Impact of Aatmanirbharta (Self-reliance) Agriculture and Sustainable Farming for the 21st Century to Achieve Sustainable Growth

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ABSTRACT

Purpose: *Indian Agriculture is 3rd most significant contributor to GDP and more than 50% of the population is dependent on agriculture, Indian agriculture accounts for15% of the country's Gross Value added to the economy, and agriculture policies and schemes implemented by the government to increase the production, income level of farmers, employment, growth of the rural area, provide Digital agricultural stack in area of IoT, block chain, Geographic Information System(GIS) Kisan Drones, Big data, as per the report of NITI Aayog AI in agriculture would be worth $ 2.6 bn and Agri-Startups promote the circular economy with sustainable farming in the area of Millet, organic farming and vertical farming. It is an important pillar of sustainability and it is recognized as 7 out of 17 Sustainable development goals. Sustainable agriculture farming is the order of the 21st century in India which currently has 4.43 million organic farmers, according to the Economic Survey 2022-23, and a much-needed alternative to conventional for protecting the well-being of the farmers and Society, Economy and Ecosystem. India is Self-reliant in the production of Sugar, Rice, Wheat and food grains. Due to Government Schemes like Atmanirbhar, Minimum Support Price(MPS), PM Kisan Scheme, PM Kisan Samman Nidhi, Pradhan Mantri Fasal Bima Yojana (PMFBY), PM Gati-shakti, National Agriculture Market(e-NAM), Young – Entrepreneurs Accelerator Fund for Agri-Startups, Paramparagat Krishi Vikas Yojana (PMVY), establishing more Farmer producers Organizations(FPO), National Mission for Sustainable Agriculture (NMSA), Agricultural Technology Management Agency(ATMA), NABARD in providing finance for farm and non-farm sector, PM-PRANAAM for protecting mother earth. These initiatives are to increase the investment opportunities in agriculture, efficiency, and productivity in agriculture for doubling the income of the farmers.*

Design/Methodology/Approach: *The research article is a descriptive study with exploratory research and secondary data collected from News articles, Journals, Government websites, Books, magazines, and reports for the analysis.*

Findings: *Organic farming and sustainable agriculture is good for the economy and environment. The study reveals that in India Sustainable green revaluation in Agriculture Technology and moving towards achieving sustainable development goals (SDG).*

Type of Paper: *Case Study.*

Keywords: Aatmanirbhart agriculture in 21st Century; Agri –Startups; Circular Economy: Digital Agricultural Stack; GDP; Government Schemes; Millet; NABARD; Niti Aayog, Sustainable Development Goals (SDG); Sustainable farming and Sustainable growth.

1. INTRODUCTION :

Aatmanirbhar Krishi both agriculture and allied plays a key role in the Indian economy. The Government has initiated various Schemes and Programmes to strengthen the agricultural productivity, incomes of the farmers, national income, employment generation, and foreign exchange even in allied Agri-sectors. Indian agriculture and allied sector largely cover four activities: Crop, Livestock, Forestry, and Fisheries. Now agriculture can trade off with advanced technology, sustainable farming, and agri- Startups. According to the Economic Survey crop diversification increases farmers' income and reduces negative impacts on the environment. Nearly three-fourths of its population is dependent directly on agriculture for a living and Sustainable agriculture plays a very important role in protecting mother earth and feeding humans and soil (Singh, M. (2021). [1]). Agriculture has great potential to create sustainable market opportunities for producers, consumers and it contributes 6 out of 17 UN 2030 Agenda for Sustainable Development Goals, ParticularlySDG2 (Zero Hunger), SDG3 (Good health and well–being), SDG8 (Decent Work and economic growth), SDG12 (Responsible consumption and Production), SDG 13(Climate action) and SDG 15 (Life on land)with initiatives of the Policies (Hinz, R., Sulser, T. B. et al. (2020). [2]). India's circular economy development route might generate an annual value of US$ 218 billion (Rs 14 lakh crores) by 2030 and US$ 624 billion (Rs 40 lakh crores) by 2050. Agriculture is defined as "the science, art, or practice of cultivating the soil, producing crops, and raising livestock and in varying degrees the preparation and marketing of the resulting and

associated with the production of arable crops, including fodder, fruits and vegetables, horticulture, and grasslands" (Velasco-Muno. et al. (2021). [3]), major food crops are cereals like rice, wheat, maize, jawar and bajra and pulse like gram, tur, moong beans, masur, peas along with major commercial crops cotton, jute, tea, coffee, rubber, sugarcane, oilseeds and horticultural products like fresh fruits, vegetables, root and tuber crops, flowers, aromatic and medicinal crops, spices and plantation crops, dairy products. India ranks second in Paddy, wheat & sugar cane and 1 in pulses when compared with the neighbouring countries. The Economic Survey 2021.-22 highlights that Dairy is the single largest agricultural commodity that contributes five percent to the national economy. The United Nations General Assembly has declared the year 2023, the International Year of Millets and India as hundreds of years of history it is deeply integrated into the food system, culture and traditions as mentioned in Kautilya's Arthashastra as well as Ragi thandheera a composition by Purandara Dasa. Sustainable agriculture in India with the support of government policy and schemes, push India in self-reliant in agriculture and allied activities. India is a prominent producer of milk, spices, pulses, tea, cashew, and jute and ranks second in the world for producing rice, wheat, oilseeds, fruits, vegetables, sugarcane, and cotton. In India green revaluation was credited to Dr M. S. Swaminathan, Green Revolution fed the masses but also brought richness to society.

India is an agricultural and allied sector and is a major contributor to the economy, more than 70% of Indian households depend on agriculture, and it contributes to the workforce, GDP, GVA, Foodgrain production, and Export.

