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AGRO-BASED INDUSTRY IN INDIA AND THE ISSUE OF SUSTAINABILITY

Dr. Monika* & Dr. Jatinder Pal**

Abstract

An Agro-based industry refers to any industry that uses agricultural produce as its raw materials. This means they are directly or indirectly connected to agriculture. These industries rely on crops, livestock, and other agricultural products for their input. The agro-based industry is one of the most significant sectors in India from the point of view of output and employment generation. However, the sector faces increasing pressure to adopt sustainable practices to face environmental and social challenges. This paper investigates the role of agro-based industries in India, with a particular focus on sustainability challenges. Key issues such as resource utilization, waste management, environmental degradation, and social implications are explored. Through a comprehensive literature review and case studies, the paper highlights sustainability practices in the agro-processing sector. The study concludes with recommendations for fostering sustainability through technological advancements, policy measures, and industry best practices.

Keywords: *Agro-Based Industry, Sustainability, India, Resource Management, Agro-Processing, Environmental Degradation*

Introduction

The National Institute of Rural Development (NIRD) categorizes agro-based industries into primary and secondary. Primary industries involve the direct processing of agricultural products (e.g., grain milling), while secondary industries involve further value addition (e.g., packaged food production).

Agro-based industries are vital to India's economy, supporting millions of farmers and providing employment in both rural and urban areas. With huge number of the population dependent on agriculture, these industries are

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integral to the agricultural value chain, transforming raw materials like cereals, fruits, vegetables, dairy, and meat into value-added products. They play a crucial role in boosting export earnings, enhancing agricultural productivity, and generating employment.

However, the sustainability of these industries is under scrutiny due to excessive resource consumption, waste generation, environmental degradation, and overexploitation of natural resources. To ensure long-term growth and minimize environmental harm, adopting sustainable practices in agro-based industries is essential.

This paper examines the sustainability challenges faced by agro-based industries in India and proposes measures to address them. By analysing existing literature and case studies, the paper underscores the importance of sustainability and explores how businesses, governments, and communities can collaborate to promote eco-friendly practices.

Literature Review

Authors focusing on economic impact often emphasize the sector's role in employment generation, rural development, and GDP contribution. However, they also highlight challenges like fragmented supply chains, lack of access to credit, and inadequate infrastructure.

- Studies by economists like **Ramesh Chand and Ashok Gulati** analyze the economic policies and their impact on the agro-processing sector, pointing out the need for reforms to enhance competitiveness and value addition.
- Researchers like **V.S. Vyas** have long emphasized the importance of integrating agriculture with industry for sustainable rural development, stressing the need for equitable distribution of benefits.
- Studies on the sugar and textile industries often highlight the high water consumption and waste generation, leading to environmental degradation. **Authors like Vandana Shiva** have brought attention to the impacts of intensive agriculture and industrial processing on biodiversity and ecological balance.
- **Social sustainability** is also a critical concern, with research focusing on fair labor practices, equitable income distribution, and the empowerment of smallholder farmers.
- **Authors like M.S. Swaminathan** have long advocated for integrated approaches to agricultural development, emphasizing the need for a

holistic approach that considers economic, social, and environmental factors.

- **Collaborative approaches** involving farmers, processors, researchers, and policymakers are seen as critical for achieving sustainable outcomes.

The Importance of Agro-Based Industries in India

Agro-based industries are crucial to India's economy, with over 60% of the population engaged in agriculture. According to the Ministry of Food Processing Industries (MOFPI), the food processing sector alone contributes 8.59% to GDP and 13.33% to industrial output. These industries enhance agricultural productivity, create jobs, and improve rural economies.

The agro-processing sector also provides essential infrastructure for agricultural marketing, storage, and transportation. It supports India's goal of increasing export volumes and plays a vital role in ensuring domestic food security and boosting international trade.

