



Review article

A systematic review of emerging environmental markets: Potential pathways to creating shared value for communities

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ARTICLE INFO

Keywords:

Environmental markets
Carbon trading
Offset
Credit
Standard certificate
Sustainable labels

ABSTRACT

The emerging environmental markets have been adopted by various sectors and industries worldwide, with regulations being implemented to make it compulsory to protect against environmental degradation through emission reduction. Thus, understanding the framework of environmental markets and their implications in mitigating climate change and addressing challenges is crucial. Following the updated PRISMA guidelines, a systematic review was conducted to provide important insights into environmental labels and their values in reducing greenhouse gas emissions. Their potential for investments in emerging business opportunities was also explored. The literature search was limited to the past 20 years and focused on peer-reviewed journal articles in the agricultural sector, using databases such as CAB Abstract, Business Sources Ultimate, Scopus, and ProQuest between March and May 2022. It is worth noting that this study did not use other popular databases (e.g. Web of Science), which might result in the omission of some relevant studies in the environmental market domain, potentially introducing some imprecisions to the findings. Based on the inclusion and exclusion criteria, 51 articles were finally selected for the study. Thematic content analysis was conducted using Nvivo software, and the results were synthesized and presented in different themes. The findings indicate that carbon, environmental, and eco-labels are among the seven identified labels, wherein environmental and carbon markets, among the four identified markets, were found in new emerging and popular markets in most countries. There has been substantial growth in the value of environmental goods and services due to increasing demand from different stakeholders seeking environmental protection, as mandated by regulations. Overall, consumers have a positive response to the willingness to pay (WTP) premium prices, particularly for environmentally friendly labels and products (eco-label and environmental labels) than conventional ones (carbon and organic labels). Further, there is huge potential for investments in the newly emerging environmental markets, e.g., the carbon market through carbon/greenhouse gas emission reduction and carbon offset/credit market by soil carbon sequestration and carbon neutral products. This study contributes to the understanding of the market structure, the main drivers influencing new environmental markets, its advantages, and co-benefits for the various stakeholders in the value chain. Overall, the adoption of environmental strategies and practices can contribute to the socio-

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<https://doi.org/10.1016/j.heliyon.2023.e19754>

Received 22 November 2022; Received in revised form 20 August 2023; Accepted 31 August 2023

Available online 1 September 2023

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economic and environmental benefits, as well as lead to environment-friendly sustainable production.

1. Introduction

Given the unprecedented changes in global climate conditions, climate change mitigation and environmentally sustainable production have become the primary environmental goals of agricultural production globally [1–3]. In recent years, there has been a growing awareness and demand for environmental consciousness and climate change concerns, which have influenced consumers and importing countries to reconsider their perspectives on the products they consume. Consumers are increasingly willing to pay (WTP) a premium price for high-quality food products that are produced using responsible farming practices, taking into account health and environmental factors [1,4–6]. The changing climate conditions and greenhouse gas (GHG) emissions have raised public awareness regarding corporate environmental disclosure and commitment to environmental protection, which has become a potential area of focus for businesses [7–9]. In response to GHG emissions and other environmental effects, several environmental policies and initiatives have been launched by governments and international bodies worldwide, including Kyoto Protocol in 1997 and the more recent Paris Agreement in 2016, adopted by the United Nations Framework Convention on Climate Change [7,10–12].

The emerging environmental markets and associated policy regulations can be seen as mechanisms to balance the environment and socio-economic interests of the stakeholders with the society as a whole. New trends in consumer awareness are shifting the agriculture sector towards sustainable practices, such as traceability and crop labels, and connecting farmers and consumers through sustainable label programs [13,14]. Potential demanders of environmental goods and services include governments and groups of individuals, such as growers seeking to protect their farms from environmental threats such as extreme climate events and salinity. There are many opportunities for investment in activities that supply environmentally related products and services, provided that appropriate incentives and awareness are in place to encourage landholders to adopt environmentally sustainable practices [5,6,15]. There is an increasing demand for these goods among certain consumer segments in both producing and consuming countries, as well as in developed economies.

