Coffee farming business development: E-commerce technology utilization

Y B S Panggabean¹, M Arsyad², Mahyuddin² and Nasaruddin³

¹Agriculture Science Program, Graduate School, Hasanuddin University, Indonesia
²Department of Agricultural Socio-economics, Faculty of Agriculture, Hasanuddin University, Indonesia
³Department of Agrotechnology, Faculty of Agriculture, Hasanuddin University, Indonesia

E-mail: panggabeanbrian@gmail.com

Abstract. After crude oil, coffee is the most traded commodity in the world. From that figure, only about 30% of the world's coffee is consumed in coffee-producing countries, the rest is exported to consuming countries such as Finland, Norway, the Netherlands, Germany and America. In recent years, total world coffee production has remained relatively constant while demand for coffee has increased significantly. Indonesia produces various types of special Arabica coffee such as Gayo coffee, Java coffee, Toraja coffee, Lintong coffee, Bajawa coffee, and Robusta coffee such as Java Robusta and Robusta Flores. Domestic coffee consumption is low, only around 3.3 million sacks of green green coffee per year. The rest, which is around 7.7 million, or about 70% of its production, both in the form of green beans and roasted coffee, is exported to Germany, USA, Japan and Italy. Of the total exports, around 25-30% are high quality Arabica coffee. E-commerce technology can play an increasingly important role in empowering such a traditional industry of agriculture. The technological underpinnings of e-commerce avail to expand the market channels of agricultural products, realizing the scale and organizational realm of agricultural product circulation, reducing the intermediaries of distribution, and reducing transaction costs. Recent studies have suggested that e-commerce helps firms to increase the information flow of agricultural products, reduce asymmetric information of farm products, and promote the creation of traceability information system for agricultural product chains. E-commerce can be part of developing a conceptual foundation for agricultural studies in the modern era and provide an understanding of the potential positive values of e-commerce.

1. Introduction
In most of today's high-income countries, agricultural productivity increase has been the source of early development, structural transformation, and industrialization. This has been
well documented by historians who studied the Western industrialization experience, which spanned the mid-1700s in England, the 1820s in France and Germany, the mid-1800s in the United States and Russia, and the restoration of the Meiji emperors in 1880 in Japan. Agriculture has been the engine of growth and transformation for Asian industrialisation marvels in Taiwan, South Korea, China, and Vietnam [1]. Following WWII. In all of these countries, an agricultural revolution occurred first, followed by a half-century of industrialization. In countries like India, Brazil, and Chile, agriculture has also played a key role in fostering industrialization [1]. In the future years, agriculture will face a number of challenges. Climate change has a significant impact on coffee output for more than 25 million small coffee producers [2]. Plants and cereals, particularly the Coffea Arabica, which accounts for 60-70 percent of worldwide coffee output [3,4], are extremely vulnerable to global warming. By 2050, it is anticipated that 54 percent of coffee harvests will have reached temperatures above 32°C [5]. Coffea Canephora (Robusta) variants, on the other hand, must be grown at temperatures between 20 and 30 degrees Celsius [6]. Climate change affects coffee yields mostly during the flowering and fruiting seasons, causing illnesses, lowering quality, and increasing production costs [7].

