

A Systematic Review of the Challenges and Opportunities of the Agriculture Economic Sector in Malaysia

Sharina Shariff^{1,2}, *Siti 'Aisyah Baharudin¹, Nor Asmat Ismail¹

¹School of Social Sciences, Universiti Sains Malaysia, Malaysia

²Universiti Teknologi MARA, Malaysia

sharinashariff@uitm.edu.my, *sab16@usm.my, norasmat@usm.my

Corresponding Author: Dr Siti 'Aisyah Baharudin

Abstract: Globalization brings the emergence of technology which has dramatically changed the traditional nature of the agriculture sector into a modern which currently achieves sustainability to address issues of food security, aging and unemployment in most agriculture sectors of the world countries. Particularly, Malaysia's agriculture sector faces challenges, including a labor shortage due to its domination by aging farmers, and low youth participation due to negative agricultural perspectives. Nevertheless, this sector remains crucial and looking forward to sustainability as world population growth is the challenge of agriculture found among Malaysian researchers. Another hand, several themes of opportunities have been found that had been expected to respond to the current agriculture challenges trends such as youth, modern agriculture and agricultural entrepreneurship which have been often discussed in the literature. Agriculture Entrepreneurship and emerging trends of technology changes have raised the attention to be integrated to respond and create an opportunity for the group of youth to respond through their agriculture sector participation which had been often discussed among previous researchers. Youth are identified as the key to productivity capability and inclusive development as aligned to the establishment of the youth agropreneur unit in 2013 which aims to groom a new breed of youth Agropreneur in Malaysia under Malaysia National Agriculture Policy 2030. Therefore, the purpose of the study is to review past studies and to analyze the pattern of the challenges and opportunities of the agriculture sector in Malaysia.

Keywords: *Agricultural challenges, Agricultural opportunities, Agricultural Entrepreneurship, Modern Agriculture, Youth, Systematic Literature Review, Malaysia*

1. Introduction

The overview of Malaysia's Challenges in the agriculture economic sector

Previous research highlights several challenges faced in the agricultural sector, such as the low application of technology, environmental degradation, and rapid urbanization, which contribute to the slow growth of the country's development (Dung & Heip, 2017). As evidence, it involved the world and Malaysia's agricultural issues such as minimal GDP growth, ranking 8th out of 10 ASEAN countries. It lags behind nations such as Myanmar, Cambodia, Laos, and Vietnam, where agriculture remains a cornerstone of rural livelihoods (Wee & Lim, 2022). Statistically, Malaysia has experienced a significant decline in the share of agriculture in its GDP, dropping from 46% in 1961 to 7.7% in 2018. Similarly, agricultural employment decreased from 37% in 1980 to 27% in 1991, and further to 11.1% in 2018, reflecting the nation's transition to a modern industrial economy the International Monetary Fund (IMF, 2019). Currently, agriculture is the third-largest contributor to Malaysia's GDP at 7.1% (RM101.5 billion), following the services and manufacturing sectors (DOSM, 2019). Despite these challenges, the agricultural sector remains a vital component of the global economy, essential for meeting the food and livelihood needs of the world population. Consequently, ensuring agricultural sustainability is of utmost importance.

Recently, the projected global population is expected to grow, as estimated by the United Nations (2015), which had serious concerns about agricultural production to ensure their ability to meet the rising demand for food (Pawlak & Kolodziejczak, 2020). With farming businesses facing challenges related to food security Milovanovic, (2014), current trends indicate that 56% more food will be required to meet human demand, as the global population is expected to reach 10 billion by 2050 (Ranganathan et al., 2018). Additionally, global food demand is anticipated to surge by 2050 due to factors such as urbanization, population growth, and rising per capita incomes (FAO, 2017). Frona et. al., (2019) highlight the importance of meeting these demands to achieve agricultural sustainability. However, this objective is increasingly challenged by the growing scarcity of natural resources, posing a significant hurdle for the future FAO, (2017). Despite these challenges, the

growing population presents opportunities for agricultural transformation. Expanding the agricultural industry, particularly through modern agricultural practices, can create employment opportunities and help address food security concerns (IMF, 2019).

Besides, the growing educational background, changing lifestyles, and employment aspirations among young people have led to a higher tendency for them to seek non-agricultural jobs, May et al., (2019); Rigg (2020), resulting in migration to urban areas. It indicates the labor scarcity in agriculture which led to a growing reliance on non-citizens in the agricultural workforce, which now accounts for 16% of the total labor force (Dung & Heip, 2017; IMF, 2018; DOSM, 2019). Since Malaysia's independence, the share of agricultural employment has steadily declined, dropping from 37.2% in 1980 to 7.2% in 2021 (IMF, 2019; Praburaj, 2018). This includes a significant decline in agricultural participation, reflecting a shift toward non-agricultural sectors, despite youth comprising approximately 42% of the population (DOSM, 2021). Recent statistics show that only 15% of youth in Malaysia participate in the agricultural sector, out of an estimated 13.9 million young people in the country (Mat Lazim et al., 2020; MAFI, 2021). In comparison, other Southeast Asian countries like Indonesia, the Philippines, and Thailand have higher youth participation rates, ranging from 22.7% to 35.1% (Kees, 2010). The lack of youth engagement in agriculture in Malaysia, as noted by Awais & Khan (2014), is attributed to the sector's unappealing characteristics, such as physical and mental exhaustion, low job security Rittirong et al., (2014), and the perception that it is dirty, dangerous, and sweaty Mohammad et al. (2015); Abu Bakar et al. (2022). Despite that, agriculture remains a critical sector for employment, and there is a need to engage, develop, and train young farmers through government-led programs to ensure the future of the agricultural industry (Jansuwan & Zander, 2021) as a new phenomenon to adopt.

Indeed, youth involvement plays a crucial role in addressing the challenges associated with an aging population. Countries like Pakistan, Japan, and Malaysia are projected to face significant issues related to an aging population by 2050, making youth engagement essential for ensuring sustainable development. Similarly, Thailand has an abundant of aging farmers than a very small number of young farmers as referred to 11th Thailand National Plan. This is because of the demographic structural change in most countries (Nordin et al., 2020). The aging workforce in Malaysia's agricultural sector, comprising 67.9% of the population, contributes to the low adaptation to modern agriculture and reduced food and crop production, particularly among elderly farmers (DOSM, 2021; MOA, 2019). Modern farming and IT are a significant barrier for farmers to improve their agriculture productivity due to low educational background that affects the development of IT in agriculture (Awais & Khan, 2014). Leaving older farmers to deal with risk, workloads, less competition, instability and food security issues are becoming future barriers because agriculture is still important as a source of living. Not rely on older farmers because they are less motivated, less open to new ideas and efficient methods, and less productive as their health might deteriorate (May, 2019; Morais, 2017). Thus, young farmers need to be invited, developed and trained through programs organized by the government (Jansuwan & Zander, 2021).