Environmental markets are recognised as essential tools for addressing environmental issues, as they present opportunities to contribute to climate change mitigation and reduce GHG emissions. These markets encompass both existing ones, such as traditional goods trading and organic products, as well as emerging ones, including carbon trading and sustainable labels, which are part of the green economy [16,17]. Global environmental markets, such as carbon footprint labels, water footprint assessments, sustainable certificates/labels, eco-labels, carbon neutral products, organic products, and non-deforestation initiatives, can play a substantial role in safeguarding the interests of stakeholders involved in climate change mitigation [1,16,18–20]. These connections among stakeholders are the basis of wealth creation (value addition) in society. Applying these labels to agricultural products can generate consumer demand for GHG emissions-reducing food products, thereby contributing global warming mitigation. Consequently, promoting more sustainable consumption patterns becomes an important strategy for mitigating agricultural GHG emissions [10,21,22].

The environmental emerging markets offer many investment opportunities. For example, green brand equity aims to build environmentally sustainable systems that benefit both consumers and business operations, creating shared value [23]. Literature search indicates a rising demand for environmental goods and services from public authorities, private firms, and consumers over the past two decades. This suggests the immense potential of new environmental markets, which could potentially reach multi-billion-dollar valuations and experience rapid growth in the coming decades. In addition, there is consumer demand for products derived from healthy ecosystems, as well as for private players to show initiatives towards protecting biodiversity and achieving climate neutrality goals [24, 25]. While existing discussions on eco-friendly market opportunities have primarily focused on consumer products, such as cosmetics, health benefits, and forest sustainability ecotourism, limited attention has been given to the environmental market potential within the Agri-based industries and its relationship to climate change. Thus, this study aims to answer the following research questions: i) what are the different types of environmental markets, opportunities, and benefits for stakeholders in the agriculture industry? ii) what are the current trends and patterns in environmental market labelling in the agri-business sector? iii) how does consumers' WTP premium prices contribute to environmental outcomes through market opportunities? And iv) what are the future directions and the contribution of environmental market investment opportunities to policies?

Following the updated guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) framework [26], this study systematically reviews the existing literature and contributes in the following ways. First, it provides new evidence on the recent types, trends, and patterns and their contribution to policy revisions in environmental markets for mitigating global warming. Second, it offers a decision-making support tool for stakeholders to increase awareness and select suitable environmental products. Third, it provides scientific information about new investment opportunities in sectors such as environmental label food production, crop certification, and traceability within emerging environmental markets, targeting stakeholders such as growers, processors, traders, exporters, and consumers in the industry.

2. Methodology

The systematic review of the published literature on emerging environmental markets was conducted in accordance with the updated guidelines of the PRISMA-2020 statement [26]. In addition, various systematic review articles were extensively studied to define search terms, extract data, synthesise findings, and critically analyse the literature. The overall methodologies employed for

this study are summarised in the following sub-sections.

2.1. Search strategies and article selection approach

Scientific literature was searched using pre-defined search terms through popular databases such as CAB Abstract, Scopus, and Business Source Ultimate, and ProQuest. The literature search was carried out between March and May 2022, using a set of key search terms, and concepts provided in Table 1. The combinations of search terms were tested manually to assess the effectiveness of using search engines such as Google Scholar. In the initial stages of the literature search, specific inclusion criteria were applied to filter targeted articles related to the study, including articles published in English and limiting the search to peer-reviewed journal publications in the last 20 years.

2.2. Inclusion and exclusion criteria

After downloading the targeted articles using the specified search terms and databases, a screening process was conducted based on the following inclusion-exclusion criteria. The inclusion criteria included: 1. Articles published in English in peer-reviewed journals within the past 20 years; 2. Articles discussing environmental market/labelling in relation to agriculture; 3. Articles specifically focused on carbon market/carbon credits in the agricultural sector or agri-business (excluding forestry); 4. Articles related to standard carbon market certificates (e.g., carbon emission certificate) or certificates pertaining to value addition in agri-business (crops and livestock).

Articles meeting the following criteria were excluded from the study: 1. Articles not published in English; 2. Articles focused on the development of a new methodologies; 3. Articles developing or monitoring tools/decision support tools; 4. Experimental articles, 5. Articles unrelated to agriculture (e.g., cosmetics, cookware, etc).