Coffee is the most traded commodity in the world after crude oil [5]. Coffee is grown on more than 10 million hectares of land worldwide, primarily in tropical and subtropical regions, which explains why the world's largest coffee producers are Brazil (36 percent), Vietnam (17 percent), and Colombia (8 percent) [7,8], and coffee accounts for a significant portion of these countries' gross domestic product. Coffee is grown in more than 70 nations, with the majority of the crop produced in poorer countries and the majority of the beverage consumed in affluent countries, where demand has doubled in the last decade [9,10]. Coffee production is also plagued by issues like as shading, carbon sequestration, insect management, soil characteristics, and rust and plant disease, which can affect productivity by up to 50% [4,11,12]. It's also worth noting that coffee farming and commercialization generate a lot of toxic waste, which has a lot of negative environmental consequences. Coffee is a traded commodity all over the world. Since 2012/13, global coffee consumption has increased by 1.3 percent per year. The global coffee demand trend is for high-quality coffee that meets sustainability standards such as environmental protection and fair trade. In 2015/16, total world coffee production exceeded 148 million bags of green beans [13]. When compared to 2014/2015, when coffee production reached 143 million bags of green beans [14], this figure has increased. Only around 30% of the world's coffee is eaten in coffee-consuming countries; the rest is exported to coffee-consuming countries like Finland, Norway, the Netherlands, Germany, and the United States. In recent years, total global coffee production has stayed essentially stable, despite a large growth in coffee demand.

Eighty-five percent of coffee production is produced by 10 countries. In 2016, the largest coffee producing countries were Brazil (36.2%), Vietnam (16.8%), Colombia (9.6%) and Indonesia (6.6%) [13]. The four largest countries account for more than 69% of total world production. In 2016, world coffee production consisted of 62.8% Arabica and 36.2% Robusta. In 2016, Indonesia was the fourth largest coffee producer after Brazil, Vietnam, and Colombia - in the previous year Indonesia was ranked number three in the world. Indonesia produces around 10 million sacks of green coffee per year from around 1.2 million ha of agricultural land [15].

Indonesia produces various types of special Arabica coffee such as Gayo coffee, Java coffee, Toraja coffee, Lintong coffee, Bajawa coffee, and Robusta coffee such as Java Robusta and Robusta Flores. Domestic coffee consumption is low, only around 3.3 million sacks of green green coffee per year. The rest, which is around 7.7 million, or about 70% of its production, both in the form of green beans and roasted coffee, is exported to Germany, USA, Japan and Italy. Of the total exports, around 25-30% are high quality Arabica coffee (Pusdatin, 2017). The majority of coffee producers in Indonesia (96.19%) are small-scale farmers. While the rest is cultivated by large private plantations (PBS), namely 1.99% and large state-owned
planted significantly since the analysis in this chapter.

Coffee farms in Honduras, Peru, and Uganda grew their market share in the

Table 1. The 10 biggest coffee producing countries in 2016/17 and the evolution of their production country in the last 17 years (in thousands of 60-kg bags).

| Country       | Type | Years          | 2000/01 | 2005/06 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---------------|------|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Brazil        | A/R  |                | 31.31   | 32.93   | 53.42   | 50.59   | 55.42   | 54.69   | 52.299  | 50.38   | 55.00   |
| Vietnam       | R/A  |                | 14.84   | 13.84   | 20.00   | 26.50   | 23.40   | 27.61   | 26.500  | 28.73   | 25.50   |
| Colombia      | A    |                | 10.40   | 12.56   | 8.52    | 7.65    | 9.92    | 12.16   | 13.339  | 14.00   | 14.50   |
| Indonesia     | R/A  |                | 6.98    | 9.15    | 9.12    | 10.64   | 11.51   | 11.26   | 11.418  | 12.31   | 11.49   |
| Ethiopia      | A    |                | 3.11    | 4.77    | 7.50    | 6.79    | 6.23    | 6.52    | 6.625   | 6.71    | 6.60    |
| Honduras      | A    |                | 2.66    | 3.20    | 4.33    | 5.88    | 4.68    | 4.57    | 5.258   | 5.76    | 5.93    |
| India         | R/A  |                | 5.02    | 4.56    | 5.03    | 5.23    | 5.30    | 5.07    | 5.450   | 5.80    | 5.33    |
| Peru          | A    |                | 2.67    | 2.48    | 4.06    | 5.37    | 4.45    | 4.33    | 2.883   | 3.30    | 4.22    |
| Uganda        | R/A  |                | 3.40    | 2.17    | 3.26    | 3.11    | 3.91    | 3.63    | 3.744   | 3.65    | 3.80    |
| Guatemala     | A/R  |                | 4.94    | 3.67    | 3.95    | 3.85    | 3.76    | 3.18    | 3.310   | 3.42    | 3.50    |
| 10 Biggest producers |  | 85.35113.67111.39139.60147.90149.62152.22148.73151.56153.86 |
| World         |      |                | 113.67  | 111.39  | 139.60  | 147.90  | 149.62  | 152.22  | 148.73  | 151.56  | 153.86  |