The Opportunities of the Agriculture Sector

Certain challenges have the potential to create opportunities in the agriculture sector. Agriculture become a crucial economic sector in developed countries and can be broadly divided into traditional and modern practices. Modern agriculture utilizes advanced production techniques to maximize efficiency and output, whereas traditional agriculture is often characterized by its focus on local markets, limited technology adoption, and lower productivity (Ismail & Mohammad, 2009). Modern agriculture presents significant opportunities by increasing food production, improving resource efficiency, and fostering economic growth. It enables the adoption of innovative technologies, such as precision farming, automation, and biotechnology, which can enhance sustainability, create new employment opportunities, and address global challenges like food security and climate change. Due to economic globalization, agriculture over the last decade has changed dramatically. The demand of the Industrial Revolution had transformed from traditional into modern agriculture since the late 1600s. Modern agriculture is using the tools of information technologies that aim for an integrated local and global economy, particularly in agriculture, industry and trade. It showed a strong integration of domestic and international markets as guided strongly by national policy (Ismail & Mohammad 2009). Food security, sustainability practices, and innovation have increasingly taken place to change the agriculture sector in the future. Government, politicians and practitioners are aware agriculture sector requires entrepreneurship to bring along technology adoption among farmers for future sustainability (McElwee 2008;

Pyysiainen et al. 2006).

Hence, entrepreneurship presents a valuable opportunity to tackle the pressing issue of unemployment, a significant concern for the government. With rising unemployment rates over the years, the National Agenda strategy has prioritized initiatives to reduce joblessness. By fostering entrepreneurial ventures, new job opportunities can be created, driving economic growth and offering innovative solutions to unemployment challenges. Statistically, Malaysia is one of the southern Asia countries that contributed to the slightly higher unemployment rate among youth. For example, Malaysia's youth unemployed constitute an estimated about 3.8% (DOSM, 2019), and the data has doubled since the country was hit by the spreading of COVID-19 by 6.3% in the fourth quarter of 2020 (EPU, 2020). In 2023, approximately 1.87 million people were employed in Malaysia's agriculture sector, marking a slight increase from 2022. However, the agriculture sector's share of total employment in Malaysia has been decreasing over time. As of Q2 2024, Malaysia's unemployment rate stood at 3.3%, aligning with pre-pandemic levels. Previous studies indicate that farmers depend on low-skilled domestic labor and foreign workers due to the shortage of skilled domestic youth. Meanwhile, a study by KRI (2020) shows that unemployed youth are eager to enter the modern agriculture sector, presenting an opportunity for them to fill the agricultural labor market, particularly in high-skilled positions or entrepreneurship. Modernized agriculture had a significant influence on productivity and environmentally saved profitability which remains a challenge for farmers to adopt, particularly in Malaysia (Global Alliance, 2014). This shows modern agricultural technology is crucial to achieving higher productivity in the economic sector including agriculture.

Despite mainstream entrepreneurship research, the scenario seems to have changed in the past couple of years, a new and diverse entrepreneurship phenomenon focusing on the agriculture sector, known as agricultural entrepreneurship. The growing entrepreneurial opportunity in the agriculture sector can be described as venture creation, learning, and development to exploit entrepreneurial opportunities and the working environment. Indeed, agricultural entrepreneurship shares many characteristics with generic entrepreneurship. However, there is a distinctive feature to the specific context of the agriculture sector. Agricultural entrepreneurship offers entrepreneurial opportunities for new product creation, innovation, distribution and marketing Pindado and Sanchez (2017) and production in agriculture. Recently, agricultural businesses have needed to adapt to new changes in consumer habits, sustainability, and modern and productive production which are indicated adopted by a relevant group of people known as agents of change. As a result, entrepreneurship in agriculture is gaining high attention in literature Seunke et al. (2013) which is closely relevant to groups of youth. The term is often discussed and connected to youth and modern agriculture by past researchers that shown a significant contribution to this literature. Therefore, youth, modern agriculture and agricultural entrepreneurship are the opportunities that have been disclosed in agricultural literature.

Significance of the Study

The concept of entrepreneurship has emerged as a response to the challenges and opportunities in the agriculture sector, particularly by embracing modern agricultural practices. This connection highlights how entrepreneurship can drive the adoption of innovative technologies and techniques, paving the way for a more efficient, sustainable, and profitable agricultural industry. For example, the current modern industrial economy has been adopted by various sectors such as manufacturing, services, medicine, robotics, telecommunication, automobile, and energy and without leaving behind including agricultural sectors, Hellinger & Seeger, (2011) and provided a new solution to industrial (Sung, 2018). For instance, to achieve sustainable agriculture trends, modern agriculture has the potential of technological revolution to embrace Wee & Lim, (2022) into integrated with the ICT system. This revolution is growing and could change into more modern, competitive, efficient, profitable and sustainable which would be lower cost and better-quality products that offer an opportunity to the agricultural sector (Mat Lazim et al., 2020).

The modern revolution in the agriculture sector provides an effective pathway to ensuring sustainability in developed countries are far enormous, and highly sophisticated throughout an extensive value chain until the final consumer (Dutonde, 2018). For instance, the US, Germany, and Japan leverage modernization, automation, and digitalization to address agricultural challenges, even with an aging agricultural workforce. Future farming is anticipated to integrate IR4.0 technologies such as AI, IoT, robotics, and big data analytics, fostering a

modern, unified system that enhances youth interest in agriculture (Mat Lazim et al., 2020). Also, Malaysia's agriculture had transformed which contributed to economic development based on agricultural development theory (IMF, 2019). Indeed, a crucial medium of entrepreneurship has offered opportunities to achieve agricultural sustainability, reflected in the growing number of research publications on this topic over the years (Condor, 2020, Wahyudi & Kiminami 2021). Studies have shown significant growth in agricultural entrepreneurship research since the late 1990s and early 2000s (Condor, 2020). However, despite the expansion of general entrepreneurship research, the agricultural sector has often been overlooked in this context (Fitz-Koch et al., 2017). This new context of agricultural entrepreneurship, driven by globalization, is critical for the sector's future development (Fitz-Koch et al., 2017; Dias, 2018). It introduces a fresh paradigm of entrepreneurship in agriculture (World Bank, 2015; Wisam, et al. (2016), extending beyond developed nations to also include developing countries (Condor, 2020).