Table 1: India's Agriculture Contribution for FY -2022

Particulars/Sectors	Contribution in Percentage/million (US$)
Gross value added to the y agriculture allied sector	18.8%
Employment generated from agriculture	39.4% and 8 Million Job
Gross Domestic Product (GDP)	India's
India's organic food market Size	1278(Expected to grow 4602 by 2028)
FDI inflow	2600.70 million
Total food grain production	149.92 million tones
Export of Marine products	6.12 Billion
Export of Rice (Basmati and Non Basmati	6.12 Billion
Sugar Export	2.78 US$
Export of Buffalo Meat	US$2.5 Billion
Tea Export	570.15 Million
Agricultural Processed good products Export	US$9598 million
Total Export of Millet products	$64 Million
India ranks first in the number of organic farmers	4.43 Million Farmers

India ranks Ninth in terms of area under organic farming	5.91 Million Hectares

Source: Author

2. RELATED WORKS :

Sustainable Agriculture greatly contributes without declining soil health and irreversibly damaging the environment and helps the farmer's productivity and profitability, sustainable agriculture includes Organic Farming, Natural Farming, Zero Budget Natural Farming, Biodynamic Agriculture, Bio-Intensive Farming, and Perma culture. The World Commission on Environment and Development (1987) defined sustainable agriculture as the management and utilization of the agricultural ecosystem in a way that maintains its biological diversity, productivity, regeneration capacity, vitality, and ability to function, so that it can fulfil today and in future-significant ecological, economic and social functions at the local, national and global levels and does not harm other ecosystems (Jatav, S. S., Naik, K., & Singh, V. (2022). [4]). A circular economy with Sustainable agriculture in the 21st century is a transforming tool to convert conventional agriculture to make it more circular by reducing, reusing, re-design and recycling the inputs and outputs from agricultural activity and contributing to economic growth by aligning cropping system with agro-climate systems may increase biodiversity and enhance India's adaptation and mitigation capabilities in combating climate change. Adopting a circular economy in the food system will strengthen to generate an annual value of US$ 218 billion (Rs 14 lakh crores) by 2030 and US$ 624 billion (Rs 40 lakh crores) by 2050. (IBEF Report). It generates quality employment in rural areas and rural agri entrepreneurship and it has a great impact in reducing multi-dimensional poverty, achieving food security and doubling farmers' income. Circular Economy (CE) is an economic concept for self-sufficient development and making the agricultural land more fertile to bring greater sustainability in the use of natural resources (Batlles-dela Fuente, A. et. al. (2022). [5]). Organic and Natural agricultural farming is a holistic production and it promotes health, and agro ecosystem including Biodiversity, biological cycles, and soil biological activity. To achieve sustainable development not using chemicals, pesticides and fertilizers and it boosts self-reliant India in food grains, crop production, and higher yields are required better investment and initiatives by the government in agriculture R&D, Agri Startups, new agricultural technology to generate high-yield crops, to handle climate changes, farmers' incomes, variety of food for consumers at lower prices will boost agriculture and fulfil the SGD of no hunger.

Table 2: Literature Review

S. No.	Focus	Author
1	The article discusses the environmental consequences of the Green Revolution in the state of Haryana, India, which has resulted in continuous environmental degradation. The use of chemical inputs has intensified, causing a decline in soil organic matter levels, and newly introduced crop varieties have necessitated increased fertilizer application and use of irrigation resulting in water contamination by nitrate and phosphate and changes in the groundwater table. Declining nutrient-use efficiency, physical and chemical degradation of soil, and inefficient water use have been limiting crop productivity. Monocultures, mechanization, and an excessive reliance on chemical plant protection have reduced crop, plant and animal diversity in recent years. Soil degradation, waterlogging, salinity, and alkalinity threaten the region's food security in the future, affecting agricultural crops and causing floods even following slight rains due to the reduced storage capacity of the soil. These ecological impacts are motivating farmers to reduce fertilizer and pesticides use, leading to an increased investment in alternative technology and products, including an interest in Integrated Pest Management. The article discusses major physical, hydrological, chemical and biological constraints relating to soil and water resources for ecosystem sustainability.	R. B. Singh (2000). [6]
2	The article discusses the Indian sugar industry and how it has evolved over time to become one of the top sugar-producing countries in the world. The	B. Solomon,

	industry has utilized innovative technological interventions for sugarcane improvement, production, and management to become self-reliant and sustainable. The article highlights the industry's ability to tackle unforeseen challenges, including those that arose during the COVID-19 pandemic, through the right mix of linkages and collaborations. Additionally, the industry fulfills its Corporate Social Responsibilities leading to the overall betterment of its stakeholders, aligning with the 2030 Agenda for Sustainable Development Goals.	S., & Swapna, M. (2022). [7]
3	The article discusses the importance of the agriculture sector in the Indian economy, with a special focus on the tea industry. India was once the leading producer and exporter of tea in the world, but has now fallen behind China. The article suggests that India has the potential to reclaim its position as the world's leading tea producer, but that there are economic reasons for cultivable lands being converted into buildings instead of being used for tea cultivation. The article proposes that the government should make policy decisions to prevent the conversion of cultivable lands into real estate, in order to bring more lands under tea cultivation. The article also suggests that analyzing the effect of the area under tea cultivation on tea production is important. The study aims to analyze the trend of tea cultivation, production, export, and import in India and suggest suitable policy measures for self-sustainability in tea production and export. The article highlights the importance of the tea industry in generating employment, contributing to GDP, foreign exchange earnings, and self-sustained growth of the country. The study aims to contribute towards the overall development of the agriculture sector and the economy of the country.	S Siva Kumar (2021). [8]
4	The article highlights the challenges of sustainable agriculture in India, particularly in the context of the Green Revolution and its reliance on inorganic fertilizers and pesticides. The authors argue that organic farming is a potential solution to address the long-term risks of soil depletion and future food crises. The article explores the obstacles and potential solutions for India to achieve sustainable development through organic farming. Overall, the paper provides valuable insights into the challenges and opportunities of sustainable agriculture in India, particularly in the context of increasing food demand and environmental concerns.	D. Singh, B., & Yadav, J. P. (2022). [9]

3. RESEARCH GAP :

Most of the articles focused on various aspects such as green revolution, evolution of sugar industry, tea industry, challenges of sustainable agriculture in India, physical, hydrological, chemical and biological constraints, and so on related to agriculture activities but not stressed on organic farming which protects the environment. This article mainly deals with Atmanirbharat organic farming to uplift the livelihood of millions of farmers also the impact of millet farming and SDGs it also explains the role of NABARD and its contribution towards sustainable agriculture.