Noyes: Type-R refers to Robusta and A to Arabica coffee. Data taken from the International Coffee Organization (ICO, 2017)

Table 2 shows global coffee farm exports as the next supporting point. The framework for the key exporters has essentially remained unchanged over this time because the top four exporters have remained unchanged, and the top four producers have remained unchanged.

Table 2. Exports of all forms of coffee by the 10 biggest exporting countries (in thousands of 60-kg bags).

| Country       | Type | Years          | 2000/01 | 2005/06 | 2010/11 | 2011/12 | 2012/13 | 2013/14 | 2014/15 | 2015/16 | 2016/17 |
|---------------|------|----------------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| Brazil        | A/R  |                | 31.31   | 32.93   | 53.42   | 50.59   | 55.42   | 54.69   | 52.299  | 50.38   | 55.00   |
| Vietnam       | R/A  |                | 14.84   | 13.84   | 20.00   | 26.50   | 23.40   | 27.61   | 26.500  | 28.73   | 25.50   |
| Colombia      | A    |                | 10.40   | 12.56   | 8.52    | 7.65    | 9.92    | 12.16   | 13.339  | 14.00   | 14.50   |
| Indonesia     | R/A  |                | 6.98    | 9.15    | 9.12    | 10.64   | 11.51   | 11.26   | 11.418  | 12.31   | 11.49   |
| Ethiopia      | A    |                | 3.11    | 4.77    | 7.50    | 6.79    | 6.23    | 6.52    | 6.625   | 6.71    | 6.60    |
| Honduras      | A    |                | 2.66    | 3.20    | 4.33    | 5.88    | 4.68    | 4.57    | 5.258   | 5.76    | 5.93    |
| India         | R/A  |                | 5.02    | 4.56    | 5.03    | 5.23    | 5.30    | 5.07    | 5.450   | 5.80    | 5.33    |
As a result, new techniques of adding value to the value chain of this beverage were required, not just for merchants and industry, but also at the farm level. The revised table below depicts the world's largest coffee growers and examines whether the global coffee supply has changed dramatically. It specifies where coffee has been produced globally in the last 17 years. It demonstrates that the origin of the worldwide green coffee supply has not altered since the study of [16]. The sole difference is that Honduras, Peru, and Uganda witnessed increases in their global market shares, while India and Guatemala saw decreases. However, the top four players (Brazil, Vietnam, Colombia, and Indonesia) remain the same. The framework of the major exporters has essentially remained unchanged over this time, as the top four exporters are the same as the top four producers.

2. Technology E-commerce for Agriculture

Social commerce differs from traditional e-commerce and online social network sites (SNSs) in that it allows consumers to build digital relationships with one another (e.g., ‘following’ or ‘friending’ others) as well as commercial entities like items, brands, or businesses. SNSs help to depict, nurture, and exploit the earlier sort of relationship [17]. E-commerce, on the other hand, has typically emphasized the latter sort of connection (consumers and products/vendors). By enabling both, social commerce enables new forms of activities that would otherwise be difficult or ineffective (e.g., browsing for things that friends have liked). Furthermore, while social commerce has some similarities to online communities where consumers connect around items, it is distinct.