2.3. Selection of articles and extraction of thematic results

Initially, a total of 456 articles were identified as relevant to the study through the searches conducted based on the inclusion criteria. The bibliographic details of these articles were imported into EndNote to eliminate any duplicates. The removed duplicate files were manually checked to ensure that no non-duplicates were mistakenly deleted. After removing the duplicates, 421 articles remained. All bibliographic information (e.g., title, abstract, keywords, doi number) from Endnote was exported into an Excel spreadsheet. The articles were then manually screened using the inclusion-exclusion criteria set out above. The article selection process was independently performed by all co-authors, who reviewed the screening procedure randomly to ensure that potentially relevant articles were not removed from the list. During the initial screening, the full texts of the articles were assessed against the inclusion-exclusion criteria, and then any discrepancies were discussed among the authors to reach a consensus. After carefully examining the articles' abstracts and full texts, a total of 51 articles directly relevant to the study were identified. The full bibliographic details of the selected articles are presented in the supplementary materials. A flowchart depicting the study process in accordance with the PRISMA framework is presented in Fig. 1.

To demonstrate the representativeness of the search strategy using predefined search terms, a thematic content analysis was conducted using NVivo 12 Plus software. This analysis was based on the titles, keywords, and abstracts of both the initially selected articles ($n = 85$) and the finally selected articles ($n = 51$). A word frequency search query was employed to identify the most important and frequently used terms in the articles. The analysis revealed that the terms "environmental", "organic", "products", "label", "carbon", and "market" were found to be the most significant and commonly used terms in the articles (Fig. 2A–B). These findings indicate that these terms are representative of the search terms defined for this study.

Table 1

Literature search framework and selection approach.

Concept	Terms for searching within titles and abstracts	CAB Abstracts	Business source ultimate	Scopus	Proquest	Total number of articles found in the search
1	<i>agribusiness</i>	("agri-business" OR "agro-business" OR "agribusiness" OR "agrobusiness")	Topic/ Descriptor/ [Title, Abstract]	All Fields [Topic/Title, Abstract]	Title- Abstract- Keywords TI-AB-KW	Anywhere [Title -Abstract- Keywords]
2	<i>environmental market</i>	("environmental market" OR "eco-friendly market" OR "green market" OR "carbon market" OR "environmental label*" OR "carbon off-set" OR "standard certificate")	Topic/ Descriptor/ [Title, Abstract]	All Fields [Topic/Title, Abstract]	TI-AB-KW	Anywhere [TI/ AB/SU]
Initial Results		281	37	23	2409	2750
Results after filtering using inclusion criteria		172	30	23	231	456

