bi-Modal agriculture transformation model for future agribusiness, Prepared by Author

### *Framework for Future Agribusiness—Emerging Countries*

The proposed Bi-Modal framework is recommended by author based out on the understanding and study of agriculture and technology in this article. The agribusiness and necessary process transformation is required for high production, demand based on customer and limited resource supply (Fig. 24.8).

### **Conclusion**

The benefit of e-commerce platform in B2B market of developing countries shows positive sign based on the adoption of technology in developing countries. With the support of government initiative and agriculture institution, the awareness of technology advantage needs to be socialized and penetrated deep into farming community.

Many farmers still strongly believe in traditional system of agriculture practice and show less interest on the following scientific approach. However, in recent times a shift is observed in farming community where mobile Internet usage gained the trust but still need to penetrate deep into connecting various system as explained in this article. A business model proposed for agribusiness in support of Bi-Modal agriculture transformation from traditional to modern was presented in this article as a case and opens forum for readers for discussion on this topic.



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