Modern agriculture, in particular, offers substantial potential benefits that can be unlocked through entrepreneurship and youth involvement. This is demonstrated by the guidance of the National Key Economic Areas (NKEA), which aim to create job opportunities and enhance farmers' incomes. Malaysia's agriculture transformation agenda focus on modernization was started under the 11th -12th Malaysian Plan: 2016-2025 to concern and address food security, improve crop productivity, and farm profitability and strengthen food supply chain support (Bujang & Bakar, 2019). Thus, the new phenomenon provides opportunities in this agriculture sector such as modern agriculture which makes farmers more creative, cost-saving, and increases productivity. Youth can be attracted to the agriculture sector as significant agents of change to adopt for achieving sustainability reasons (De Lauwere, 2009). Aligned with, the many benefits of modern agriculture, various initiatives and programs in Malaysia are carried out by the government to promote modern agriculture farming as part of encouraging younger to have more confidence in pursuing their opportunity of jobs in the agriculture sector despite the challenges faced in Malaysia.

Significantly, a Systematic Literature Review (SLR) can reduce biases, fill the research gap, and increase research validity. A comprehensive structured review is well-organized and clear (Higgins et al. 2011). Therefore, the study wants to analyze the recent pattern of the challenges and opportunities faced by the agriculture sector in Malaysia which had been often discussed ten years ago by past studies (2014 – 2024) since these are unclear to derive future agricultural literature studies. The author will be closely investigating different challenges in Malaysia's agriculture sector which can get clues for the different potential opportunities to employ in 10 years of Malaysian literatures from 2014-2024. The study develops SLR based on common terms on emerging agricultural issues in Malaysia and identifies several themes of opportunities that can address the challenges that had been discussed by past studies. The reason for SLR's study is based on this specification, to help the government or organization plan strategies. In addition, it is increasing the empirical studies contribution which focuses on significant entrepreneurship specifically in the agriculture sector, modern agriculture and youth, despite agricultural challenges in Malaysia. Lastly, this recent SLR helps to describe current trends of youth through the medium of agricultural entrepreneurship and modern agriculture which provides recommendations to future researchers that warrant this recent SLR to do a further investigation.

2. Methodology

The Systematic Review protocol provides a detailed overview, including the rationale, hypothesis, and methods. This study uses the Reporting Standards for Systematic Evidence Syntheses (ROSES), which involve steps such as formulating a research question, systematic searching (identification, screening, and eligibility), quality appraisal, data extraction, and analysis.

ROSES

Unlike PRISMA, which is mainly focused on the health sector, ROSES are more flexible for multidisciplinary research, supporting quantitative, qualitative, and mixed methods (Haddaway et al., 2018). The process includes (1) searching, (2) screening, (3) quality appraisal, (4) data extraction, and (5) result in development to ensure transparency, and quality, and reduce bias (Shaffril et al., 2020; Haddaway et al., 2018; Lockwood et al., 2015).