### Table 3. Technology e-commerce for agriculture.

| Differences with social commerce | E-commerce sites | Social network sites | Online communities |
|----------------------------------|------------------|----------------------|--------------------|
| They don't keep track of, show, or allow you to navigate via social networks. | They don't focus on the product and don't take use of a network that connects people and businesses/products. | They don't have to be about items, and they don't require consumers to connect. |
| They frequently allow for user-generated material. Users may have a shared interest in a product. | They enable their users to have a profile, to connect to friends, and travel | |
| **Similarities with social commerce** | | | They allow people to congregate around a shared topic of interest. |

Data taken from the International Coffee Organization
E-commerce technology has the potential to play a growing role in enabling traditional industries like agriculture. The technological underpinnings of e-commerce allow for the expansion of agricultural product market channels, the realization of the scale and organizational domain of agricultural product circulation, the reduction of distribution intermediaries, and the reduction of transaction costs [18]. Recent studies have suggested that e-commerce helps firms to increase the information flow of agricultural products, reduce asymmetric information of farm products, and promote the creation of traceability information system for agricultural product chains [19]. E-commerce has emerged as a vital tool for improving agricultural efficiency and bolstering rural income. According to authoritative statistics, online rural retail transactions in China (the study's setting) totaled 113.30 billion US dollars in the first half of 2019, with retail sales of agricultural items accounting for 27.32 billion US dollars. [20]. However, other than a few successes, e-commerce continues to face challenges to penetrate the agricultural industry.

E-commerce capability refers to a company's capacity to "use the Internet to share information, ease transactions, improve customer service, and boost backend integration" as a specialized IT capacity [21,22]. E-commerce capability refers to a company's capacity to "use the Internet to share information, ease transactions, improve customer service, and boost backend integration" as a specialized IT capacity [23].

In China, the adoption of e-commerce efforts in agribusinesses is still in its infancy, as agricultural corporations are notoriously reluctant to respond to market developments. Furthermore, because to the high sensitivity of agricultural products to time factors and consumers' concerns about their health and quality of life, the demand for time lines and agricultural company responsiveness is increasing. becoming increasingly stringent. Thus, understanding how to improve business agility is silent to agricultural firms survival and sustainability [24,25].

Capability influences agricultural firm business agility, and whether environmental uncertainty (environmental dynamism and complexity) plays a reinforcing moderating function in this equation is unknown. The core assumption of this study, based on organizational “capabilities-based theory and the IT-enabled organizational capabilities perspective” [26], The central hypothesis of this study is that agricultural firms can use e-commerce capability to enable two types of business agility: market capitalizing agility (strategic focus) and operational adjustment agility (operational focus), with positive moderating effects on this equation from environmental dynamics and environmental complexity.

3. Conclusion
E-commerce can be part of the development of a conceptual foundation for the study of agriculture in the modern era and provide an understanding of the potential positive values of e-commerce. By paying attention to every unique aspect of existing social trade, this can become a reference as a trigger to develop interest in society to keep up with developments in the modern era and become dependent on digital networks as a forum for mediating trade, and also as a place to refer to prospects for marketing, social networking, as well as developing research in information systems. Overall, the explanation provided in this paper creates opportunities for coffee farmers to take part in social trading and create value opportunities that may be provided as a formation or action on the structure of the producer and consumers in agriculture.