Sustainability Issues in Agro-Based Industries

Despite their importance, agro-based industries face significant sustainability challenges:

- **Resource Depletion**: These industries require substantial water and land resources. Intensive farming and high water consumption in processing lead to the depletion of natural resources and groundwater.
- **Waste Management**: Agro-industries generate large amounts of agricultural waste, such as husks and stems, which are often poorly managed, causing environmental pollution.
- **Energy Consumption**: Agro-processing industries, particularly in food production, consume significant energy for refrigeration, cooking, and packaging, resulting in a high carbon footprint.
- **Environmental Degradation**: The use of chemical fertilizers, pesticides, and inefficient waste disposal systems contribute to soil degradation, air and water pollution, and biodiversity loss.
- **Social Implications**: Workers in agro-based industries often face poor working conditions, low wages, and lack of social security. There is also an imbalance in the distribution of economic benefits between rural farmers and urban processors.

Sustainable Practices in Agro-Based Industries

There is growing interest in integrating sustainability practices into agro-based industries. Strategies include:

- **Water and Energy Efficiency**: Adopting technologies that reduce water and energy consumption, such as rainwater harvesting, solar-powered facilities, and waste-to-energy systems.
- **Waste Utilization and Recycling**: Converting agricultural waste into valuable products like biofuels, fertilizers, and animal feed.
- **Sustainable Sourcing and Fair Trade**: Promoting organic farming, fair trade practices, and reducing the use of harmful chemicals.
- **Policy Interventions**: Governments can incentivize sustainable practices through subsidies, grants, and frameworks for waste management and energy efficiency.
- **Technology and Innovation**: Encouraging research and development to create environmentally friendly packaging, processing methods, and alternative raw materials.

Case Studies

1. Case Study 1: ITC Limited's Agro-Based Sustainability Initiatives

ITC Limited, a leading agro-processing company in India, has implemented several sustainability initiatives. Its "Wellness and Sustainability" framework focuses on reducing environmental impacts through energy conservation, water management, and sustainable sourcing of raw materials.

The e-Choupal initiative empowers farmers by providing access to the latest information and technology, improving productivity and promoting sustainable farming practices like water conservation and organic farming. ITC's "responsible sourcing" model ensures sustainable raw material procurement, benefiting both farmers and the environment.

2. Case Study 2: Amul's Dairy Sustainability Model

Amul, a major dairy cooperative in India, has established a sustainable business model by ensuring farmer welfare and adopting environmentally friendly practices. The company encourages dairy farmers to use biogas for energy and implement efficient waste management practices.

Amul has invested in waste-to-energy plants, converting animal waste into biogas for electricity generation. This reduces environmental impact and provides a sustainable energy source for its operations.

3. Case Study 3: Sugarcane Industry in Uttar Pradesh

The sugarcane industry in Uttar Pradesh exemplifies how agro-based industries can integrate sustainability practices. Several sugar mills have

adopted cogeneration technology, using bagasse (a sugarcane by-product) to produce electricity. This renewable energy reduces dependency on external power sources and promotes energy efficiency.

Government initiatives like the "National Policy for the Promotion of Biofuels" encourage the use of biofuels from agro-residues, reducing greenhouse gas emissions and minimizing waste disposal problems.

Discussion

Agro-based industries in India are crucial for economic growth but face significant sustainability challenges. The literature review and case studies reveal that while some companies have made progress in adopting sustainable practices, the sector as a whole needs to intensify its efforts.

Key challenges include inefficient water and energy use, with many industries relying on outdated technologies that result in high resource consumption and pollution. Waste management is another critical issue, as agro-industries generate substantial by-products that are not always effectively utilized.

The case studies demonstrate that sustainable practices offer environmental and economic benefits. Companies like ITC and Amul show that eco-friendly practices can lead to cost savings, improved brand reputation, and enhanced market access.

Conclusion

Agro-based industries are integral to India's economic and social fabric but face sustainability challenges such as resource depletion, environmental degradation, and poor worker conditions. Addressing these issues requires a multi-faceted approach involving technological innovation, policy interventions, and responsible business practices.

The case studies highlight the potential for sustainable development in agro-based industries. By adopting green technologies, promoting fair trade, and reducing waste, companies can significantly reduce their environmental impact and improve operational efficiency.

Future research should focus on scaling up sustainable practices across all agro-based sectors in India and analyzing the long-term impact of sustainability initiatives on economic and social well-being. A holistic approach to sustainability can help India's agro-based industries contribute to a greener, more inclusive future.