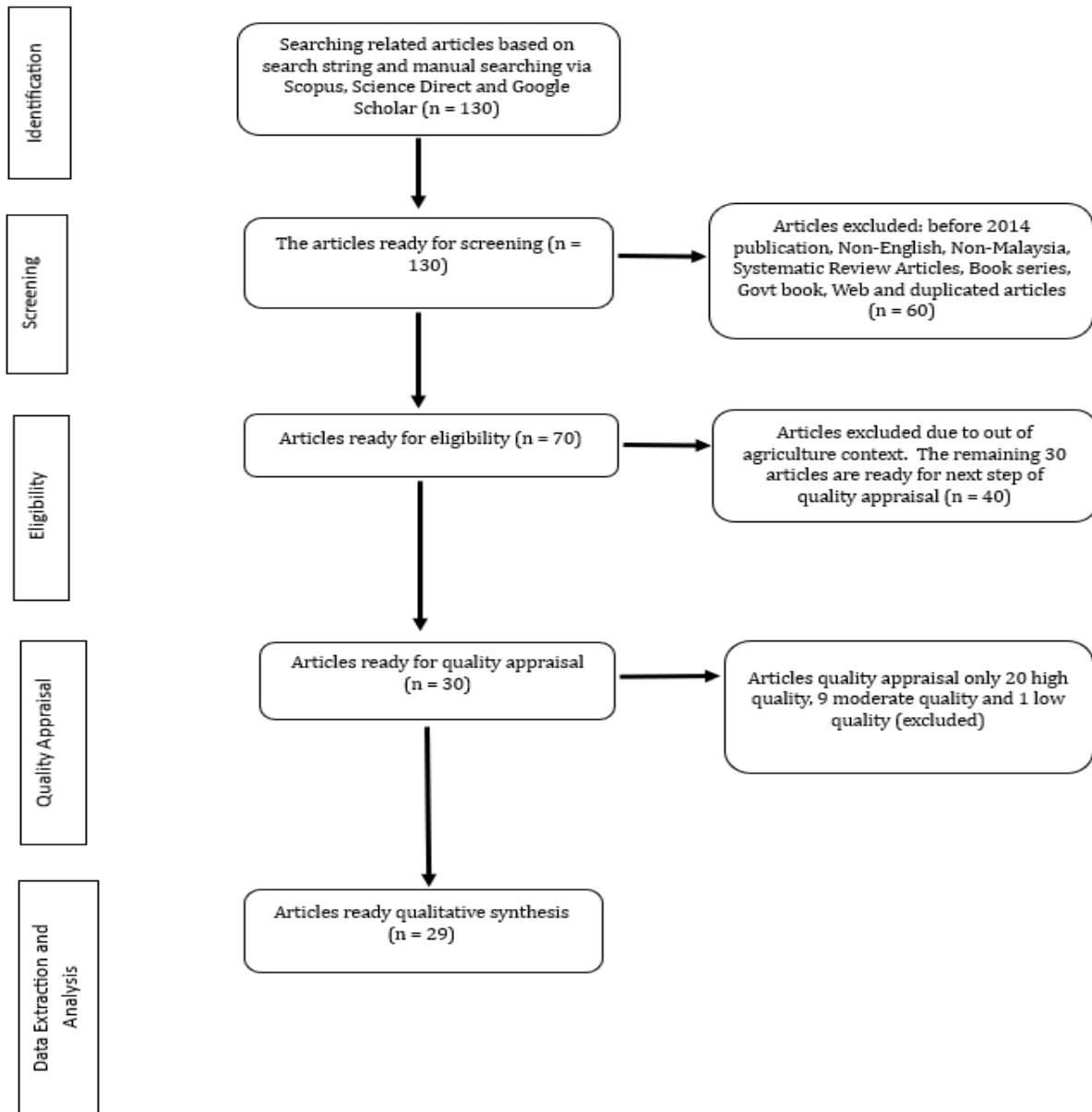
Research question formulation

The research question was formulated using the PICO method (Lockwood et al., 2015), where 'P' represents the problem or population, 'I' denotes interest, and 'Co' indicates context. Following three systematic screening stages—identification, screening, and eligibility—the finalized articles undergo quality appraisal as outlined by Hong et al. (2018). This process involves the main author, co-authors, and qualitative study experts for thorough evaluation. Using the PICO framework by Lockwood et al., (2015), the main research question focuses on the challenges and opportunities in Malaysia's agriculture sector, using keywords and symbols of the search function in Scopus, Web of Science and Google Scholars.

Systematic searching process

Subsequently, the identification, screening and eligibility and inclusion and exclusion criteria process followed after the research question are formulated as presented by the flow chart process below.

Figure 1: the systematic searching process by the researcher



Identification

The Keywords “challenges”, “Opportunities” and “Malaysia agriculture sector” as guided research question: The challenges and the opportunities of Malaysia's Agriculture Economic Sector. The synonyms-related terms from previous studies were employed from the three largest databases from 2014 to 2024 (Table 1). The two largest databases Scopus and Web of Science were used for literature search, identifying selected articles and for reviewing purposes. These two databases have covered 40 million disciplinary scientific literature of book series, open access journals, books and reports commonly high impact indicators (Pranckute, 2021). In addition, the author also considers Google Scholar databases as an additional source of databases due to the largest free access article, diversity in subject area and languages as suggested by (Haddaway et al. 2015). Reviewing additional Google Scholar databases is part of the significance of employing diverse search techniques (Shaffril et al. 202: Cooper et al. 2018). The author combined the main keywords for searching articles related as follows. To sum up, the author retrieved 130 potential articles in this identification stage.

Table 1: Search String for the systematic review process.

Databases	Keyword used
Scopus	TITLE-ABS-KEY (“Agriculture’ OR “Agricultural” AND “Challenges” OR “Barrier” AND “Opportunities” OR “Prospect” AND “Malaysia”)
Web of Science	TS = (“Agriculture” OR “Agricultural”) AND (“Challenges” OR “Barrier” OR “Opportunities OR Prospect”) AND (“Malaysia”)
Google Scholar	The challenges AND The opportunities in AND Agriculture Economic Sector AND Malaysia

Screening process and exclusion criteria

The second stage is the screening process of the duplicate articles manually followed by inclusion and exclusion criteria. The inclusion databases include research articles and exclude systematic reviews, book series, books, chapters in books and conferences proceeding from a maturity timeline of 10 years which indicates a sufficient period for revolution research (Alexander, 2020). The authors selected articles from 2014 to 2024 that showed significant literature contribution and maturity intensity. As a result, more diverse research articles from different database sources would increase the level of literature intensity. The qualitative, quantitative and mixed methods were selected to review with different perspective outcomes. Articles are chosen in English as a common language preference. The primary data are preferred rather than secondary data. The author believes that it is very important to review the challenges and opportunities in Malaysia's economic sector to know the existing issues faced and to identify the prospects of the agriculture sector that need to be addressed. Overall, a total of 60 articles were excluded from the review based on these criteria, which resulted in 70 articles continuing for the next eligibility process.

Eligibility

The authors screened all selected articles to verify and meet the inclusion criteria and research question. It included screening and discussing the abstract, title, and methodology. The criteria for eligibility and exclusion are presented in Table 2. A total of 40 articles were excluded because do not match on inclusion criteria and context such as a focus on organization, technology and engineering and science and agriculture context. The remaining 29 articles were eligible for the next step of quality appraisal.

Table 2: The Criterion of eligibility and exclusion articles.

Criterion	Eligibility	Exclusion
Literature Type	Journal (research articles)	Journal (systematic review), book series, chapter in book conference proceeding
Language	English	Non-English
Timeline	Between 2014 to 2024	<2014

Indexes	Social Science Citation Index Expanded (Web of Science) Indexed, Emerging Sources Citation Index, Art and Humanities Index (Web of Science)
Countries and territories	Malaysia Non-Malaysia

Quality Appraisal

These 29 articles have been evaluated under quality appraisal as suggested by (Shaffril et al. 2020; and Haddaway et al., 2018) to ensure the risk of bias is minimal, secure the article quality, and integrity and be highly satisfied. Then the discussion took place until all authors met mutual judgment by using a measurement scale, tool and checklist of Mixed-Method Appraisal Tool (MMAT). MMAT allows appraisal of all types of methodologies studies (Hong et al. 2018). It has 5 main criteria for assessment question of MMAT such as questions covered (1) appropriate and clear research question, data collection to address the research question, (2) adequate data collection (3) adequate interpretation of result and analysis (4) relevant strategy sampling (5) relevant measurement tool or statistical analysis. Overall, 29 articles were eligible for the next inclusion review, of which 20 articles were high ranked with 5 and 4 criteria fulfilled, 9 articles were moderate as fulfilled 3 & 2 criteria and 1 article was low quality and removed to the next process.

Data Extraction and Analysis

The qualitative synthesis was used to review articles to present thematic analysis across qualitative, quantitative and mixed methods article forms. This thematic analysis can interpret and represent data from qualitative studies (Flemming et al., 2019). The authors used inductive thematic analysis by developing a theme guided by research objectives. Authors review from abstract, result, discussion and conclusion through frequent reading which resulted in the similarities and relationships, kiger & Varpio, (2020), among authors to ensure groups of themes are matched and any inconsistency ideas are frequently discussed until mutual agreement among authors.

