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THE NEXUS BETWEEN GREEN PRODUCTION AND ENVIRONMENTAL SUSTAINABILITY: AN EMPIRICAL ANALYSIS

Komal Yadav Assistant Professor, School of Humanities, K R Mangalam University, Gurugram.

Email id: komalyadav.05dec@gmail.com

Nitisha Sehrawat Doctoral Student in Economics, Indira Gandhi University, Meerpur-Rewari (Haryana) - India- 123501.

Email id: nitishakhardwal352@gmail.com;

ORCID: https://orcid.org/0009-0005-5248-4262

Devinder Singh Hooda* Assistant Professor, Department of Economics, Indira Gandhi University, Meerpur, Rewari, (Haryana)-India-123501.

Corresponding Author Email: dshooda.igu@gmail.com;

ORCID: https://orcid.org/ 0000-0002-1026-2122

Abstract

The environment is very important and any shift in the climate will cause the planet's equilibrium to become unbalanced. Resources and overpopulation are two of the biggest issues in today's globalised globe. Currently, the focus is on reducing the harm that sectors are doing to the ecosystem. A modern manufacturing method called "Green Manufacturing," which is appropriate for a systematic approach to long-term sustainable development, is required. The effects of climate change and the expanding population increase are profoundly affecting the world's food supply. The green production method is expressed in the green agro - based food supply chain, which could be characterised as to enhance the brand image of agro - food performance and environmental preservation. Utilizing the synergies of green agriculture's economical, societal, and ecological facets will increase yields, according to the environmentally friendly production plan. In terms of tactical management, organizational, production, and product innovation decisions, sustainability and ecological challenges are quickly becoming some of the most crucial topics. The ideas of sustainable development, including green initiatives, environmental

marketing, green production, green innovation, etc., are currently being explored so as to solve the issues of environmental degradation. This study determines green production and green sustainability are green farming, green management, green technology and green manufacturing. It finds that there is a significant impact of Green Production and Green Sustainability on Green Environment.

Keywords: Green Production, Green Environment, Sustainable, Regression Analysis.

I. Introduction

Similar to firms with strong resources and capabilities, businesses that see opportunities in their environmental practises to boost internal productivity and create new environmentally friendly goods and technology may be more likely to enhance their environmental performance. This idea is predicated on the idea that businesses with a green production emphasis are more likely to understand the value of building a green reputation and the possible cost savings associated with reducing waste in their production cycle. From a profit-maximizing perspective, rational businesses with the necessary information (about costs, substitute products, and other considerations) analyse the gross benefits and costs of an environmental strategy and implement it if it provides the best net positive benefits relative to other options. This comprehensive plan is predicated on the notion that businesses are motivated to boost operational effectiveness and pursue competitive advantage through product differentiation. The motivation behind an organization's actions and ensuing gains is the drive. As a result, businesses are more inclined to take action to lessen their negative environmental effects if they think that doing so will boost internal efficiencies. In addition, they are more inclined to see the possible danger of creating eco-friendly goods and services as a strategic chance rather than as a disturbance of ongoing business operations (Dornall, 2009).

Proteins, lipids, polysaccharides, polyphenols, micronutrients, and vitamins are just a few of the nutritionally beneficial substances that are abundant in mushrooms. They are a particularly important dietary source of B group vitamins and can be a great way for vegetarians to receive these nutrients. Conventional extraction techniques frequently use water or organic solvents and might cause components to degrade noticeably. It discusses the possible application of novel, non-traditional technologies for the recovery of important compounds from mushrooms, including enzyme-assisted extraction, pulsed electric fields, ultrasounds, microwaves, and subcritical and supercritical fluid extraction. Recent research has demonstrated the enormous potential of these eco-friendly manufacturing techniques for the synthesis of particular chemicals for usage as nutraceuticals or as components of functional foods (Soto, et al. 2015).