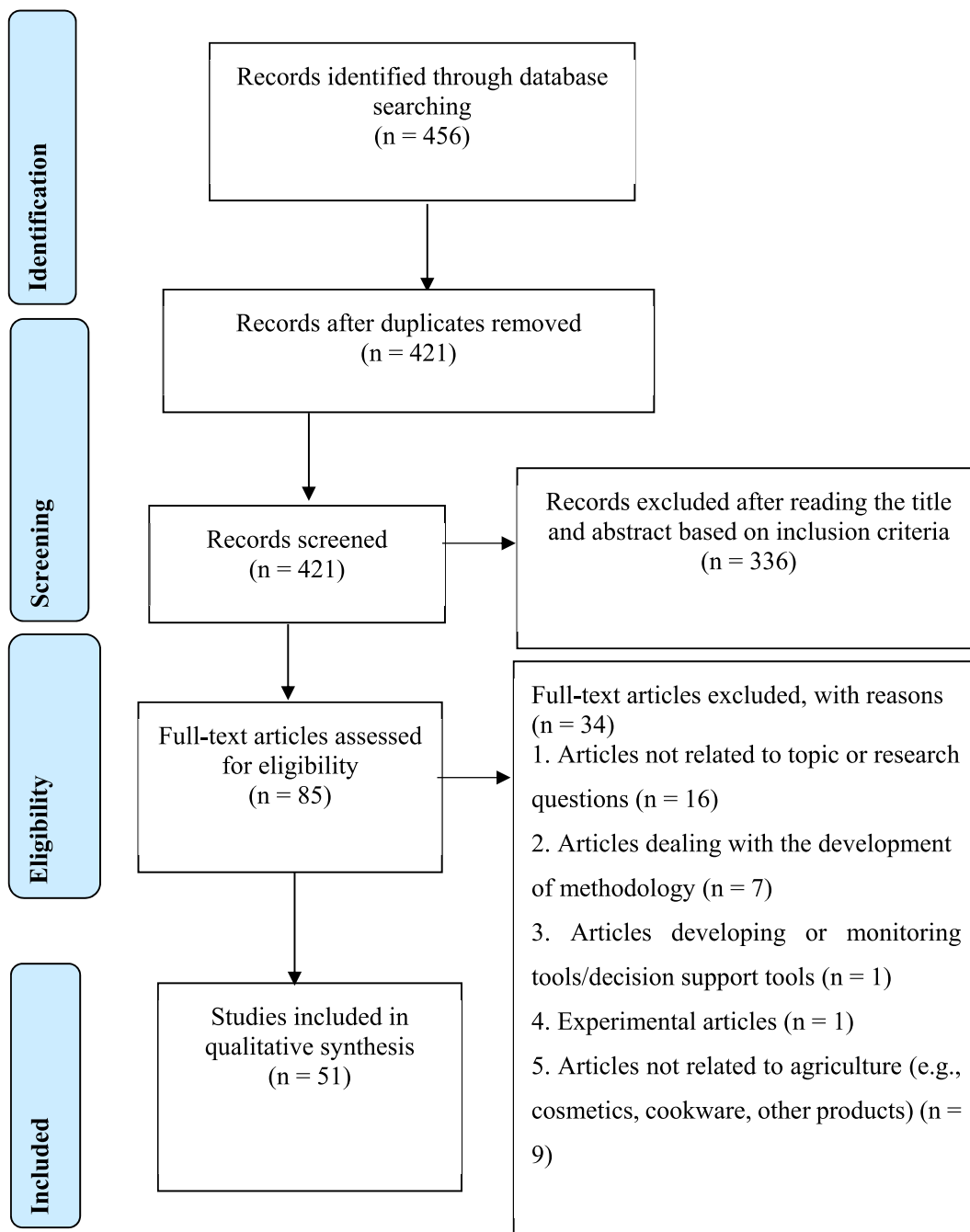


Fig. 1. Flow chart depicting the article selection process following the PRISMA framework (Adapted from Ref. [26]).

3. Results

3.1. Mapping of emerging environmental market labels and market types

The literature review yielded a list of country-wise label acronyms, and based on this information, a detailed global distribution map was created to show the distribution of emerging environmental market labels worldwide (Fig. 3). The review identified seven prominent labels: animal welfare label, carbon label, environmental label, eco-label, organic label, genetically modified organism (GMO) label, and green label. Among these, carbon, environmental and eco-labels were the most commonly observed labels across the study countries (see Fig. 3).

Furthermore, the study mapped the country of origin for environmentally labelled products and markets, and the details are

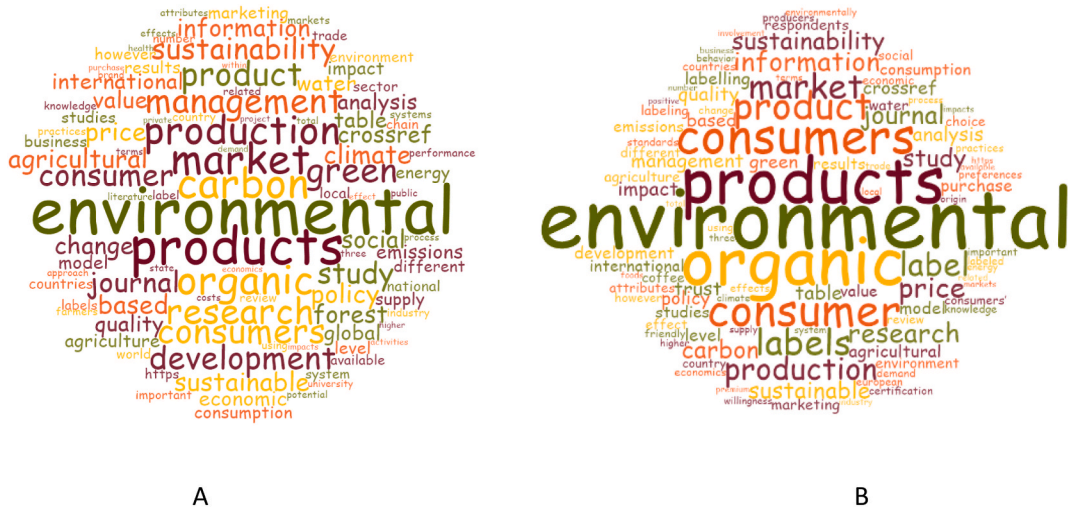


Fig. 2. Representativeness of the search terms used in a systematic search of the selected articles (A) initially selected articles (n = 85), and (B) finally selected articles (n = 51).