As a result, (5) main themes had developed under the challenges in the agriculture sector such as labor shortage that has sub-theme of low GDP and productivity, unemployment, aging farmers, growing population and negative agriculture perspectives and the theme of opportunities had found such as modern agriculture, agriculture entrepreneurship and group of youth as future generation in Malaysia agriculture economic sector. In all, this identified theme represented the challenges and opportunities of Malaysia's agriculture's economic sector phenomena in Malaysia. The similarities of these review studies are presented in (Table 3) as follows.

Table 3: Summary of the challenges and opportunities of the agriculture sector by Malaysia literature (2014-2024)

Malaysian Authors	Agricultural Challenges					Agricultural Opportunities		
	Shortage of labor, low productivity and low GDP growth	Negative agricultural perceptive	Growing population	Low youth participation in the agriculture sector	Aging Farmer unemployment	Modern Agriculture	Youth	Agricultural Entrepreneurship
Mat Lazim et al., (2020)	/				/	/		
Dardak & Adhman, (2014)	/					/		
Sabirin & Fadhil, (2022).	/					/	/	/
Harun et al (2015).	/					/	/	/
Gabriel, W. W. E & Irving, T. S. H (2024)	/					/		/
Abdullah & Abu Samah (2014)	/				/		/	/

D'Silva et al., (2021)			/	/	/	
Humairah			/	/	/	
Mat, T. et al (2022)						
Ambad, S. N. A., & Rafiki, A. (2024),			/	/	/	/
Che, N. (2022)			/		/	/
Musa et al., (2021)			/	/	/	/
Man, N., (2012)	/				/	/
Abdul Raman, M. H. et al, (2014)	/				/	
Hadi, N. M. H. & Zainol. F. (2019)	/		/		/	/
Abdullah, N., (2012)	/				/	/
Mohammad, N et al. (2015)		/			/	/
Abu Bakar et al. (2022)		/			/	/
Yusoff et al., (2018)		/			/	/
Wee & Lim, (2022)	/			/		
Firos Mustaffa (2019)		/		/	/	/
Zainol et al. (2021)		/		/	/	
Yusoff et al. (2019)		/			/	/
Ambad et al. (2021)		/		/	/	/
Firos et al. (2020)						
Yusoff et al (2017)				/		/
Waktu, S. et al. (2020)			/			/
Humairah			/	/	/	/
Mat, T. et al. (2022)						
Zainol et al (2019)	/	/	/		/	/
Abdullah & Sulaiman (2014)	/		/		/	/

3. Research Findings

Out of 29 articles selected for systematic review, two recent articles were published in 2024; six articles were published in 2022; the publications of 2021 have 3 research articles; the year 2020 had five articles; 2019 consists of four articles; 2015 has two articles and 2014 have an article publication of each year. In summary, most of the articles identified the common challenges in Malaysia's agriculture sector are shortage of labor, low productivity and low GDP contribution. It was followed by the second recurring issues of unemployment and issues of aging farmers, growing population, negative agricultural perspective and low youth participation which the study had identified as the common challenges pattern in Malaysia literature. In contrast, Malaysian agricultural literature also revealed the common opportunities pattern of the recent need of a group of youth and integrated with the recent need for emerging agricultural entrepreneurship and thus open opportunity to accept modern agriculture. Generally, most articles focus target group of youth towards agricultural entrepreneurship but they involve with diverse number of group youth in Malaysia's agriculture sector with different natures of study. Overall, these theme of agricultural entrepreneurship serves as a platform for youth

to engage in modern agriculture which has identified trends within Malaysia's agricultural literature.

Discussion: The Agricultural Challenges

According to Table 3, several of the challenges faced by the agriculture sector in Malaysia have been identified by Malaysian's past researcher such as shortage of local labor that will contribute to low agricultural productivity and GDP as well which had discussed by Mat Lazim et al. (2020); Dardak & Adhman, (2014); Sabirin & Fadhil, (2022); Harun et al. (2015); Gabriel & Irving (2024); Abdullah & Samah (2014); Abdul Raman et al., (2014); Man (2012); Hadi & Zainol (2019); Abdullah (2012). In tremendously, Malaysia's agriculture sector is dominantly by the aging farmer most of them are more than 55 years old as refer to Hadi & Zainol (2019); Musa et al. (2021); Ambad et al. (2021) and Mat Lazim et al. (2020). Referring to a similar discussion, aging farmers prefer the traditional way because age factors lack awareness and interest among them (Mat Lazim et al., 2020; Hadi & Zainol (2019); Ambad et al., 2021). As a result, they lack the technology skills and knowledge for the modern agricultural industry Yusoff et al. (2017), and most senior farmers are not as productive and innovative as younger individuals (Ambad et al., 2021). Nevertheless, the agriculture sector remains the crucial backbone for the country and livelihood as the statistics showed an increasing rate of the world population. Significantly, this pressure will demand more food to be produced by shrinking resources with higher productivity needed were discussed by Wee & Lim (2022); Musa et al. (2021) and Firos et al. (2019). Therefore, it is crucial to implement an improved national plan to address these issues, as the country still has opportunities to leverage its growing youth population and rising youth unemployment. By channeling these dynamics into the agricultural sector, Malaysia can revitalize it with fresh energy and innovation.

Due to globalization, changes require demands for appropriate manpower and modern technological machinery to conduct economics at a high level of growth (Firos et al. 2020). This is because the success of the agricultural sector relies on human capital development, with a particular focus on training programs (Abdul Raman et al., 2014). In contrast, appropriate manpower needed can address the unemployment rate by approaching dynamic economics and rebranding the agricultural sector, Humairah Mat et al., (2022), an increase in local youth participation in the plantation sector such as working environment, job status, facility and benefit in plantation field Abdullah (2012) and reduce unemployment and drive economic growth as well (Abdullah & Sulaiman, 2014; Abdullah & Samah, 2014; Abdul Aziz et al., 2013). Also, it would help to improve farmers' incomes, enhance agricultural productivity, maintain food security, and boost overall efficiency Ambad et al., (2024); Abdullah & Samah, (2014) and have a significant effect on boosting human productivity as well (Che, 2022).