Many industrialised nations already have abundant access to goods, food, and energy, but local governments and international organisations are currently making insufficient preparations for future environmental and energy implications in order to eliminate or significantly mitigate the issues. To change the megatrend of disasters in a way that protects human lives, the following decades will be crucial. Research on sustainable technology is progressing more rapidly, which reflects the severity of energy-environment-resource challenges. Transportation, heating/cooling of buildings, and

industry all account for around 33 percent of global energy usage, respectively. The environment is negatively impacted by both the use of energy and the emission of hazardous waste and poisonous compounds during manufacturing processes. Even though it seems like manufacturing-related technologies will be extremely important to human life in the future, sadly, very few technical publications have been publishing research findings in these areas (Ahn, 2014). Although the idea of sustainability as a standalone notion is losing credibility, when it is followed by a defining qualifier like ecological, agricultural, or economic, it seems to be accomplishing something. Members of numerous occupations have taken the initiative to define the term in the perspective of their individual fields. The word ecological sustainability is defined by academics as a valuable idea for preservation biologists. Authors present an environmental sustainability concept in their work, Ecological Sustainability as a Preservation Concept, which links needs of the people with natural ecosystems in order to fulfil people's needs without jeopardising ecological health. They suggest using this idea as a compass for regions where people do operations (Morelli, 2011).

Meeting current requirements without sacrificing the potential for future generations to meet their own is what is meant by sustainability. Information on sustainability that is supported by science is necessary when a choice regarding sustainability issues needs to be taken. Giving decision-makers logical, cohesive, and transparent support for sustainable patterns of consumption and production has become more difficult. When it comes to issue of sustainability, there is minimal agreement and a greater influence from human conduct and society context. The ecological pillar focuses on habitats and how they support human life. The idea of sustainability has many distinct sources, including criticism of technology, environmental load factor, and resource reserves. Each of the research fields has its own history and distinct goals, such as minimising the effects of technological advancement and remaining below earth's carrying capacities (Dong and Hauschilda, 2017).

The rest of the study is organised into following sections. Section II highlights the existing literature and identifies the research gap. Section III elaborates the objectives of the study followed by research methodology in section IV, Results and discussion in section V and In the end, section VI includes conclusion.

II. Literature Review

The value of green output is rising quickly. For instance, it is predicted that by 2050, the influence of human activities will have multiplied tenfold as nations like China benefit from lifestyles that are similar to those of western cultures. The use of environmentally friendly materials in products, the production process, and the simplicity of product disposal are just a few ways production-based businesses may demonstrate their commitment to sustainability (Baines, et al., 2012). Since non-toxic, biodegradable, and green products are in demand right now, a large number of worldwide or domestic businesses across a range of industries and product categories are changing their behaviour and implementing green marketing strategies. The best people to use this maxim are marketers. Trivedi and Sharma, (2017) said that with affluence came many issues brought on by the previous manufacturing and consumption patterns. pollution, ozone depletion, water poisoning,

numerous diseases, and the depletion of natural resources are some of the issues. Adam, et al. (2020) proposed that environmental quality can be raised through green chemistry and green manufacturing. It is feasible to foresee some of the financial gains brought about by the use of green chemistry in industrial chemical processes, including the reduced demand for nuclear waste and treatment investments and reimbursement for ecological damage. Frimpong, et al. (2020) conveyed that adopting Green Manufacturing Practices (GMP) encompasses more than just producing excellent products. Standard environmental planning and certification of environmental management systems (EMS) are required for businesses with GMP aims. Eltayeb, and Zailani, (2009) defined eco-design as the design of a product and its packaging with an eye toward reducing the product's adverse environmental effects throughout the course of its life and encouraging good environmental actions like recycling and reusing the product and its packaging. With respect to Afum, et al. (2020) the topic of sustainability has recently taken on significant importance in the global industrial industry. The green creativity acts as a mediator between proactive green innovation and green product development success, coupled with greater proactive technology practices in businesses (Chen, et al., 2016). With regard to sustainable supplier, environmental and social strategic planning, green technology development, and green production methods and procedures, D'Souza, et al. (2015) are using the origins of marketing plan to investigate associations between necessary institutional micro environment activities of companies and the eco-friendly promotional strategies. Yong, et al. (2019) proposed that employing green human resource management (HRM) procedures can assist businesses in integrating environmental sustainability into their business plans. Green selection, performance evaluation, performance analysis, and rewards, on the other hand, did not appear to have any substantial impact on sustainability. However, Filho, et al. (2019) found that the establishment of Green and Sustainability Offices is a unique environment that helps institutions of higher learning coordinate their activity in the area of environmental sustainability. A larger examination of the connection between environmental sustainability and the ecosystem has traditionally been tied to the analysis of numerous "green" notions. Reduced business output, which would include significant constraints on resource consumption, is the view of some authors as the answer to the issue of the influence on the environment of the planet. Some experts assert that it is entirely doable to strike a balance between economic boom and concern for the environment and people while others believe that economic activity may grow farther while having a smaller negative influence on the environment. As the authors of the article who researched the situation in the EU countries in the years 2016–2017 indicate, it is vital to employ a new paradigm in this context that explicitly emphasises that "environment" and "economic growth" cannot be considered as competing aims (Lavrinenko, et al. (2019).