4. RESEARCH METHODOLOGY :

The research article is a descriptive study with exploratory research and secondary data collection the ted from News articles, Journals, Government websites, Books, magazines, and reports for the analysis.

5. OBJECTIVES OF THE STUDY :

(1) To know the sustainable development growth through various agricultural progress.
(2) To develop a Conceptual model of Aatmanirbharta sustainable agriculture.
(3) To analyze the impact of Aatmanirbharta sustainable agriculture in the 21st century.

6. DATA ANALYSIS :

6.1 Atmanirbhar Bharat Organic Farming:

Organic Farming helps in improving the livelihood of smallholders. India has exported products of 1978460.38 million tons (MT) valued at $2480.24 million of processed food, oilseeds, cereals, Millet, sugar, pulses, coffee, spices, condiments and Tea. (Business Line-August, 9, 2022).

Table 3: Export of Organic Products year wise
The table shows organic products export data for recent years

Year	Export in $ Million value
2019-20	681.29
2020-21	1032.98
2021-22	765.97

Sources: Business Line –August 09, 2022

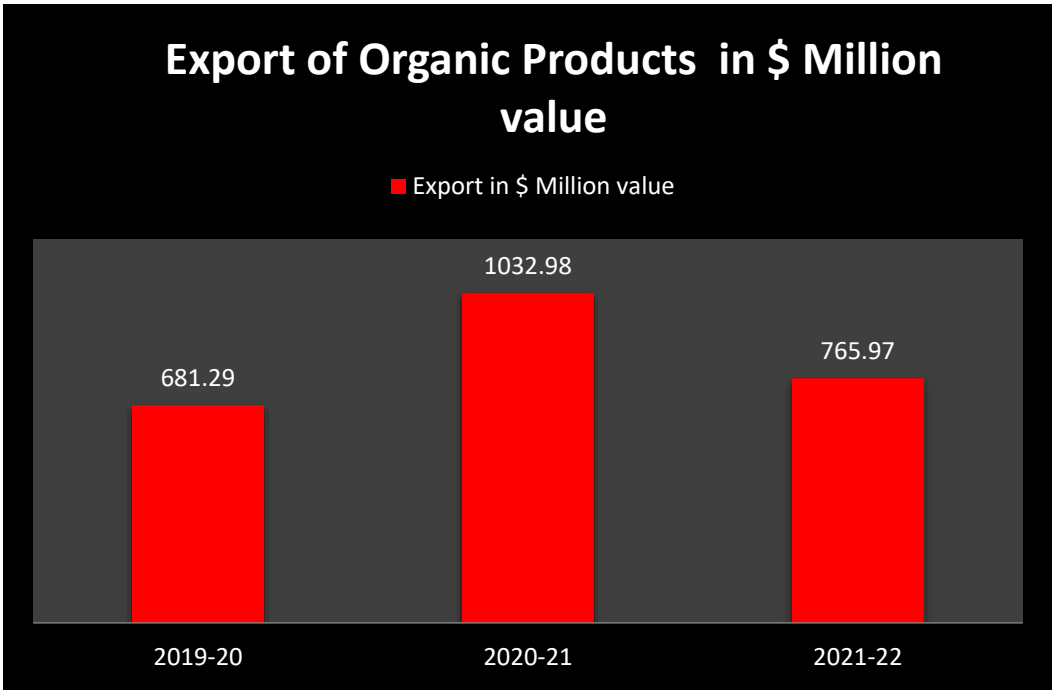

Fig. 1: Export of Organic Products year wise

There are many types of sustainable agriculture or Sustainable Farming some of them are Organic farming, Crop Rotation, Perm culture, Cover Crops, Soil Enrichment, Natural Pest Predators, Bio intensive integrated Pest Management, Poly culture Farming, Agro forestry, Biodynamic Farming, Better Water Management as the impact on Income, Yields, water use, GHG emissions, Health, Biodiversity, and Gender (empowerment of Women in rural areas) and the Economy, it produces high quality, environmentally safe, profitable, its movement is "humus farming movement" it means humus content in the soil to preserve soil health (Sharma, R. et. al., (2019). [10]).
Organic agriculture is practiced in 187 countries with 72.3 Million agricultural land hectares with 31 million farmers. In India2.3 million hectares as per FiBL Survey 2021 and Information published by the National Centre for Organic and Natural farming. India ranks 5th in terms of world organic agricultural land.

Table 4: Organic Agricultural Land country wise FY 2021
The table shows country wise Organic Agricultural Land

Country	Organic agricultural Land (million Hectares)
Germany	1.61
Italy	1.99
Uruguay	2.14
China	2.22
France	2.24
India	2.3