Generally, unemployment can worsen the economy in the countries but it can be managed and it can complement labor shortage mainly among local people in this sector. This has been debated by, such as D'Silva et al., (2021); Humairah Mat et al. (2022); Ambad et al. (2024); Che (2022); Musa et al., (2021); Waktu et al. (2020) and Humairah Mat et al. (2022) to highlight. However, these opportunities are unable to be realized when youth are not really representing their participation in the agriculture sector and instead prefer to non-agricultural sector as mentioned by Zainol et al. (2021) and Yusoff et al. (2019). The participation of youth is very low in Malaysia's agriculture sector cause identification literature found such as a negative agricultural perspective such as dirty, not professional, not glamour careers among youth that had been highlighted in the literature by Mohammad et al. (2015); Abu Bakar et al. (2022) and Yusoff et al. (2018). Overall, the shortage of labor which dominated by aging farmers and low youth participation since the literature also found a negative agricultural perception. Another hand, the recurring debates about unemployment among youth are of high attention and would be able to counter the lack of labor in the agriculture sector in Malaysia. Nevertheless, the agriculture sector in Malaysia remains crucial and sustainable to cater to the world population growth as well. These challenges become a dilemma for Malaysia's agricultural sector and therefore, the government strongly continues to support through incentives, advice and grants under a national policy designed for the Malaysian agricultural community. Such interventions can increase innovativeness among youth and attract them toward agribusiness. Therefore, the researcher has seen the common pattern and themes in some opportunities in the literature that is currently practiced and its hope remains continues for better agricultural development in Malaysia.

Summary

Below is a summary list of agricultural challenges based on the selected discussion of Malaysia's agricultural

literature.

Labor Shortage – The uncertainty of Agricultural Production as low productivity, and low GDP. There is global uncertainty in agriculture's ability to meet the expanding food demand, particularly due to population growth and urbanization. It led to high reliance on foreign workers who refused to use technology in agriculture.

Rising Aging Population: Aging populations in countries like Malaysia, Pakistan, and Japan pose a challenge to the agricultural sector due to the lack of younger, skilled labor and the resistance of older generations to adopting modern agricultural practices

Unemployment Issue: Youth unemployment, particularly in Malaysia, has been rising, with many young people eager to join the modern agriculture sector, presenting an opportunity to fill high-skilled agricultural positions

Low Youth Participation: The agriculture sector in Malaysia faces a low of 15% youth participation in the sector, compared to higher participation rates in other Southeast Asian countries.

Negative agriculture perspective – this negative agriculture view also contributed to low youth participation in Malaysia's agriculture sector.

Discussion: Way Forward of the opportunities in the agriculture sector

A systematic literature review has highlighted several recurring themes related to agricultural opportunities in Malaysia. There has been a growing body of knowledge on youth participation in agriculture in the past few years, the literature is scattered with limited coherence. Based on the evidence found, the study therefore recommended and offered valuable insights for future researchers namely about youth participation, modern agriculture, and agricultural entrepreneurship as summarized in Table 3. Several key terms for agricultural opportunities have been identified such as, Modern agriculture discussed by Mat Lazim et al., (2020), Dardak & Adhman (2014), Sabirin & Fadhil (2022), Harun et al., (2015), Gabriel & Irving (2024), D'Silva et al., (2021), Humairah Mat et al (2022), Ambad et al. (2024), Musa et al., (2021), Wee & Lim, (2022) Firos Mustaffa (2019) Zainol et al. (2021) Ambad et al. (2021), Yusoff et al (2017), Humairah Mat et al. (2022). In addition, Youth is also the identified key term of opportunities in the agriculture sector by most previous studies such as Sabirin & Fadhil, (2022), Harun et al, (2015), Abdullah & Abu Samah (2014), D'Silva et al., (2021), Humairah Mat et al (2022), Ambad et al. (2024), Che (2022), Musa et al., (2021), Man (2012) Abdul Raman et al., (2014) Hadi & Zainol (2019), Abdullah (2012) Mohammad et al. (2015) Abu Bakar et al. (2022) Yusoff et al., (2018), Firos Mustaffa (2019), Zainol et al. (2021), Yusoff et al. (2019), Ambad et al., (2021), Humairah Mat et al., (2022), Zainol et al., (2021) and Abdullah & Sulaiman (2014). Lastly, the opportunities of an emerging trend of agricultural entrepreneurship also had been discussed among researchers such as Sabirin & Fadhil, (2022). Harun et al. (2015). Gabriel & Irving (2024) Abdullah & Abu Samah (2014), Ambad et al. (2024), Che (2022), Musa et al., (2021), Man (2012), Hadi & Zainol (2019), Abdullah (2012), Abu Bakar et al. (2022), Yusoff et al., (2018), Firos Mustaffa (2019), Mohammad et al. (2015), Yusoff et al. (2019) Ambad et al. (2021) Yusoff et al (2017) Waktu et al. (2020) Humairah Mat et al. (2022), Abdullah & Sulaiman (2014).

These articles highlighted similar key terms that represent the growing importance of opportunities discussed in the literature, which are crucial for achieving sustainability in Malaysia's agricultural sector and addressing the identified challenges. Technology adoption contributes a huge potential to resolve of limited use of land, low agriculture productivity, shortage of labor and modern agriculture (Dardak & Adhman, 2014). Additionally, with a growing population and increasing demand for food, farmers must integrate and adopt modern agricultural practices and connected technologies in their farming activities (Wee & Lim, 2022). This is because modern agriculture might help to improve productivity, and efficiency and increase food production (Wee & Lim 2022; Hadi & Zainol, 2019). Similarly, it supported that modern technology presents new opportunities for agropreneurs to improve productivity and profitability Gabriel & Irving (2024). Significantly, farmers need to change from a traditional method to a digital technique in food production to meet the demand for food (Sabirin & Fadhil, 2022).

Referring to past studies, modern agriculture participation is directly relevant to the group of society named farmers as the main players in the agriculture sector (Sabirin & Fadhil, 2022). Therefore, farmers who are the

relevant persons to encouraged to adopt into agriculture activities in Malaysia by (Mat Lazim et al., 2020). This is because the Industrial Revolution (IR4.0) via modern agriculture has the potential to replace aging farmer intelligence with robots in the agriculture sector (Mat Lazim et al., 2020). Despite the great benefits IR4.0 adoption in modern agriculture could offer to the agriculture industry, however, farmers need to change and would take a long time to process Mat Lazim et al., (2020), whereby local farmers were unwilling to change to the new method, a survey had conducted by Harun et al. (2015) majority of them are elderly which prefer traditional way because age factors lack awareness and interest among them (Mat Lazim et al., 2020). Therefore, several past studies have discussed that youth are the future generation and need to be encouraged into modern agriculture to improve global food supply, food security and unemployment issues Musa et al., (2021).