III. Objectives of the Study

The purpose of the study is to look out how environment sustainability can be achieved considering growth in population, climate changes and other factors. Hence, we take into consideration green production and green sustainability to provide ways on how these

play a role to bring environment sustainability. The specific research questions are as below:

1. What are the various determinants of Green Production?
2. What are the various determinants of Green Sustainability?
3. What is the impact of Green Production and Green Sustainability on Green Environment?

IV. Research Methodology

This paper is empirical in nature and based on the data collected from the experts in the field of Green Production, Sustainability and Environment. The data are collected from 300 experts. The collected data have been categorized into three categories namely; Gender, Age profile of respondent and Educational Profile of respondent. For finding the relationship between the environment sustainability and green production various test have been used in this study. Exploratory Factor Analysis applied to determine the constructs of Green Production, Sustainability and Environment and causal relationship of green production and Green Sustainability on the Green Environment will be measured with the help of Multiple Regression analysis. Basically, Exploratory Factor Analysis this technique is used to reduce data to a smaller set of summary variables and to explore the underlying theoretical structure of the phenomena. This technique is used for the current study to identify the structure of the relationship between the variables and respondent.

V. Results and Discussion

Respondent's basic details is shared in table below. Males are 66.0 percent and rest 34.0 percent are females. 32.3 percent are below 36 years, 36.4 percent are of 36-42 years and rest 31.3 percent are above 42 years of age. The educational qualification of 39.7 percent of the respondents is post-graduation and below, 32.3 percent of them are having professional degree and rest 28.0% are having other qualification.

Table 1: Basic Details

Variable	Respondent	Percentage
Gender		
Male	198	66.0
Female	102	34.0
Total	**300**	**100**
Age profile		
Below 36 years	97	32.3
36-42 years	109	36.4
Above 42 years	94	31.3
Total	**300**	**100**
Educational qualification		
Post Graduates and below	119	39.7
Professional Degree	97	32.3
Others	84	28.0
Total	**300**	**100**

Source: Author's own estimation

"Factor Analysis"

Table 2: KMO and Bartlett's Test

"Kaiser-Meyer-Olkin Measure of Sampling Adequacy"		.886
"Bartlett's Test of Sphericity"	"Approx. Chi-Square"	4741.361
	"df"	136
	"Sig."	.000

In the table above "KMO and Bartlett's Test" have been applied in which the KMO value found is .884.

Table 3: Total Variance Explained

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	Percentage of Variance	Cumulative percentage	Total	Percentage of Variance	Cumulative percentage
1	7.655	45.028	45.028	3.745	22.030	22.030
2	2.473	14.549	59.577	3.575	21.029	43.059
3	2.098	12.344	71.921	3.441	20.241	63.300
4	1.404	8.256	80.177	2.869	16.877	80.177
5	.581	3.418	83.595			
6	.552	3.248	86.843			
7	.397	2.334	89.177			
8	.334	1.965	91.141			
9	.276	1.625	92.766			
10	.240	1.411	94.177			
11	.219	1.286	95.463			
12	.198	1.165	96.628			
13	.180	1.061	97.689			
14	.145	.851	98.540			
15	.113	.665	99.205			
16	.072	.422	99.627			
17	.063	.373	100.000			

It is found that total variance explained in table 3 that all the four factors indicates total 80 percent of the variance. The first factor explains 22.030 percent of the variance followed by the second factor with 21.029 percent, third factor having 20.241percent and fourth factor explains 16.877 percent of variance.