References
[1] Bustos P, Caprettini B and Ponticelli J 2016 Agricultural productivity and structural
transformation: Evidence from Brazil Am. Econ. Rev. 106 1320–65
[2] Schroth G, Laderach P, Dempewolf J, Philpott S, Haggar J, Eakin H, Castillejos T, Moreno JG, Pinto L S and Hernandez R 2009 Towards a climate change adaptation strategy for coffee communities and ecosystems in the Sierra Madre de Chiapas, Mexico Mitig. Adapt. Strateg. Glob. Chang. 14 605–25
[3] Ovalle-Rivera O, Laderach P, Bunn C, Obersteiner M and Schroth G 2015 Projected shifts in coffee arabica suitability among major global producing regions due to climate change PLoS One 10 e0124155
[4] Muñoz-Villers L E, Geris J, Alvarado-Barrientos M S, Holwerda F and Dawson T 2020 Coffee and shade trees show complementary use of soil water in a traditional agroforestry ecosystem Hydrol. Earth Syst. Sci. 24 1649–68
[5] Esposito F, Fasano E, De Vivo A, Velotto S, Sarghini F and Cirillo T 2020 Processing effects on acrylamide content in roasted coffee production Food Chem. 319 126550
[6] Le Q V, Jovanovic G, Le D-T and Cowal S 2020 Understanding the perceptions of sustainable coffee production: A Case Study of the K’Ho ethnic minority in a small village in Lâm ĐồngProvince of Vietnam Sustainability 12 1010
[7] Haggar J 2012 Coffee and climate change impacts and options for adaption in Brazil Nat. Resour. Inst. 1–55
[8] Pham Y, Reardon-Smith K, Mushtaq S and Cockfield G 2019 The impact of climate change and variability on coffee production: a systematic review Clim. Change 156 609–30
[9] Hollingsworth R G, Aristizábal L F, Shriner S, Mascarin G M, Moral R de A and Arthurs S P 2020 Incorporating Beauveria bassiana into an integrated pest management plan for coffee berry borer in Hawaii Front. Sustain. Food Syst. 4 2
[10] Sengupta B, Priyadarshinee R, Roy A, Banerjee A, Malaviya A, Singha S, Mandal T and Kumar A 2020 Toward sustainable and eco-friendly production of coffee: Abatement of wastewater and evaluation of its potential valorization Clean Technol. Environ. Policy 22 995–1014
[11] Mussatto S I, Machado E M S, Martins S and Teixeira J A 2011 Production, composition, and application of coffee and its industrial residues Food Bioprocess Technol. 4 661–72
[12] Kellermann J L, Johnson M D, Stercho A M and Hackett S C 2008 Ecological and economic services provided by birds on Jamaican Blue Mountain coffee farms Conserv. Biol. 22 1177–85
[13] Zambolim L 2016 Current status and management of coffee leaf rust in Brazil Trop. Plant Pathol. 41 1–8
[14] International Coffee Organization (ICO) 2016 ICO Annual Review 2016
[15] International Coffee Organization (ICO) 2017 ICO Annual Review 2017
[16] Pusat Data dan Sistem Informasi Pertanian 2017 Outlook Komoditi Kopi
[17] Lewis W A 1954 Economic development with unlimited supplies of labour (Bobbs-Merrill Company, College Division)
[18] Boyd D M and Ellison N B 2007 Social network sites: Definition, history, and scholarship J. Comput. Commun. 13 210–30
[19] Kurnia S, Karnali R J and Rahim M M 2015 A qualitative study of business-to-business electronic commerce adoption within the Indonesian grocery industry: A multi-theory perspective Inf. Manag. 52 518–36
[20] Chae H-C, Koh C E and Park K O 2018 Information technology capability and firm performance: Role of industry Inf. Manag. 55 525–46
[21] MOFCOM 2019 China e-commerce report

[22] Zhu K 2004 The complementarity of information technology infrastructure and e-commerce capability: A resource-based assessment of their business value J. Manag. Inf. Syst. 21 167–202

[23] Zhu K and Kraemer K L 2002 E-commerce metrics for net-enhanced organizations: Assessing the value of e-commerce to firm performance in the manufacturing sector Inf. Syst. Res. 13 275–95

[24] Ghasemaghaei M, Hassanein K and Turel O 2017 Increasing firm agility through the use of data analytics: The role of fit Decis. Support Syst. 101 95–105

[25] Benitez J, Llorens J and Braojos J 2018 How information technology influences opportunity exploration and exploitation firm’s capabilities Inf. Manag. 55 508–23

[26] Wei S, Ke W, Liu H and Wei K K 2020 Supply chain information integration and firm performance: Are explorative and exploitative IT capabilities complementary or substitutive? Decis. Sci. 51 464–99