Other studies also found that modern technology will certainly attract the interest of youth to be involved in the agriculture sector, Mat Lazim et al. (2020), by cultivating a new generation of farmers who possess the vision, energy, and expertise to succeed the aging farming population, ensuring sustained food security to encounter issues of shortage of skilled labor, aging farmer in the agriculture sector (Hadi & Zainol, 2019). Younger farmers are essential for boosting agricultural productivity, as they tend to be more versatile, adaptive, and open to adopting modern technologies. They are also more likely to promote diverse agricultural activities, contributing to a more dynamic and sustainable agricultural industry Ambad & Rafiki (2024). In addition, modern agriculture has the potential of a source of employment opportunities for DOSM, (2021), particularly in youth participation because youth are strong for country development and are active, skilled and perform to derive which had been discussed by Malaysia researchers before 2014 by (Samah et al., 2010). These groups of youth become attention youth agropreneurs due to their high tendency to accept, adopt and use technology (D'Silva et al., 2021). Currently, Malaysia statistically reported the unemployment rate in Malaysia is about 4.3% Department of Statistics Malaysia, (2023). It was supported that knowledge-intensive and technology innovation adoption is the tool to invite youth into modern agriculture FAO, (2020) and it was agreed by Dr. Niaz Abdullah a UM professor, who realized that modernizing could make the agriculture sector a commercialized and productive sector which can remove worse stigma about it and attract more youth to come.

This modern agriculture opportunity to young generation can switch the wrong perceptive of the agriculture sector as a labor-intensive, dangerous job, sweaty, difficult and now change agriculture into one of the lucrative jobs, and thus the sector becomes a viable option for youth sector high in incomes and riches have said by Malaysia Education minister Datuk Dr. Radzi Jidin in 2022. Therefore, Malaysia has taken significant steps toward modernizing agriculture, focusing on increasing food production, improving productivity, and addressing labor shortages. As Aligned, Malaysia established the Young Entrepreneur Unit in 2013 by the Ministry of Agriculture and Agro-based Industry (MOA) to encourage the participation of young people in the agriculture sector. The main focus of this initiative was to increase the number of agropreneurs participating and nurture income agropreneurs among the young generation via various support programs to develop more modern agriculture generation and methods. The past study supported that the young focus of Malaysia's national agenda to incline them into modern agriculture technique adoption through training intervention among university students can drive them towards modern solopreneur which can reduce the unemployment rate by approaching dynamic economics and rebranding agricultural sector (Humairah Mat et al 2022). Significantly, the recent entrepreneurship trend is a powerful instrument to create employment opportunities and reduce the amount of unemployment. This is because individuals equipped with entrepreneurial, are able to create new methods, new products and processes creation which are able to trigger innovation and thus encourage youth to develop this sector, Ridha et al., (2017) as past studies focused on investigating the development of graduate agropreneur into agriculture sector (Zainol et al., 2021).

Recently, Malaysia has been on the right track in promoting agricultural entrepreneurship, aligning with the national transformation agenda to address unemployment and drive economic growth (Abdullah & Sulaiman, 2014; Abdullah & Samah 2014; Abdul Aziz et al., 2013). This initiative also aims to improve farmers' incomes, enhance agricultural productivity, maintain food security, and boost overall efficiency (Ambad & Rafiki 2024; Abdullah & Samah, 2014). The success of high-impact agricultural programs by the Ministry of Agriculture (MOA) further demonstrates the effectiveness of this approach. Moreover, agriculture entrepreneurship courses can attract more youth to be involved in the agriculture sector resulting in positive and significant effects to boost human productivity as well (Che, 2022). The attraction factors can increase local youth

participation in the plantation sector such as working environment, job status, facilities and benefits in the plantation field (Abdullah, 2012). Agricultural entrepreneurship serves as a platform to engage youth as a key target group for adopting modern agricultural practices, contributing significantly to Malaysia's agricultural literature. This is further supported by the steady increase in the youth population, which reached 6.2% in the fourth quarter of 2020 (DOSM, 2020). Therefore, youth are expecting to fill the sector gap in modern agriculture using technologies and tools adoption which need farmers to be knowledgeable, risk-takers person, creative, independent which youth are the common group discussed. The new agricultural entrepreneurship concept is the combination of two elements of entrepreneurship and agriculture that has shown growing relevant as a medium transformation towards new and modern technology opportunities to explore (Yusoff, Ahmad, & Halim, 2017). Indeed, modernization via entrepreneurship elements is a new path to resolve these challenges to penetrate agricultural farmers and often employed by other developing countries due to reason for poverty elimination among communities (Firus, 2020). Therefore, the study can summarize that agricultural entrepreneurship can trigger opportunities for modern technology applications which have been realized as an expected means to address these challenges.

According to empirical studies, a moderate level of youth involvement in agricultural entrepreneurship aligns with the 12th Malaysia Plan (12MP) and the National Food Security Policy 2.0. This initiative aims to encourage youth participation in agricultural entrepreneurship, contributing to economic growth and agricultural sustainability. To further support this, additional entrepreneurship programs and activities have been planned to nurture more youth agropreneurs in the future (Abu Bakar et al., 2022). Agricultural entrepreneurship plays a crucial role in addressing the issue of aging farmers, who, at an average age of 50, often face challenges in adopting new technologies. This has been a significant factor contributing to the lagging performance of Malaysia's agricultural sector. Increased youth involvement in agriculture can help Sabah combat poverty and reduce youth unemployment, as entrepreneurs generate job opportunities within the market. Currently, most farmers are senior citizens, who may not be as productive or innovative as younger individuals (Ambad et al., 2021).

