

## **Implications of Sustainability toward Green Innovation Investment: Livestock Industry Perspective**

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### **Abstract**

This research study examines the effect of sustainability on green innovation in the livestock industry of Pakistan. The main concern is related to the different dimensions of sustainability that influence green innovation. The cross-sectional analysis conducted was based on primary data collected from the livestock industry that works in the Pakistani districts. The empirical findings are based on structural equation modeling and propose that the economic, institutional and social aspects comprehensively affected green innovation. The environmental aspect has shown a comparatively less-contributing effect, which means a significant relationship exists between environmental sustainability and the investment in green innovation. The results recommend that economic and institutional sustainability could be a good source of innovation that affects social sustainability.

**Keywords:** Green Innovation Investment; Sustainability; Structural Equation Modeling

### **1. Introduction**

Managerial science literature has shown contribution toward the green innovation investment which based on sustainable factors (Gao, 2018; Albort-Morant et al., 2016; Sezen & Cankaya, 2013; Qi, Shen, Zeng & Jorge, 2010). Social and environmental aspects could not be compromised in trade-off optimal products and services (Boons & Ludeke-Freund, 2013), so the modern world must discuss sustainability factors because these are directly associated with natural resource-intensive divisions. There is increasing trend on academic and practical research studies on green innovation (Gupta, & Barua, 2018; Chen, Yi, Zhang, & Li, 2018; Cuerva et al., 2014); and it is the latest and emerging theories, equipment, and procedures or management systems (Li et al., 2017) that could succeed in solving environmental issues (Kemp & Pearson, 2007). Therefore, green innovation should be prioritized instead of traditional innovation which only focuses on availing competitive edge through developing new ideas and procedures (Baregheh, Rowley, & Sambrook, 2009).

Green innovation denotes the developments identified with technological advancement in the prevention of impurities and energy, as well as the reuse of waste and ecological sustenance (Chen et al., 2006). Ecological progress can feasibly reduce environmental pollution and the negative effects of reserve utilization procedures that stimulate sustainable development (Kemp & Pearson, 2007). This foundation entails an utter comprehension of the determinants of ecological innovation. Henceforth, companies must create a diversity of sustainability as a determining factor that reveals the advantages of adopting green innovation.

Historical research studies propose environmental commitment (Chang, 2016), regulations (Zailani et al., 2015), cost reduction programs (Hojnik & Ruzzier, 2016) as determining factors of green innovation startups. Corporate social responsibility and sustainability are considered important factors that have been ignored in the current literature. Therefore, this study will examine the determinants of green innovation investment. The main concern is our focus on the environmental, social, economic and institutional aspects of sustainability (Albort-Morant et al., 2016; Choi & Ng, 2011), while taking into account the economic, ethical, legal and philanthropic aspects of CSR (Carroll, 1979).

Experimental sections of research were examined in Pakistan's livestock industry, assuming a remarkable status in society despite different circumstances that this industry has gone from the battle horse and the agro-industry to the world of entertainment, racing, milk and leather production (Raento, 2016). In Pakistan areas, such industry in recent decades has progressed from open territories to urban areas, due to the environmental and sustainable problems with care and cleanliness (Liljenstolpe, 2009).

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Green innovation could be an advantageous source that resolves numerous conflicts. This research emphasizes the organizations' valuation of the sustainable measures (Mamede & Gomes, 2014). Moreover, this research focuses on relationships of green innovation. Consequently, it determines green innovation investment. This study also contributed to the context that explores diverse aspects of sustainability and the determining factors of green innovation.

## 2. Literature Review

Pooled research on innovation and sustainability has increased in recent years (Franceschini et al., 2016). Therefore, the economic, environmental, ecological and sustainable aspects of innovation have been discovered (Schiederig et al., 2012). These terminologies in their diversity are used for the welfare of many communities (Franceschini et al., 2016). Historical researchers proposed dimensions of sustainability as ecological innovation (Schiederig et al., 2012), environmental (Pickman, 1998), sustainable (Franceschini et al., 2016), and economic innovation (Charter & Clark (2007).

Research studies are growing in the sustainable development areas and the issues are increasing (Cuerva et al., 2014). Researchers feel that green innovation explains green products and services it's concerned with advanced technology in the prevention of impurities and energy, the reuse of waste and ecological sustenance. Therefore, green innovation is related to the advance in production, procedures and administration of competitive advantage (Huang et al., 2016). It is considered a necessary element for efficient business management in achieving a competitive edge leading to better performance (Chang & Chen, 2013).