USA	2.33
Spain	2.35
Argentina	3.67
Australia	35.69

Source: FiBL survey2021 & National Centre for organic and Natural farming

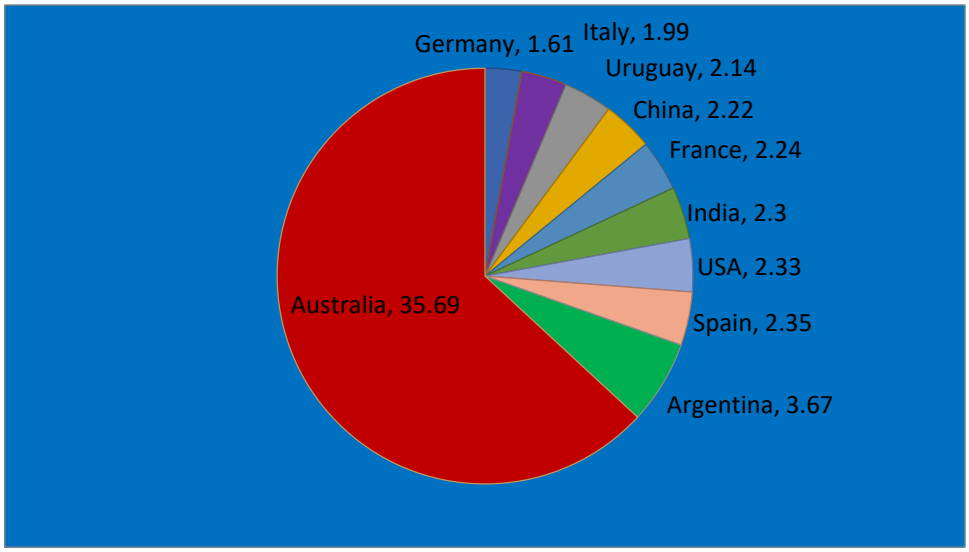

Fig. 2: Organic Agricultural Land country wise

Their good demand for organic products in both domestic and overseas markets, organic products are exported to the USA, European Union, UAE, Japan Canada, Switzerland, Vietnam, Turkey, Australia, and China. As per Statista data, the export volume of organic products from India was 460 thousand metric tons for FY2022. During 2019-2022 organic products valued at $2,480.24 million were exported and India exported 1062.15 Million tonnes during these three years (2019-2022) the US with 1063,345.19 million tonnes, European Union 613,512.98 and China 1062.15 Million tonnes.

Table 5: Export destinations for Indian Organic products between FY 2019-2022

Country	Value (in $million)
USA	1237.25
European Union	909.2
Canada	152.6
Great Britain	61.11
Switzerland	28.14
Australia	24.47
Israel	9.82
Korea	9.81
Ecuador	8.41
Japan	8.15
Turkey	7.82
NewZealand	7.3
Vietnam	7.14
UAE	6.65
China	2.37

Sources: B09, 2022 Line, August 09, 2022

6.2 Sustainable Agriculture-Millet Farming:

Aatmanirbhar Millet Krishi is highly resistant to harsh conditions. It is food for humans and fodder for animals. That is why it is a dual-purpose crop. Millets production plays a **revolutionary role in the 21st century due to Climate Change, increasing world population, and water scarcity. Its**

cultivation has contributed to mitigating climate change and the climate-resilient – it is good for human beings, the farmer and the planet. On India's request to make millet, a global brand United Nations declared 2023 as the International Year of Millet (IYM) on 5th March. It is an Environment friendly, economical, and healthy product. It is most suitable for all types of land and its production can meet Sustainable Development Goal 2 "Zero Hunger" achieve food security and improve nutrition and promote sustainable agriculture (Antony Ceasar, S., & Maharajan T., (2022). [11]). The Government of India has established Millet Missions in states with the support of NITI Aayog and integrated them into the National Food Security Mission and the Public Distribution System and Agribusiness Zones for millets. India has now given the name of 'Shri Anna' to Millets in this budget and it will greatly benefit the small farmers.

6.2.1 Impact of Millets on SDGs:

Millet's contribution to the UN2030 Agenda for Sustainable Development Goals and create sustainable market opportunities for creators(producers/Farmers), consumers (storehouse of nutrition), and Climate- friendly Crops require minimum rainfall for growth.