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CONTRIBUTION OF AI IN ATTAINING SDG 2030

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Abstract

This research explores the diverse contributions of Artificial Intelligence (AI) to achieving the UN's Sustainable Development Goals (SDGs) by 2030. It examines AI applications across key sectors like healthcare, education, agriculture, and environment, showcasing its potential to accelerate progress towards specific SDG targets.The research aims to provide a comprehensive overview of AI's potential and challenges in the context of the SDGs.

Introduction

The United Nations' Sustainable Development Goals (SDGs), particularly the ambitious Agenda 2030, represent a global commitment to addressing vital social, economic, and environmental challenges. Achieving these goals requires innovative solutions and transformative approaches. Artificial intelligence (AI), with its remarkable ability to analyze data, automate processes, and generate insights, has emerged as a powerful tool with the potential to significantly contribute to the attainment of the SDGs.This research explores the multifaceted contributions of AI in achieving the SDG 2030. It delves into the diverse applications of AI across various sectors, including healthcare, education, agriculture, and environmental conservation, examining how AI-powered solutions can accelerate progress towards specific goals. The study also investigates the challenges and ethical considerations associated with AI implementation, emphasizing the importance of responsible and inclusive AI development. By examining the potential of AI, this research aims to provide valuable insights into the role of AI in shaping a sustainable and equitable future for all. The research paper explores how AI applications can accelerate progress across diverse sectors crucial for SDG achievement,

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including healthcare (e.g., disease diagnosis, drug discovery), education (e.g., personalized learning, accessible education), agriculture (e.g., precision farming, crop yield prediction), and environmental conservation (e.g., climate modeling, biodiversity monitoring). The figure 1 highlights the central role of AI in achieving the goals set for sustainable development.

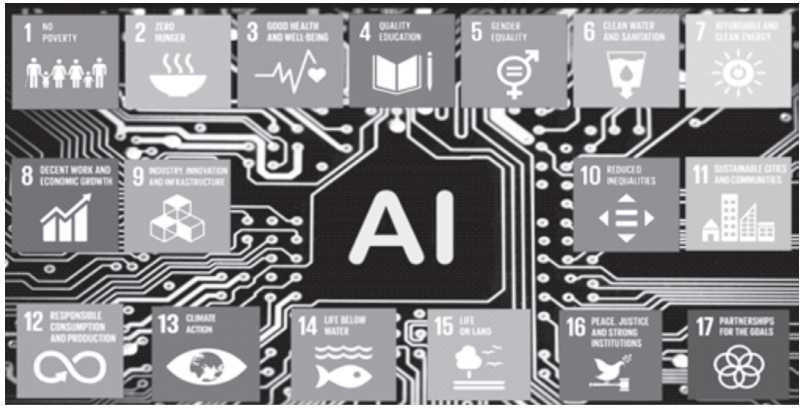

Figure1: AI and SDG 2030

Sustainable Development Goals (SDG2030)

Fifty years of discussion and agreement on sustainable development led to SDGs.At the 2015 UN Sustainable Development Summit, world leaders adopted the 2030 Agenda for Sustainable Development, which they describe as "a plan of action for people, planet, and prosperity," in an effort to steer the globe toward a more resilient and sustainable future.This universal, integrated, and transformative agenda is based on 17 SDGs, 169 targets, and 232 indicators (United Nations, 2022a). Figure.2 depicts all 17 SDGs organized into three pillars: environmental, social, and economic.

Environmental Pillar		Social Pillar		Economic Pillar	
6. Clean Water & Sanitation	7. Affordable & Clean Energy	4. Quality Education	5. Gender Equality	1. No Poverty	2. Zero Hunger
12. Responsible Consumption & Production	13. Climate Action	10. Reduced Inequalities	11. Sustainable Cities and Communities	3. Good Health & Well-being	8. Decent Work & Economic Growth
14. Life Below Water	15. Life on Land	16. Peace, Justice & Strong Institutions	17. Partnerships for the Goals	9. Industry, Innovation & Infrastructure	

Figure 2: SDGs 17 Goals organized into three pillars

The following section highlights the major contibution of AI in attaining goals of SDG 2030.