Green technologies provide benefits in the context of commercial rewards, which create environmentally sustainable products and services while augmenting financial performance with enhancing competitive advantage (Albort-Morant et al., 2016). This provides great opportunities that could possibly accomplish customer requirements without compromising environmental systems. The green innovation process will be considered successful as prosperous achievements display in environmental, market and financial performances (Li, 2014; Cai & Zhou, 2014). In summary, it is proposed that traditional innovation involve only the context of financial benefits via new products, services and procedures, while green innovation will essentially address environmental prevention and related issues (Li et al., 2017).

Organizations should be encouraged to make green innovation a priority. There are several research studies that recommend method of adopting green innovation, (Cuerva et al., 2014) proposed to carry out the development in the differentiation of the product while (Albino et al., 2009) developing green products. Chang, (2016) proposed to work for an environmental commitment that could be a possible determinant of ecological innovation. This is intended for organizations to achieve their environmental objectives, and also helps them to act in accordance with environmental regulations.

Dangelico and Pujari (2010) depicted environmental obligations as one of the main sources of inspiration for organizations to produce ecological articles. They proposed that such an obligation begin either from the internal ecological introduction of an organization or from the individual responsibilities of the administration itself. Hojnik and Ruzzier (2016) have discovered that the economic advancement of the items, the process and the projects of natural research and development could be updated by the ecological management frameworks. Cuerva et al. (2014) discovered that with an administrative framework, the corporation will probably enjoy environmental innovation. The present state of business, institutions are more remarkable than the effects of their exercises on nature, and are awakened by the environmental apprehensions related to innovation. The first hypothesis constructed based on the above recommendations;

*H<sub>1</sub>: There is significant impact of environmental sustainability on green innovation.*

Internal improvement activities and skills of organizations started to assume a vital part in green development (Zailani et al., 2015). Vibrant capacity roles are instruments that enhance rehabilitation of the predominant operational capacities (Albort-Morant and others (2016).) Chang (2016) perceived that an operative capacity, which is the capacity to consent to dubious ecological legislations, can help by applying feasible human capital of the company for the advancement of the green element. Huang et al., 2016

explored that advancement of human capital through preparation can help to encourage the representatives and alter the attitude to more natural practical activity.

Scholars demonstrated in the case of human development that there is influence of internal knowledge movements on the procedures of eco-innovations (Del Rio et al., 2015). Employee productivity and welfare activities are also affected by environmental practices (Lanfranchi & Pekovic, 2014). There is coherence between learning capabilities with respect to the environment and green innovation that influences green innovation and its performance (Chen, 2008). Additionally, the development of human capital and its sustenance will determine green innovation (Huang et al., 2016). The apprehension of management (Qi et al., 2010) and social recognition (Cai & Zhou, 2014) motivate green innovation. Thus, hypothesis constructed as;

*H<sub>2</sub>: There is significant influence of social sustainability on green innovation.*

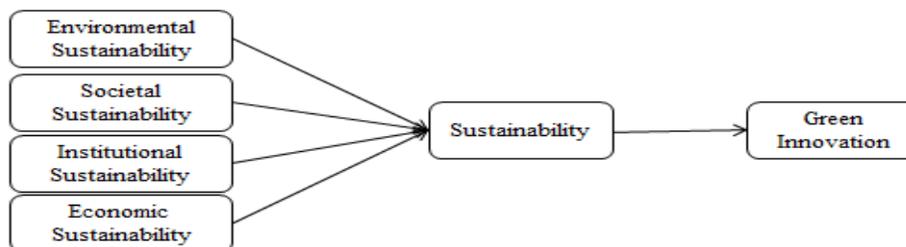
There are numerous determining factors that have differentiated according to some characteristics (Kesidou & Demirel, 2012). Economic innovations are preceded by the meeting of societal needs. The reduction of costs and the implementation of rules according to benchmarks are examples of green innovation (Hojnik & Ruzzier, 2016). These are also considered to determine economic innovation. The implementation of the rules also includes the movement of external knowledge and the coordination of employees leads to innovation (Del Rio et al., 2015). Rules related to environmental activities are necessary in an organization for the needs of its stakeholders (Li et al., 2017). External cooperation for green innovation is also required because it provides better knowledge and information (Horbach et al., 2013). Public and private market players contribute to innovation in their own ways and their association is necessary for the adaptation of green innovation (Bar, 2015, Klewitz et al., 2012). The strong association between market agents will improve the understanding of green innovation. External knowledge is related to product innovation (Del Rio et al., 2015), while government grants increase trends in economic innovation (Doran & Ryan, 2012). Research and development are also considered necessary to improve green innovation because they are used to take advantage of advanced technologies (Huang et al., 2016). So, hypothesis developed on the basis of above discussion;

*H<sub>3</sub>: There is significant influence of institutional sustainability on green innovation.*

Cost reduction programs are necessary to establish green innovation (Horbach et al., 2013). The main dimensions of innovation are; product and process, both organizational and environmental, which are associated with cost reduction activities (Hojnik & Ruzzier, 2016). Energy and material cost reduction programs are key determinants for all dimensions of innovation (Horbach et al., 2012), but a clear identification related to environmental innovations is lacking. The financial performance of the organization contributes to the development of the innovation of the green product without being associated with the innovation of the green process (Li et al., 2017). In addition, Horbach et al. (2012) demonstrated that the stimulus element to decrease energy consumption is molded via consumer demands. The client will prioritize placing a demand in which energy consumption and management programs are practiced. Thus, the development of a fourth hypothesis is established.