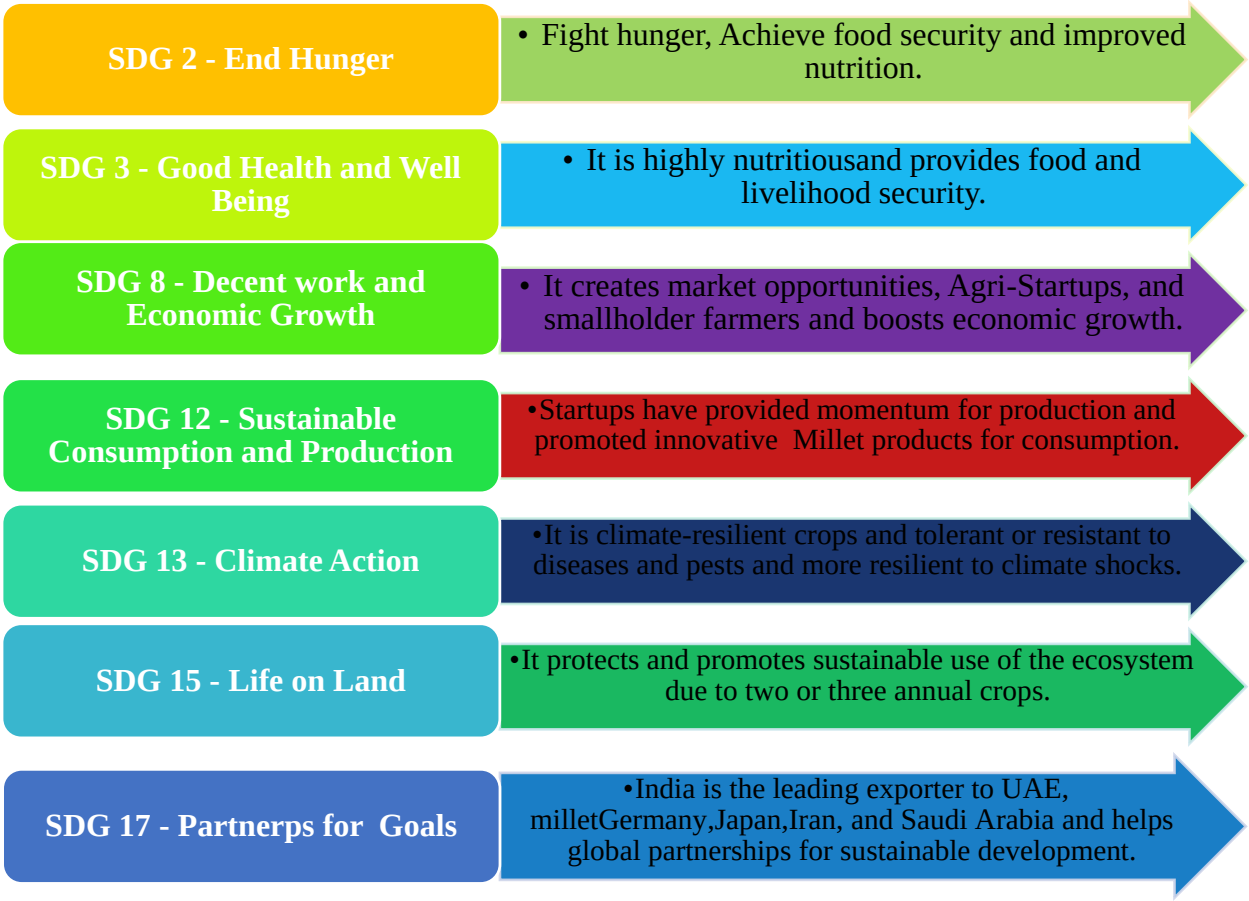

Fig. 3: Source: Yojana –January 2023 and Author

6.2.2 Types of Millets:

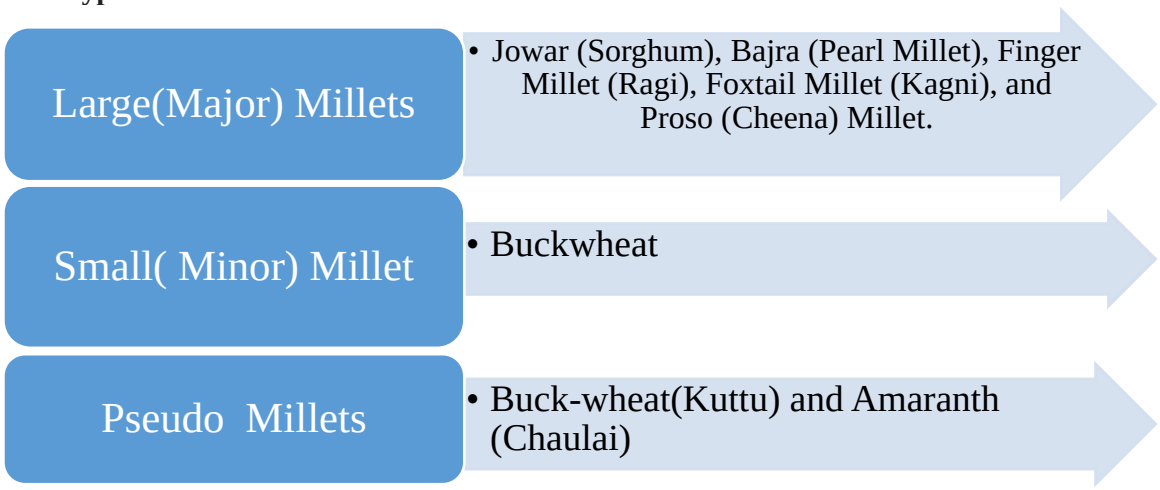

Fig. 4: Types of Millets;
Source: https://www.indiascienceandtechnology.gov.in/listingpage/millets-future-food

Table 6: Top 10 Nations Importing Indian Millets for 2021-22
Millets cultivation is a major boost to export. India registered a significant surge in Millet's export. Top 10 Nations Importing Indian Millets UAE, Nepal, US, Egypt, Germany, Oman, Iran, Bangladesh.

Countries	UAE	Saudi Arabia	Nepal	US	Japan	Germany	Bangladesh	Egypt	Iran	Oman
$ Million	11.5	6.6	5.9	4.5	2.9	2.5	2.3	2.1	1.9	1.8

Source: The Economic Times 19th February 2023-RAGI TO RICHES

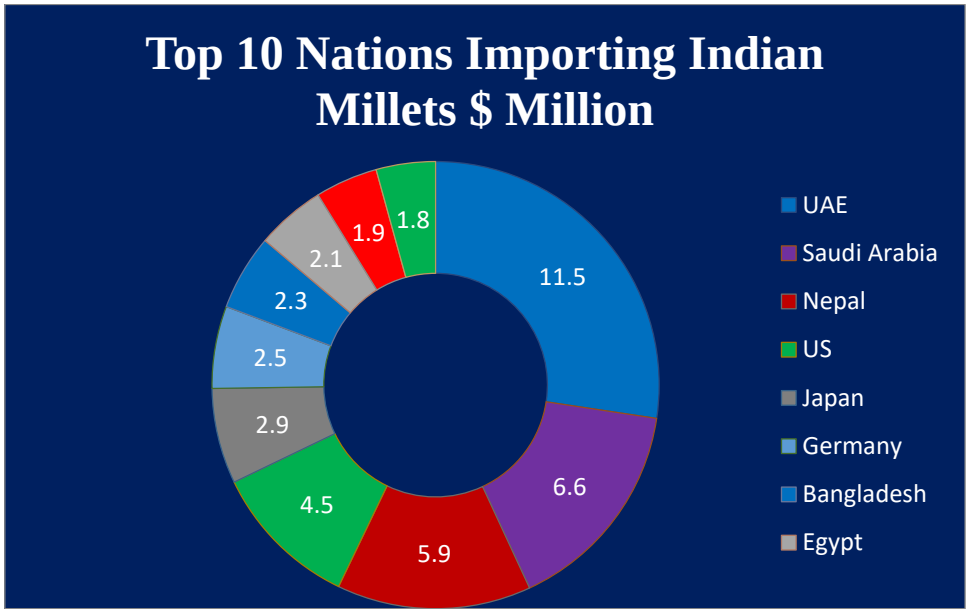

Fig. 5: Top 10 Nations Importing Indian Millets for 2021-22

The Government of India has brought Millets under the Minimum Support Price (MSP) based on the recommendations of the Commission for Agricultural Costs and Prices (CACP). This mechanism encourages the farmers to cultivate and bring back the glory of the Indus valley people (3000 BC) and it's a driving force of nutrition millets included in the Public Distribution System (PDS). In 2021-22 the Nine States have decided to procure 6.5 Lakh Metric Tonnes (LMT) under, Karnataka alone has decided to Procure 7LMT of Millets (The Hindu dated 25, January 2023). According to the Karnataka Agriculture Price Commission (KAPC), Karnataka is growing millet in an area of 61,000 hectares. Today MSP is fixed for 22 startups real whose major coarse cerls millet, Bajra, and Ragi. The MSP of