AI and SDG 2030

SDG1: No Poverty: AI is a powerful tool in the fight against poverty, contributing to the achievement of the first Sustainable Development Goal (SDG1). In predictive analysis, AI can analyze vast amounts of data to identify patterns and predict economic downturns[1], natural disasters[2], and other events that can exacerbate poverty. This allows for proactive measures to mitigate the impact on vulnerable populations. Job Creation as an aim, AI can drive economic growth and create new job opportunities, contributing to poverty reduction.

SDG2: Zero Hunger: AI is playing a crucial role in addressing the complex challenges of food security and helping to achieve SDG Goal 2: Zero Hunger. By improving agricultural practices, optimizing supply chains, and reducing food waste[3], AI is contributing to a more sustainable and food-secure future for all..By optimizing food supply chain, it contributes by predicting demand, managing inventory, and improving logistics. This reduces food waste and ensures that food reaches those who need it most, especially in remote areas. Improvement of agricultural practices through AI algorithms can assisst in analyzing images and data to detect crop diseases[4] and pests early on, allowing for timely interventions and preventing widespread damage. This helps to minimize losses and ensure food security.

SDG3: Good Health and Well Being: AI is revolutionizing healthcare and contributing significantly to SDG Goal 3 [5]. AI has contributed in following healthcare services:

A. **Early and Accurate Diagnosis:** Through image analysis and symptom checker, the prompt diagnosis of deadly diseases is possible, which further assist in treating the patient instantaneously.[6]
B. **Drug Discovery and Development:** AI can analyze vast amounts of biological and chemical data to identify potential drug candidates and predict their effectiveness, significantly speeding up the drug discovery process.
C. **Remote Healthcare and Telemedicine:** AI-powered telemedicine platforms can provide remote consultations, diagnosis, and monitoring, especially in underserved areas with limited access to healthcare facilities. Addidtionally, AI algorithms can analyze data from wearable sensors to track vital signs, detect anomalies, and provide early warnings of potential health issues, enabling proactive interventions.[7]

D. **Mental Health Support:** AI can analyze text and speech to detect signs of mental distress, enabling early interventions and personalized support[8].

SDG4:Quality Education: AI has the potential to significantly contribute to the attainemnet of quality education. Through personalised learning, improved accessibility and enhanced teaching practices, AI has revolutionised the traditional educational system and has assisted in achieving high quality in education.AI can recommend relevant courses and learning materials based on an individual's interests and career goals, supporting lifelong learning and skill development. It also enhances efficiency and effectiveness by optimizing resource allocation in educational institutions and predicting student enrollment, henceforth, identifying areas where resources are needed most[9].

SDG5: Gender Equality: AI can be used to develop apps and systems that help women report and prevent gender-based violence. AI can analyze data to identify high-risk areas or patterns of abuse.For women empowerment, AI can help women entrepreneurs access funding, mentorship, and business resources. AI-powered platforms can connect women with investors or provide personalized business advice. Although, AI has the potential to be a powerful tool for advancing gender equality[10], but it's not a silver bullet. Addressing the challenges and ensuring ethical development are crucial to realizing the positive potential of AI for SDG5.Bias in algorithm, privacy concerns, digital divide and job displacement are some of the crucial challenges that needs to be addressed while handling gender equality through AI.

SDG6: Clean Water and Sanitation: AI helps in monitoring quality of water in real time and assists in detecting pollutants and anomalies quickly. Additionally, AI algorithms can predict when pipes or treatment facilities are likely to fail, allowing for proactive maintenance and preventing costly disruptions in service. For sanitation services, AI can analyze data from sanitation systems[11] to identify problems like overflows or blockages, enabling timely interventions and preventing the spread of disease. Pridiction of water availability can be achioved by analyzing weather patterns, climate data, and other factors to predict water availability in rivers, lakes, and aquifers.This helps communities plan for droughts or floods and manage water resources sustainably.

SDG7: Affordable and clean energy: AI algorithms analyze weather patterns, historical data, and other factors to accurately predict solar and wind energy generation.This allows for better grid management and integration of

renewables. AI-powered smart grids can optimize energy distribution, reduce transmission losses, and integrate distributed energy resources, such as rooftop solar panels. It can also accelerate the discovery of new materials for solar panels, batteries, and other clean energy technologies.AI can analyze data on energy demand, resources, and infrastructure to help governments and organizations plan for expanding access to clean energy.Overall, AI has the potential to accelerate the transition to a more sustainable energy future. By leveraging the power of AI, we can make significant progress towards achieving SDG7 and ensuring access to affordable, reliable, sustainable, and modern energy for all.