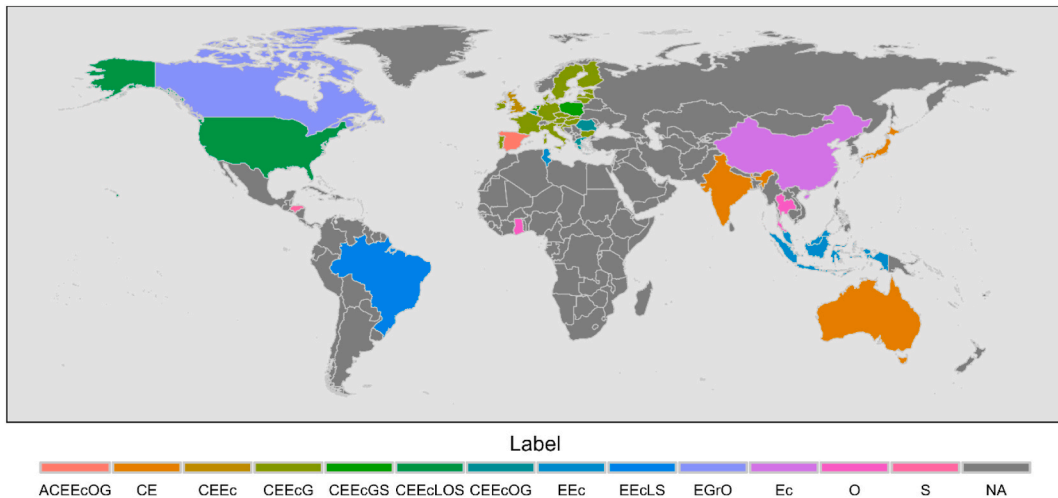


Fig. 3. Global distribution of emerging environmental market labels listed from the study. Note: The list of acronyms and colour scale is used for distinguishing between label types and origin distribution. A: Animal welfare label, C: Carbon label, E: Environmental label, Ec: Eco-label, L: Locally grown label, O: Organic label, G: GMO label, Gr: Green label, and S: Sustainable label. For example, ACEECoG: Animal welfare label, Carbon label, Environmental label, Eco-label, Organic label and GMO label. Note: EU (European Union) interpreted that they have all labels from EU plus their individual labels.

presented in Table 2. Most of the labelled products were food and fruit, wheat, rice, apple, banana, and pineapple. Fibre and meat products were found in only a few countries. The study identified four main types of environmental markets: 1) Environmental markets; 2) Carbon markets; 3) Organic markets; and 4) Sustainable supply chains (refer to Table 2). Among these, the environmental and carbon markets emerged as the most prevalent and popular markets across the countries included in this review study.

3.2. Commercial environmental markets and benefits

There is a growing interest among governments, non-governmental (e.g. not-for-profit) organisations, private firms, and consumers in establishing new emerging environmental market for various environmentally sustainable products and services. Studies have reported that premiums are paid for a range of products in food industry, such as milk, fruits, eggs, and others, that are certified with labels like low carbon, traceability, organic, and eco-labels [1,27–30]. In recent years, there has been a noticeable increase in the value of environmental goods and services due to rising demand for environmental conservation and healthy food by stakeholders, including regulations and consumers [27,28,31–36].

Dornfeld, da Silva Mansano [36] reported that environmental strategies implemented in the sugar-energy sector in Brazil have led

Table 2

Country of origin and distribution of new emerging environmentally labelled products and markets.