Bajra has been fixed at Rs 2350/- Per quintal, and Ragi has been fixed at Rs 3578/- for the year 2022-23. Many central and state government agencies also procure millets on MSP. Many Agri- startups developed millet-cook products from millets.
In India, more than 500 startups working on working in the millet value chains, while the Indian Institute of Millets Research has incubated 250 startups under Rashtriya Krishi Vikas Yojana – Remunerative Approaches for Agriculture and Allied Sectors Rejuvenation (RKVYRAFTAAR) and Agri startups received Rs 6,600 cores funding in the area of the supply chain, packaging, storage, payments, credit as per Economic Survey 2023.

6.3 Role of NABARD in Sustainable Agriculture:

NABARD plays a capacity-building role in promoting sustainable rural development by providing both Financial and non-financial support to farmers and Partner institutions in agriculture through Zero-Budget Farming farm ponds, soil water conservation, funding for climate change projects, climate-smart irrigation, and raising millets to ensure projects, climate-smart irrigation, and raising millets to hence the sustainable livelihood solutions to achieve food security and meet the Sustainable Development Goals. NABARD promotes sustainable farm sectors and assists farm innovation technologies, and skills to enhance farmers' productivity through adopting an Integrated Farming System (Dairy+ Crop Production+ Horticulture) and Capacity Building in Crop rotation, Pest management and water management practices. The Government – owned NABARD is instrumental in funding Agritech startups and Agri -Startups play a key role in developing Green Revolution and Self- reliant India by transforming technology and innovations in the areas of food processing, dairy, farming, sericulture, mushroom cultivation for the benefit of farmers' marginal, Small, Semi – Medium, Medium and Large farmers and double farmers' incomes, employment in the rural area and economic growth.

Table 7: NABARD in Farm sector promotion.
The National Bank for Agriculture and Rural Development (NABARD) has offered support to boost farm productivity by making make use of Technology

Financial year/Amounts	Projects
2022-22. 2 Crore	164 Projects in agri and allied sectors for technologies transfer and Capacity Building for the adoption of New Technology
	33 visits for 8700 farmers in collaboration with Krishi Vigyan Kendra State Agricultural University ICAR

Source: nabard.org

6.4 Government Initiatives, Schemes, and Policies for Sustainable Agriculture:

Agriculture is the focus of several risks including production, weather, quality, price and market. The government of India has introduced to re-vitalize the agriculture sector, improve farmer welfare, mitigate the impact on the environment, and increase agricultural production economic growth and transformation of Indian agriculture. The government policies and programs have boosted crop production, Pan-India electronic trading portal, improve farm water use, Insurance and changed some other employment (agri entrepreneurs) and well-being of the framers and society with the incorporation of Agri-environment schemes to bring more sustainability and digital or e- practices to enhance the ecosystem in different agro climate conductions (Nedumaran, D. G. (2020). [12]) and enhance the livelihood of farming communities. The structural reforms in schemes and programs like MPS, Budgetary grants and PM KISAN have influenced the agriculture growth and farmers' incomes (Bathla S. & Hussain, S. (2022). [13]).

Table 8: The Government of India has been providing support through policies and programs for the sustainable growth of agriculture

Government Schemes	The focus area in agriculture for Sustainability
National Mission for Sustainable Agriculture (NMSA)	For best farming practice-Soil conservation, water management practices, and Distribution channels.

Pradhan Mantri Krishi Sinchai Yojana (PMKSY)	Irrigation and Water
Paramparagat Krishi Vikas Yojana (PMVY)	To encourage farmers for organic farming and traditional –organic manures, bio-fertilizers and bio-pesticides
NABARD Micro Irrigation Fund Scheme-	To Install Micro irrigation
Mission Organic Value Chain Development for North Eastern Region (MOVCDNER)	To create a value chain for organic production for northeastern states
Kisan Credit Card (KCC)- Aatmanirbhar Bharat Package	To provide adequate and timely credit to farmers for their agricultural expenditures.
PM Kisan Samman Nidhi Yojana	Transferring of Rs 6,000/- Per annum directly to the farmer's bank account through (DBT) for continuance in the farming activities.
Pradhan Mantri Kisan Urja Suraksha Evam Utthaan Mahabhiyaan (PM-Kusum)	Solar Powered agricultural pumps for irrigation to reduce diesel and electricity consumption.
Minimum Support Prices (MPS)	Remunerative pieces to the farmers for their produce
India Digital Ecosystem of Agriculture (IDEA)	For creating an integrated financial grid for the agricultural ecosystem in link databases for Primary agricultural credit societies (PACS).
National Agriculture Market(e-NAM)-Electronic Trading Portal	To promote better marketing opportunities for farmers and stable prices.
Farmer Producer Organization (FPO)-Organization of farmers.	To provide linkages of inputs like seeds, collective marketing fertilizer, and advisory services for sustainable agriculture.
Agriculture Accelerator Fund	To encourage agri-startups by young entrepreneurs in rural areas.
Pradhan Mantri Fasal Bima Yojana	To Provide Insurance coverage and Financial support to the farmers on the notified crop.
PM Gati Shakti Multi-Modal Connectivity	Last mile connectivity of movement people, goods and services and reduce logistic cost.