Table 4: Rotated Component Matrix

S. No.	Factors and variables	Factor Loading	Factor Reliability
	Green Farming		**.915**
1.	Green farming does not use chemical fertilizers	.925	
2.	Green farming increases the fertility of the soil	.900	
3.	Green farming mitigates green-house effect	.874	
4.	Use of non-renewable energy is reduced by green farming	.700	
5.	Natural habitat areas were preserved by green farming	.688	
	Green Management		**.957**
1.	Green commuting is encouraged in green management	.865	
2.	Company promotes remote working culture	.860	
3.	Adoption of complete digitalization	.848	
4.	Company encourages recycling at work	.823	
	Green Technology		**.936**
1.	Green technology does not emit harmful chemicals in air	.897	
2.	Green technologies help in reducing global warming	.896	
3.	Green technology helps in reducing fossil fuels	.871	
4.	Green technology helps in effective recycling	.867	
	Green Manufacturing		**.953**
1.	Waste is reduced in green manufacturing	.817	
2.	Green manufacturing requires less resources	.813	
3.	Energy consumption is reduced in green manufacturing	.805	
4.	The level of environmental pollution is less	.757	

Source: Author's calculation

Factor Development

Green Farming is first factor and its associated variables are green farming does not use chemical fertilizers, green farming increases the fertility of the soil, green farming mitigates green-house effect, Use of non-renewable energy is reduced by green farming and Natural habitat areas were preserved by green farming. Second factor is named as Green Management is factor green commuting is encouraged in green management, Company promotes remote working culture, Adoption of complete digitalization and Company encourages recycling at work. Green Technology is factor third which includes the variables like green technology does not emit harmful chemicals in air, green technologies help in reducing global warming, green technology helps in reducing fossil fuels and green technology helps in effective recycling. Fourth and the last factor is Green Manufacturing is the first factor which includes the variable like Waste is reduced in green

manufacturing, green manufacturing requires less resources, Energy consumption is reduced in green manufacturing and the level of environmental pollution is low. The reliability of green farming has 0.915, green management is 0.957, green technology is 0.936 green manufacturing is showing factor reliability as 0.953.

Table 5: Reliability Statistics

Cronbach's Alpha	No. of Items
.918	17

Above table 5 shows total 17 items that includes all the variables related to environmental sustainability with total reliability is 0.918.

Regression Analysis

Table 6: Model Summary

Model	**R**	**R Square**	**Adjusted R Square**	**Std. Error**
1	.757[a]	.574	.568	.58905
a. Predictors: (Constant), Green Farming, Green Management, Green Technology and Green Manufacturing				

In this study, to measure the impact of Green Farming, Green Management, Green Technology and Green Manufacturing on "Environmental Sustainability", multiple regressions have been applied in which R Square value is 0.574.

Table 7: Coefficients

Model	**Unstandardized Coefficients**		**Standardised Coefficients**	**"t"**	**"Sig."**
	"B"	**Std. Error**	**"Beta"**		
(Constant)	3.810	.034		112.029	.000
Green Farming	.108	.034	.120	3.163	.002
Green Management	.184	.034	.205	5.389	.001
Green Technology	.640	.034	.714	18.790	.000
Green Manufacturing	.077	.034	.086	2.252	.025
DV: Environmental sustainability					

The table 7 shows that all the factors like green farming, green management, green technology and green manufacturing have significant impact on "Environmental Sustainability".

VI. Conclusion

Regarding issues such as global warming and the impending scarcity of essential natural resources, we are aware that there are a variety of points of view. It is difficult to argue against durability as the ultimate objective, provided that it is achieved within the biosphere's regeneration capability. Everything else ought to be based on facts, not speculation. The degradation of the environment, diminishing fossil resource reserves, loss of natural habitats and bio - diversity, global warming, demographic change, natural catastrophes, agricultural issues (like soil loss, accessibility of arable land), effects of factory output, mineral extraction, and intensive farming on local ecology, pollution, and water shortages have all been extensively studied and documented by top scientists worldwide. In this respect, empirically informed results obtained from tens of thousands of peer-reviewed papers and internationally reproduced results in disciplines ranging from farming to wildlife are compelling. People who find the evidence inadequate or the multiple perspectives unconvincing may be drawn to a simply rational argument. It goes without saying that the majority of the planet's most valuable resources are finite. If degradation and use continue without preservation or replacement, they will end up running out and disappear, if not in the near future, then at some time in the distant future. So, at the very least over the long haul, sustainability must be a worry. Water, air, arable, natural resources, energy, and wildlife are just a few examples of the environmental assets that are crucial for human existence on this planet as well as for business growth. It's smart business to be environmentally conscious. The study found that the factor that determines green production and green sustainability are green farming, green management, green technology and green manufacturing. The study concludes that there is a significant impact of Green Production and Green Sustainability on Green Environment.

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