SDG8: Decent work and economic growth: By Boosting Productivity and Efficiency, AI automates repetitive tasks, freeing up human workers to focus on more creative and strategic work. This increases productivity and efficiency across various industries. The development, implementation, and maintenance of AI systems create new job opportunities in fields like data science, AI engineering, and AI ethics thereby, aiding in accelerating economic growth. Additionally, AI can analyze data on job postings and worker skills to identify skills gaps and inform education and training programs. AI can help small businesses and entrepreneurs access funding and resources, promoting economic growth and job creation.

SDG9: Industry,Innovation and Infrastructure: SDG9 include poverty free, healthy, child friendly, water sufficient, clean & green, self-sufficient infrastructure, socially secured, good governance and women friendly villages.AI promotes SDG9, which embraces three essential attributes of sustainable development: infrastructure, industrialization, and innovation. AI-based innovation (such as digital financial services) SDG9 stimulates economic growth, creates employment opportunities (SDG8), and reduces poverty (SDG1) in cross-country settings, as indicated by several prior studies[12].

SDG10:Reduced Inequality:AI can be used to make recruiting more equal by integrating data-driven insights into hiring choices. Through the use of AI-powered algorithms, employers can guarantee that applicants from any demographic category have an equal probability of being hired[13].Health inequity and education inequity are significant issues in many parts of the world. AI has the potential to bridge this gap by making healthcare,education facility more accessible and affordable for everyone.Artificial intelligence is playing an important role in reducing inequalities around the world.As

technology continues to evolve, so will our ability to use it to reduce inequality gaps even further, making the world fairer and more sustainable for everyone.

SDG11: Sustainable Cities and community: Reports from international organizations indicate that over 50% of people worldwide live in cities, and by 2050, over two-thirds of the population will do so, offering significant investment prospects for tech development firms. The role of AI in sustainable cities is going to play a big role in making urbanization smarter, aiming to accomplish sustainable growth by making the cities prepared with advanced features to live, shop, walk, and enjoy a safe and more convenient life in such environments.Advance Security Camera,Face Detection Cameras,Surveillance System,Autonomous Flying Objects for Ariel View Monitoring and Movement for Public Safety are major role of AI in obtaining sustainable cities and community.

SDG12: Responsible Consumption and Production: Digital and artificial intelligence (AI) technology can create disruptive and commercially successful new product and service models.AI plays a significant role in promoting responsible consumption by enabling businesses and consumers to make informed decisions based on data analysis, allowing for optimized resource usage, reduced waste, and increased transparency throughout the product lifecycle, ultimately contributing to more sustainable practices in production and consumption patterns.

SDG13:Climate action :AI has been trained to measure changes in icebergs 10,000 times faster than a human could do it.This will help scientists understand how much meltwater icebergs release into the ocean – a process accelerating as climate change warms the atmosphere.AI system is helping to tackle climate change by making waste management more efficient. AI can also be used to improve agriculture and reduce its environmental impact by processing data from sensors placed on crops.

SDG14:Life below water : By analyzing massive amounts of underwater data to identify marine species, monitor ocean health, detect pollution, optimize fisheries management, and even help clean up ocean debris, artificial intelligence (AI) can greatly aid in the protection and understanding of life below the surface. This is made possible by sophisticated algorithms and autonomous underwater vehicles (AUVs) that can reach difficult-to-reach areas.

SDG15:Life on Land: It aims to 'Protect, restore and promote sustainable use of terrestrial ecosystems,sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity

loss'.AI helps to monitor environmental conditions,detecting threats to biodiversity, and predicting weather patterns, ultimately helping to conserve ecosystems and mitigate climate change impacts by providing data-driven solutions for sustainable practices in agriculture, forestry, and conservation efforts.

SDG16: Peace, Justice and Strong Institutions: AI powered legal analytics for judicial decision support. AI based algorithmic tools for identifying and addressing human rights violations,predictive policing and crime prevention algorithms[14] provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels.