6.5 Atmanirbhar Bharat Agri-Startups Ecosystem:

India's Agri start-up ecosystem has been rising due to the Green Revolution in militias farming, organic, allied agriculture and sustainable food along with government initiatives like Startup, Atmanirbhar Bharat Abhiyan India. Agri tech is focusing more on new technology tools like data analytics, ML, AI, IoT, Drones and Software as a Service, farming as a service for creating models in Agri bioscience, Silk, Farm advisory, grocery delivery, B2B supply chain and with the support of the Indian Council for Agricultural Research (ICAR) and the significant increase in Funding in agriculture to make India self-sufficiency in agriculture and develop climate-resilient farming practices and support sustainable agriculture rural India.AI application startups are developing agricultural robotics, crop, and soil monitoring, predictive analytics, data governance models (Gurumurthy, A., & Bharthur, D. (2019) [14]).

Agri startup funding is improving farming techniques, and innovation encourages entrepreneurship, Indian agri startups are receiving funding in the form of Growth, late stage, and early stage. The number of deals in the growth stage is 25 deals with$980 Million and the amount raised in the early stage is $350 Million with 114 deals with series. The table 9 shows agri startup funding city wise and funding patterns.

Table 9: Agri Startup Funding city-wise from January 2020 to June 2022

Startups and Funding Patterns	**Funding Deals**	**Funding in $ Billion/Million**
No of Startups	96	$1.33 Billion
Total deals	139	
Funding growth/Late stage	25	4980 million
Funding Early stage	114	350 million
Agritech startup Funding year wise		
Year	**Funding deals**	**Total amount raised $ million**
2020	37	155
2021	58	636
2022	44	539
City-wise agritech startup funding		
City		**Amount in $ million**
Delhi –NCR		441
Bengaluru		354
Chennai		210
Pune		98
Mumbai		76
Patna		32
Samastipur		15
Indore		10
Hyderabad		7
Jaipur		1
Kochi		1
Series-wise agritech startup funding		
Series		**Funding**
Seed		56
Debt		7
Angel		4
Pre seed		10
Pre series A		15
Pre Series B		1
Series A		24
Series B		9
Series C		7
Series D		5
Series E		1

Source: https://entrackr.com/2022/07/the-rise-of-indian-agritech-startups-since-2020-entrackr-report/

7. CONCEPTUAL MODEL :

Agricultural sustainability refers to the ability of the agricultural system to meet present needs without compromising the ability of future generations to meet their own needs. It involves utilizing practices and methods that minimize negative impacts on the environment while promoting long-term ecological balance and productivity. The environment plays a crucial role in agricultural sustainability, as it provides the necessary resources and ecosystem services for farming.

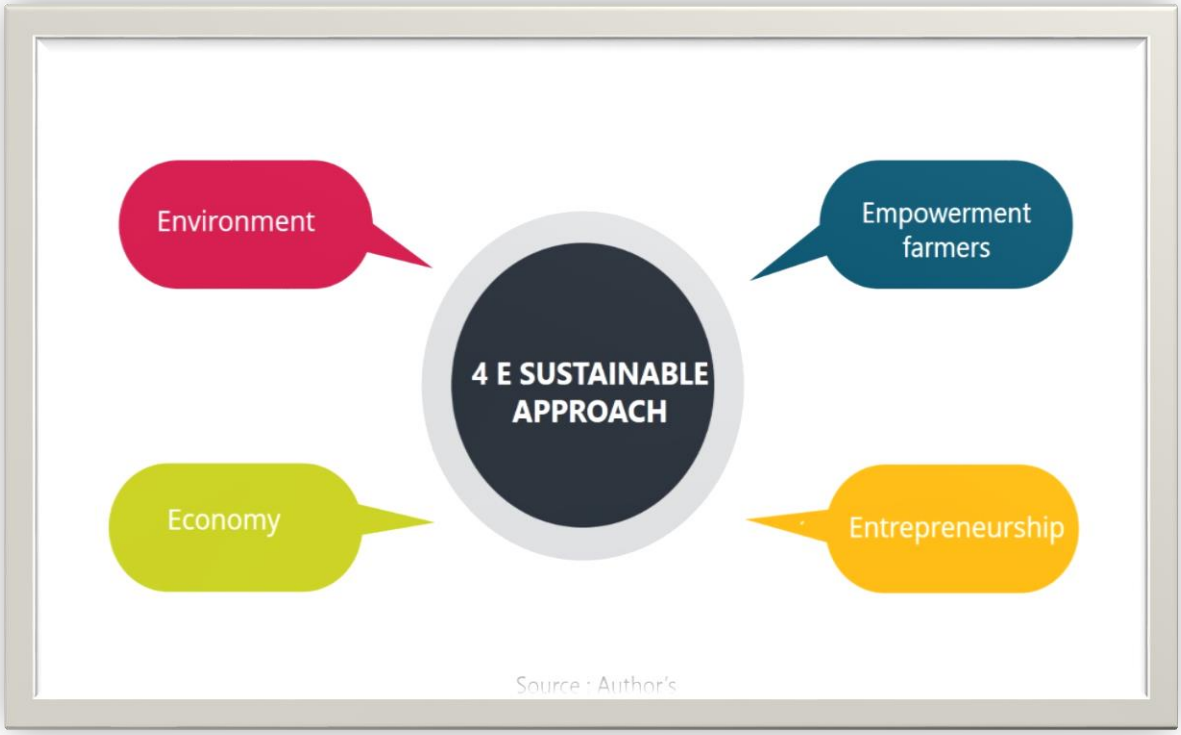

Fig. 6: 4 E Sustainable Approach

(1) Environment:
Maintaining healthy soils is essential for sustainable agriculture; Sustainable agriculture requires efficient water management to minimize water wastage and pollution. Preserving biodiversity is crucial for sustainable agriculture. Biodiversity provides natural pest control, pollination services, and nutrient recycling. Agriculture depends on various natural resources such as land, water, and energy. Minimizing the use of synthetic pesticides, herbicides, and fertilizers is important for environmental sustainability. Agriculture is both affected by and contributes to climate change. Agricultural sustainability recognizes and values the ecosystem services provided by natural habitats. Livestock farming has significant environmental impacts. Collaboration among farmers, researchers, policymakers, and consumers is essential to promote sustainable agricultural systems that protect the environment while ensuring food security and economic viability.