Country	Product	Market
Spain	Beef products	Environmental market
India	Food and fiber products	Carbon market
Australia	Wheat, rice, and millet	Carbon market
Japan	Fruit	Environmental market
UK	Fruit	Environmental market
EU	Emission reduction from oil products, electricity, steel, paper products, mineral products	Carbon market
Netherlands	Food products (Pork meat and coffee)	Environmental market
Poland	Apple, banana, rice, beans	Environmental market
USA	Apple	Carbon market
Belgium	Apple	Organic market
Greece	Certified food products (Sugar, flour, croissant, eggs & spaghetti)	Environmental market
Romania	Food products	Organic market
Indonesia	Organic food products	Environmental market
Malaysia	Food products	Environmental market
Tunisia	Agriculture food products	Environmental market
Brazil	Agriculture and food products	Environmental market
Canada	Food products	Environmental market
China	Food products	Environmental market
Ghana	Pineapple	Organic market
Thailand	Food products	Organic market
Honduras	Fruit and Vegetables	Sustainable supply chain

to improvements in competitiveness, market demand for the product, employee satisfaction, and sustainable production in sugar mills. This literature study demonstrates that environmental markets labels, such as environmental certification, environment label (EL), eco-labels (eco-L), euro-leaf (euro-L), locally grown label (LL), green label (GL), sustainability label (SL), and eco-friendly label, serve as effective tools to provide consumers with information about product origin, cultivation, harvesting, and increase awareness. Further, these labels are used as marketing tools to build customer confidence, brand recognition, and increase consumers' WTP premium prices for products like milk, eggs, meat, etc. (Table 3) [36–46].

The carbon market (e.g., carbon offset and carbon credits) and water market are becoming globalised as a result of the Paris Agreement on climate change and government regulations aiming for net zero emissions. The agriculture sector's initiatives to reduce its carbon footprint (CF) through the development of carbon-neutral products (CF-labels) in supply chains are driving the carbon market's growth [1,27]. Customers are WTP higher prices for products with CF-labels, and producers who adopt carbon and water market initiatives receive differential prices for their environment-friendly products compared to standard market prices. Additionally, they can trade in the carbon offset/credits market and similarly in the water market for water credits. These climate initiatives in the

Table 3

Published research articles regarding WTP for environmental, carbon, organic and sustainability labels and products.

Region (country)	Label	Product/crops/industry	Reference
Oceania (Australia and New Zealand)	Carbon label, Environmental label Certified bush product label	Wheat, rice, and millet Bush products (Natural plant products), meat products	Settre et al., 2019, Cunningham et al., 2009; Bhaskaran et al., 2006
Latin America (Brazil, Honduras)	Environmental labels, Eco-labels, Sustainability labels	Agriculture and food products, Fruit and Vegetables	Dórea et al., 2022; Blandon et al., 2009
China	Environmental label, green label, Organic label	Food products	Bing et al., 2011; Ayyub et al., 2018
EU	Eco-label, Environmental label, Organic label, Carbon label, Eco-label, Certification label, sustainability label, Animal welfare label	Food products, Apple, Pig and Broiler chicken, Certified food products (Sugar, flour, croissant, eggs & spaghetti), Dairy products, Wine products and wine industry, banana, rice, beans, Beef products, Strawberries	Kijek et al., 2015; Koos, 2011; Rousseau & Vranken, 2013; Van der Werf & Salou, 2015; Anastasiou et al., 2017; Canavari & Coeroni, 2020; Fiore et al., 2016; Pomarici et al., 2015; Kaczorowska et al., 2019; Oroian et al., 2017; Grymshi et al., 2022; Eldesouky et al., 2020; Carmona, 201; Sønderkov & Daugbjerg, 2011
Africa (Ghana)	Organic label	Pineapple	Kleemann, 2016
Asia (Japan, India, Indonesia, Malaysia, Thailand)	Environmental label, Eco-label, Organic label, carbon label	Coffee, Food products, Fruit	Marie-Vivien et al., 2014; Herdiansyah et al., 2019; Mohamed et al., 2014; Nuttavuthisit & Thøgersen, 2017; Tait et al., 2016
UK, USA and Canada	Carbon label, locally grown label, Environmental label, Eco-label, Organic label, locally grown label, Eco-friendly label, sustainable label	Apple, Wine industry, Wine products, Potato, Coffee, Blue berries, Food products, Forest, wood products	Onozaka et al., 2016; Barber et al., 2009; Zedler, 2009; Larson, 2003; Hu et al., 2009; Campbell et al., 2015; Berghoef & Dodds, 2011; Gava et al., 2018; Aguilar & Cai, 2010

industry can create additional income for the primary producers [27,33,47,48].