Nevertheless, the current level of modern agricultural technologies among farmers in Malaysia remains low, which contributes to reduced productivity. To address this, the success of the agricultural sector relies on human capital development, with a particular focus on training programs (Abdul Raman et al., (2014). By emphasizing agricultural entrepreneurship, efforts are being directed toward transforming the sector into a modern and innovative field, with a strong emphasis on engaging youth to take an active role in shaping the future of food production. Therefore, the agriculture education program can assist and expose youth to the modern economy Man (2012). It was agreed that institutional factors play an imperative role in influencing agriculture entrepreneurship intention among students. Therefore, education is positively influenced by agricultural entrepreneurship intention. Young farmers need for their agriculture entrepreneurship careers Musa et al., (2021). As a result, numerous successful entrepreneurs were produced after the incubation program which indicated a good program means to be an intermediary for farmers to become experienced agriculture technology entrepreneurs (Abdul Raman et al., 2014). A significant effect of social institutional and psychological influence on the development of agricultural intention and behavior among Malaysia Gen Y as preparation for agricultural business (Yusoff et al. 2018).

According to Waktu, et al. (2020), Malaysia is a great place great of the development of modern agriculture as well as to promote agricultural entrepreneurship by spending billions of dollars, and yet there is a statistical number showing a discouraging number of youth who have an interest in the agriculture sector. Yet, it remains a less-looked-for career for them even though promising prospects are increasing their participation in the agricultural sector with policy guidance. For instance, Malaysia has strengthened more policies focused on young agropreneur and their participation in agriculture, such as the 11th MP, Malaysia government has applied various programs such as the Agro Youth Entrepreneur Incubator Program, Youth Agropenuer Grant to attract the younger generation to participate into agricultural entrepreneurship as a new direction to be modern and dynamic sector. Then, under the 12th MP (2021-2025) remains to strengthen smart farming in Young Agropreneur Programs as part of eager youth interest in agricultural entrepreneurship participation. Specifically, National Food Security Policy 2.0 (NAP 2.0), is also mentioned to empower modernization for environmental sustainability reasons to ensure food stability and food security. Consistently, Malaysia plans to conduct these programs currently and even until the future to encourage youth into the agriculture sector

since past studies have revealed that the statistical number of agropreneurs among youth is still low.

Summary

Here is a summary list of the opportunities in Malaysia's agriculture sector based on the discussion above. There are three main opportunities found in Malaysia's agriculture sector as mentioned below. With strong continuous government support under various national agricultural policies and agendas towards modern agriculture which is able to reduce unemployment among youth offer a viable career path and achieve food security, agricultural sustainability complements Industrial Revolution 4.0.

Youth Participation: Youth are seen as a critical target group for modern agriculture, offering fresh ideas, skills, and the drive for innovation.

Modern Agriculture: The adoption of modern agricultural techniques using technology such as IoT, Big Data, and AI has the potential to overcome labor shortages, low productivity, and land limitations.

Agricultural Entrepreneurship: This field is growing in relevance, combining agriculture with entrepreneurial skills to boost innovation, productivity, and sustainability in the sector.

These opportunities indicators have been highlighted by the most of selected articles reviewed which the study believes is relevant for addressing current agriculture challenges faced in Malaysia. The focus of youth in participating in agriculture activities is to replace aging farmers which are currently dominant in this sector. It was being attention by past researchers such as most of the above-selected review articles. In alignment with that, promoting entrepreneurship in the agriculture sector known as agricultural entrepreneurship is a medium to make this sector more dynamic and competitive. This is because entrepreneurship helps an individual to be more innovative which is closely related to modern technology to adopt for production, marketing and so on. Besides, it also helps individuals consider taking risks, opportunists and creating a new concept for a better solution that fits the group of youth as currently very relevant as the target population for agricultural entrepreneurship and modern agriculture. It is in accordance with the Industrial Revolution embarked in developed and developing countries to employ as an opportunity. Therefore, youth are the target group of the population and are relevant for the current phenomena of embarking on modern agriculture with the new concept of entrepreneurship in the agriculture sector known as agricultural entrepreneurship. These opportunities reflect Malaysia's strategic push to modernize its agricultural sector, increase youth participation, and ensure food security while promoting economic growth through innovation. These elements encourage future researchers to do further investigation in this area of study.

4. Conclusion

The unsolved consequences of structural problems will hamper sustainability agriculture development. Those challenges will lead to an array of agricultural development problems if not get involved young generation into attractive modern agriculture. Therefore, the transformation of modern agriculture to make this sector more attractive to the eyes of youth as part of an effort to encourage youth to replace the challenges of low agriculture productivity, aging farmers, rising unemployment and keep rising of growing youth in Malaysia as well because the transformation of agriculture development is need the role person to change. Since the 9th Malaysian Plan, government strategies have focused on empowering youth for the future by enhancing education and training opportunities. Youth are being paid attention by the government to development programs to attract their interest in agricultural-based activities which include encouraging to use of modern technology to establish a young and modern generation of young farmers. The strategy to bring youth involved in modern agriculture has been illustrated in the Malaysia 11th National Policy and 12th Malaysia Plan to strengthen the role of youth in modern agriculture. In fact, numerous agriculture programs related to youth development have been illustrated by the establishment of the Young Agropreneur Unit which aims to increase the number of agropreneur among youth in Malaysia-by-Malaysia Agriculture and Food Industry since 2013. Another example is the higher education institution in Malaysia offers an Agriculture program at Malaysia University in which modern agriculture can trigger youth interest at the university level or even at the school level in inclusiveness development.

It is demonstrated that the recognition of the participation of youth in the development of agriculture is paramount which is interpreted with various policies and programs initiated by the government to encourage young people to engage in agriculture. On the other hand, this area also contributes to an increasingly growing concept of agricultural entrepreneurship context as the effort to innovate and explore new ways and means of venture into agriculture enterprise via modern agriculture. The development of youth agropreneurs via agriculture entrepreneurship context is gradually getting attention which originated from the general concept of entrepreneurship. It combines mixed agriculture and entrepreneurship areas which are able to create and redefine new and modern agriculture. Therefore, realize that intervention programs such as training by the government are continuous efforts and encouragement for them to produce better output. Malaysia aims to increase the number of agropreneurs as an agent of change that can be characterized as among youth, modern method and contributes to the growing literature of agricultural entrepreneurship areas, which getting attention from researchers. To sum up, the agricultural entrepreneurship context is able to open, create and adopt modern agriculture for sustainability which requires a group target population particularly 'youth' as agents of change. Towards that, agricultural entrepreneurship, modern agriculture and youth are identified opportunities in Malaysia's agriculture sector that can give branches of ideas for future researchers to contribute to existing literature.

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