(2) Economy:
Sustainable agriculture seeks to ensure the economic viability of farming operations. Agricultural sustainability involves identifying and capitalizing on market opportunities for sustainable and responsibly produced food and agricultural products. Sustainable agriculture emphasizes efficient resource management to reduce costs and increase profitability. Governments play a crucial role in promoting agricultural sustainability by developing policies, regulations, and support programs. Sustainable agriculture involves collaboration and coordination among different stakeholders in the agricultural value chain, including farmers, processors, distributors, and retailers. Agricultural sustainability aims to build resilience in farming systems to withstand economic shocks and uncertainties. Agriculture is a significant contributor to rural economies, providing employment and income opportunities for rural communities. Achieving agricultural sustainability requires a balanced approach that considers the economic viability of farming practices alongside environmental and social considerations.

(3) Empowerment farmers:
Empowering farmers is a crucial aspect of promoting agricultural sustainability. Empowerment involves equipping farmers with the knowledge, skills, resources, and decision-making authority to

adopt and implement sustainable practices effectively. Here are some key strategies to empower farmers in agriculture sustainability. Providing farmers with access to up-to-date information and educational resources is essential for empowering them to make informed decisions. Enhancing farmers' skills and capabilities through capacity building initiatives helps them implement sustainable practices effectively. Facilitating peer learning and knowledge exchange among farmers can be a powerful empowerment tool. Ensuring equitable access to necessary resources is vital for empowering farmers. This includes access to land, water, seeds, credit, inputs, and technology. Providing financial support mechanisms can empower farmers to invest in sustainable practices. Including farmers in decision-making processes that affect their farming practices is essential for empowerment. Empowering farmers also involves providing them with access to fair and lucrative markets. Advocating for policies that promote sustainable agriculture and address the challenges faced by farmers is essential.

(4) Entrepreneurship:

Entrepreneurship in agriculture sustainability refers to the application of innovative ideas, business principles, and entrepreneurial skills to create and scale sustainable agricultural ventures. It involves combining environmental stewardship, economic viability, and social responsibility to address sustainability challenges and create positive impact within the agricultural sector.

Entrepreneurs in agriculture sustainability identify market gaps and opportunities. They explore and develop new solutions, such as precision farming technologies, IoT devices, data analytics, drone technology, and renewable energy applications, to optimize resource use, enhance productivity, and minimize environmental impacts. Entrepreneurs in agriculture sustainability focus on creating sustainable supply chains that integrate ecological, economic, and social considerations. Entrepreneurs develop and implement innovative business models that prioritize sustainability and create shared value. Entrepreneurship in agriculture sustainability involves measuring and monitoring social and environmental impacts to demonstrate the value created. Entrepreneurs collaborate with various stakeholders, including farmers, researchers, government agencies, NGOs, and investors, to leverage expertise, resources, and networks. Entrepreneurs in agriculture sustainability require access to finance and support mechanisms tailored to their specific needs.

8. ABCD ANALYSIS :

ABCD analysis stands for advantages, benefits, constraints and disadvantages. This analysis gives more clarity about atmanirbharath agriculture and sustainable farming to achieve sustainable growth [15- 19].

8.1 Advantages:

(1) Union Budget has allocated 127 crores for new-age technologies to reduce the cost of farming.
(2) Government has taken the initiative to increase institutional Credit to Agriculture Sector.
(3) Credit support to Kisan Credit Cards and MSP on pulses and oilseeds for self-sufficiency in agri production
(4) Government has taken several steps to promote the Indian killers or sure Anna on account of United Nations declaring 2023 International Year of killers.
(5) To promote sustainable agricultural government has established National Mission on Natural Farming.
(6) Agri Entrepreneurial is providing technology to increase agri output.

8.2 Benefits:

(1) In the Budget 2023-24 government has set target10,000 Farmers producer Organisation (FPOs) to facilities small and medium farmers in terms of better prices for their produce.
(2) To make India self -reliance in agri food and food security and farmers welfare government encourage for growing millets foods like ragi, cheena, jawar.
(3) DAY-NRLM scheme is catalyst for entrepreneurial ecosystem in rural areas.
(4) Agriculture Accelerator Fund will encourage agri startups in the area with sustainable and cost-effective agricultural practices.

8.3 Constraints:

(1) SHGs and FPOs have to initiate bulk purchases of agricultural inputs.
(2) Banks, Financial institutions have to counsel the farmers about ease access of to formal credit to reduce dependence on informal credit.
(3) Government has to introduce more Sustainable. farm practices through the SHGs, FPOs, and cooperatives.
(4) Government has initiated more capacity-building and training programs for agriculture farmers in the area of natural farming.

8.4 Disadvantages:

(1) The farmers required more subsidies for procuring technology infrastructure.
(2) Government should take up more awareness campaigns on AI IoT digital tools to rural farmers to enhance farm productivity.
(3) Microfinance loan limit has to be raised for farmers based on hectares or land holding.
(4) Irregular weather condition has pushed more irregular payments on debt repayments.

9. FINDINGS :

Organic farming and sustainable agriculture is good for economy and environment. The study reveals that in India Sustainable green revaluation in Agriculture Technology and moving towards achieving sustainable development goals (SDG).

10. CONCLUSIONS :

Sustainable green revaluation in Agriculture Technology, Startup Fun, and ding, Government Initiatives converted rated the agriculture challenges in the areas of farmers income, quality seeds, storage, and logistics through Aatmanirbhar Bharat has enhanced the sustainable agriculture ecosystem and improving the livelihood of agriculture farmers it shows great progress in attaining sustainable Agriculture E's approach in protecting Environment, promoting Economy, provides unique opportunities for Entrepreneurs, providing Employment in a rural area and End the hunger by meeting sustainable development goals (SDG).

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