Certification and traceability of farm products are an important tool for bridging the information gap between supply and demand for these products. Furthermore, organic agriculture-produced eco-friendly green products (organic labels (OF)) are priced at a premium in the international market compared to conventional products. However, the value of these certifications may reduce over time due to the emergence of new certification schemes. These schemes would potentially signify the need for setting a wider frame in adopting various environmental labels through multidimensional indicators (e.g., social, ecological, commercial), as well as ensuring that governance mechanisms, including both legislative and business goals, are met. The research findings highlighted the importance of farmer involvement in co-designing the principles and regulations for developing environmental labels [30,49–52]. Therefore, the review of research suggests that environmental markets offer increasing advantages at all levels of the supply chain by creating additional value and economic returns.

3.3. Willingness to pay premium prices for environmental labels and products

This study has demonstrated that consumers are WTP premium prices for different labels and products, which could contribute to sustainable environmental outcomes by creating environmental market opportunities. Table 3 summarises the main aspects of the selected studies: country, label and product references, and the main findings. Most of these studies indicated that in general consumers are more responsive to environmentally friendly labels and products as compared to conventional ones, particularly in terms of health benefits. The findings highlighted that consumer exhibit a positive response to WTP premium prices, particularly for eco-labels and environmental labels, followed by carbon and organic labels (Table 3). For example, consumers from environmental groups had stronger preferences for environmental and food quality, expressing a higher WTP for these food products due to health concerns [4, 39,53]. Several studies also indicated that consumers are WTP premiums for multiple labelled products (EF, LL and OL), and they prefer to pay a premium price for LL, EL and OL blueberry and food products [30,40,54]. However, a decline in product preference is observed for non-food products (forest and wood products) if the logo is poorly known [37,43]. Consumers are WTP premium price for locally grown carbon neutral products (e.g. apples) and environment friendly products [33,35]. To summarise, these studies have indicated that customers are WTP premium prices and there is an increasing potential for environmental markets in agriculture sector worldwide.

3.4. Investments in next-generation new emerging environmental markets

In the agriculture sector, the environmental market is gaining importance with the global climate change outlook and industries progressing towards net zero commitments by 2050 [55] and climate-related financial disclosures [56]. In this regard, there is huge potential for investments in newly emerging environmental markets, for example, the carbon market through carbon/greenhouse gas emission reduction and carbon offset/credit markets by soil carbon sequestration and carbon neutral products [42,48]. Another investment opportunity lies in the environmental credit market, where initiatives are undertaken to improve water and air, promote fertile soil, and reduce pollution. This scheme will help improve the ecosystem services that ultimately benefit communities as environmental credits are bought and sold [27,36,57]. Globally, many industries and entrepreneurs, particularly those new to the market, have initiated environmental market projects/schemes like credits and off-set markets, which in turn are progressing new pathways for the next generation of environmental markets.

4. Discussion

The findings of this systematic review demonstrated the potential opportunities for emerging environmental markets in the agriculture sector, which could play a significant role in reducing climate change impacts in agriculture and adding value to the agriculture supply chain. Previous studies have also demonstrated similar findings, indicating that changes in farm cultivation practices and food consumption patterns were encouraged by the environment-friendly labels. The interventions in the supply chain have shown positive effects in reducing climate change impacts [53]. The drivers for environmental markets are increasingly a feature of environmental-friendly production of goods and services, especially those products aimed to mitigate climate change, reduce emissions and carbon offset [58].

Furthermore, the findings of this study reveal that there is a need to support these emerging environmental markets by creating joint opportunities and co-benefits. Support from both government and non-government organisations is likely to improve governance, overcome hurdles and accelerate investment and subsequent value to new environmental markets. However, literature also indicated that consumers show more elasticity in WTP higher or premium prices for products related to food, nutrition, and personal care categories compared to some luxury items (e.g., fashion, brand) regardless of different environmental labelling [15].

This study thus demonstrated that consumers express a WTP premium prices for Agri-based products with various environmental labels. For instance, in a study by Akaichi, de Grauw [59] consumers were willing to pay 22% higher when provided with information about local origin or lower CF. These findings are also supported by another study by de Boer, de Witt [22] which reported that WTP premiums for the carbon neutral label up to 28% for eggs and 23% for olive oil, signifying the potential of emerging environmental market opportunities worldwide.