SDG17: Parternerships for goals: AI driven data collaboration platforms for global development initiatives. Predictive analytics for identifying partnership opportunities and enhancing collaboration effectiveness[15]. By streamlining data exchange, decision-making procedures, and resource allocation for the SDGs, artificial intelligence (AI) can promote cooperation and partnership among stakeholders. AI functions as a potent tool to optimize global efforts towards achieving a sustainable future and strengthen partnerships.

Conclusion

The paper has examined the nuanced relationship between Artificial Intelligence (AI) and the Sustainable Development Goals (SDGs).It includes the potential of AI in advancing specific SDGs through its capabilities in data analysis, prediction, and optimization.In order to guarantee that AI supports sustainable development initiatives, stakeholders must give ethical considerations, human-centered methods, and proactive mitigation strategies top priority. This highlights the significance of responsible AI deployment.

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AWARENESS LEVEL OF YOUNGSTERS TOWARDS SUSTAINABLE FASHION: A CASE STUDY OF PUNJAB

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Abstract

One of the global markets with the quickest growth is the retail sector. Marketers nowadays, use sustainable practices to maintain their competitiveness. This study aims to pinpoint the informational sources that play an important role to aware the youngsters regarding sustainable practices adopted by fashion retailers. In order to collect information from 750 respondents in the state of Punjab, stratified random sampling was used. For the aim of research, Ludhiana, Patiala and Sangrur districts from Malwa region, from Majha region Amritsar district and from Doaba region Jalandhar district had selected. These five districts were chosen based on the highest population according to the 2011 Census. The research was conducted using an exploratory and descriptive research approach. The information was examined by using weighted average score (WAS). It was found in the study that social media such as Instagram, Facebook, LinkedIn, Snapchat, Blogs were the strongest platforms used by the marketer to influence the behaviour of youngsters towards sustainable fashion clothing brands.

Keywords: *Buying habits, Sustainable fashion, Clothing industry and Youngsters behaviour.*

Introduction

Youngsters typically refer to young people, often adolescents or young adults, who are in the process of transitioning from childhood to adulthood. The exact age range can vary depending on context, but it usually refers to individuals aged anywhere from their early teens to their mid-20s. In this phase of life, youngsters often go through significant physical, emotional, social, and intellectual development. This period is also marked by the

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exploration of independence, personal identity, and the pursuit of education or career opportunities. Youngsters represent the future, and their choices, attitudes, and actions shape the world around them. They are heavily influenced by technology, culture, and social movements, while also facing unique challenges as they navigate personal growth, career development, and societal expectations. As they continue to develop, they are likely to have a profound impact on the world, fostering new ideas, cultural shifts, and technological advancements. Youngsters' behavior towards sustainable clothing has been evolving significantly in recent years, driven by growing awareness related to environmental issues, social justice, and the long-term consequences of fast fashion. This demographic is increasingly focused on making ethical, environmentally conscious, and socially responsible choices in their clothing purchases.

Review of Literature

Niinimaki (2009) conducted research in Finland to the ideology of consumers towards eco- clothing. The data was gathered from 246 respondents and was analyzed by mean. The findings of the study showed that consumers ethical commitment towards purchasing eco- clothes played significant role in influencing their buying behaviour. The findings further revealed that 94.6% of respondents were ready to buy durable, better quality, clothes in future to lower the adverse effects on the environment.

Bianchi et al. (2012) have done research on comparative study of buying behaviour of consumers towards sustainable clothing in Australia and Chile. The data was collected from 488 respondents viz. 239 and 249 from Australia and Chile respectively. Further, the data was analyzed by using Structural Equation Model. The findings of the study showed that consumer awareness related to the environment protection and age of the consumers significantly influence their behaviour in both the consumers.

Koszewska (2016) examined to understand the consumer behaviour in the sustainable clothes market. The data was collected from 98 consumers of Poland and analyzed by using Structural Equation Model. The findings of the study showed that there was positive attitude of consumers towards sustainable apparel products. The findings also showed that they were ready to pay premium price for sustainable goods.

Jalil and Shaharuddin (2019) experimented research on consumer buying behaviour towards eco- fashion clothes. The research was conducted in Malaysia. The data was collected from 583 respondents using snowball sampling technique and analyzed by using factor analysis and Structural