Environmental labelling is an important tool that can contribute addressing climate change through improvements or practice changes in agricultural supply chains from farms to consumers. Although there is increasing awareness and demand for products with verifiable environmental credentials, their presence in the global food sector is still limited. Some studies have examined the WTP for

these environment-friendly product labels, and the literature review reveals a positive WTP for these products [1]. For both the producers and consumers, policy framework should aim to raise awareness regarding climate change and its impact on the environmental and health concerns. Many government bodies have set up incentives for producers to adopt environmental/certification labels, including financial initiatives that offer win-win business models for both producers and consumers [60–63].

The concept of sustainable development was introduced to secure production and income in various sectors as well as improve supply for growing markets. However, with the global climate challenges and ongoing environmental degradation, there is a need for reorientation of production systems and markets through a new concept of emerging environmental markets [64]. The implications of environmental markets in the agriculture sector will bring added value and benefits to producers through additional knowledge gained from new channels and players such as third-party auditors, agents, institutions, and firms. Globally, the carbon market is emerging at a rapid pace through credit and offset schemes, followed by the biodiversity market for environmental protection, which is growing multi-fold year-on-year.

The findings of this study highlight the significant opportunities in emerging environmental markets, particularly in agricultural products, and their value within the supply chain. These opportunities can contribute to sustainable production and the reduction of GHG emissions from the agricultural sector.

However, this study also acknowledges a few limitations, which should be addressed in further studies. For example, in this study, literature searches were confined to a few databases and ignored other potential sources of information such as Web of Science, which could have produced imprecisions in the presented results. In addition, the article screening procedure did not strictly follow the software-led protocol, indicating a possibility of human error in the screening process described in this study. Extracting quantitative data and adoption of a statistical analysis could also improve the quality of the recommendations made from this study. Thus, these aspects should be considered in future research. In addition, while this study focused mainly on environmental markets and pathways in the agriculture and farming sector, it is essential for future research to explore potential environmental market opportunities in other sectors like natural resources, energy, health, and wellbeing.

5. Conclusions

The emerging environmental markets play a significant role in reducing global emissions through adopting sustainable production strategies. However, the potential of these markets in the agricultural sector are poorly reported in the existing studies. This systematic review was conducted to provide valuable insights into environmental labels and their values in mitigating GHG emissions, and to show the potential for investments in emerging business opportunities, particularly in agriculture.

The findings of the review study demonstrate that a range of mechanisms and strategies are already in place to incentivise farmers and regulate the environmental impact of agricultural practices. The design of environmental markets should allow consumers or external players to invest in and trade credits, thereby creating a business model with returns. The study findings reveal that the carbon and water markets are expanding rapidly, followed by the increasing preference of consumers for environmental labels in the agri-food sector. These labels encourage farm management practices that align with market demands. The study also indicates that consumers are WTP premium prices for products with carbon neutral labels and eco-labels, which signifies the potentials of globalising carbon markets as a policy guideline to climate change mitigation strategy. Furthermore, the value of these markets has been growing in recent years because of their robust potential for GHG emission reduction from the agricultural sector.

This review contributes to a better understanding of the value and new pathways for environmental markets, particularly in co-designing the principles of labels and policies. The literature review presented in this paper provides valuable knowledge to producers, investors, traders, exporters, importers, consumers, and other stakeholders, enabling them to grasp the structure and potential of the environmental markets and identify investment opportunities.

Author contribution statement

All authors listed have significantly contributed to the development and the writing of this article.

Data availability statement

No data was used for the research described in the article.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgements

We gratefully acknowledge the funding received from the Australian Government under a flagship of the multi-billion-dollar Future Drought Fund through the University of Southern Queensland (UniSQ)-led Southern Queensland and Northern New South Wales Drought Resilience Adoption and Innovation Hub, Queensland, Australia (<https://www.unisq.edu.au/research/sqnnsw-hub>). We thank and acknowledge Brooke Holmes for proof reading and editing. We thank the anonymous reviewers for their constructive

comments and suggestions.

Appendix A. Supplementary data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.heliyon.2023.e19754>.

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