*H<sub>4</sub>: There is significant influence of economic sustainability on green innovation.*

## 2.1 Conceptual Framework



*Figure I – Conceptual Framework*

### 3. Methodology

Green innovation and sustainability have been considered as areas of major attraction by researchers, experts, and practitioners. This research wants to identify the relationship sustainability has with green innovation in a Pakistani context. There are about 140 million animals are in Pakistan which contributing about 11% toward the National GDP (Rehman et al., 2017). 30 million of total Pakistani population is associated with this industry (Sarwar, 2002). 600 questionnaires distributed, 455 returned back out of which only 396 met criteria for data analysis. Developed questionnaires (Delai & Takahashi, 2011; Mamede & Gomes, 2014; Svensson & Wagner, 2015; Khan et al., 2016) utilized to examine relationship and structural equation modelling is applied as a statistical tool. Confirmatory factor analysis indicated the measurement model fitness and direct relationship which was examined via AMOS-22.

### 4. Empirical Findings

#### 4.1 Measurement Models

The measurement model explained the level of fitness of each observed factor with its latent variable. This means that if the items of any factor are completely adjusted to their observed factor, it will be an indication of the adequacy of the measurement model that is necessary before the start of any confirmatory factor analysis. There are different measures of model adequacy that include chi-square, normed chi-square, comparative fitness index (CFI), GFI, RMR and RMSEA (Schumacker & Lomax, 2004; Steiger, 2000; Browne & Cudeck, 1989; Tabachnick & Fidell, 2007; Shevin & Miles, 1998).

These measurements have some benchmarks and are compared with the values obtained from the fitness of the measurement model. If these values are among the standards, then that model will be treated as appropriate for the structural model; otherwise, it will be updated with the help of changes in the data or the questionnaire. Data was normalized and verified after the survey of the respondents. The Cronbach's Alpha values explained that reliability and all dependent and independent variables are reliable because their values are within the defined ranges of 0.7 to 0.9.

**Table 1: Comparative Fitness - Measurement Models**

Index	Benchmarks	GI	ENS	SS	IS	ES
		Fit Level				
$\chi^2$	Low preferred	111.0	3.680	26.00	1.750	2.210
$\chi^2/df$	$\leq 5.00$	4.990	3.680	5.000	1.745	2.210
RMR	$\leq .080$	0.030	0.011	0.045	0.012	0.030
CFI	$\geq .900$	0.890	0.980	0.890	0.890	0.950
GFI	$\geq .900$	0.955	0.970	0.970	0.880	0.940
NFI	$\geq .900$	0.834	0.950	0.923	0.910	0.930
RMSEA	$\leq .100$	0.090	0.067	0.080	0.043	0.060

#### 4.2 Descriptive Statistics and Correlation

Descriptive statistics explained the different measures of normality in the form of mean and standard deviations. The values are between the ranges with respect to the maximum and minimum values that are indications of normality. Other measures such as skewness, kurtosis and Jarque Bera are also verified, which are also between the defined ranges. Normality tests are included; Cronbach alpha, descriptive statistics, P-P Plot, and Histogram etc. There are numerous methods to examine the normality (Thode, 2002). Cronbach value is between described ranges which mean data is reliable.

**Table 2: Descriptive Statistics and Correlation Matrix**

	Mean	S.D	GI	ENS	SS	IS	ES
<b>GI</b>	3.620	0.341	1.000				
<b>ENS</b>	2.981	0.711	.523**	1.000			
<b>SS</b>	3.932	0.499	.302**	.298**	1.000		
<b>IS</b>	4.001	0.597	.499**	.297**	.315**	1.000	
<b>ES</b>	3.711	0.539	.369**	.402**	.202**	.410**	1.000

\*\* Significant at 5% Level

The correlation indicated that all variables show a significant level with a confidence interval of 95%, which is the indication of the lowest level of error estimates. There are majority relationships that show significance with the green innovation. There is a significantly higher correlation between green innovation and environmental sustainability and the weakest relationship between economic sustainability and social sustainability, which are 52% and 20%, respectively.

### 4.3 Hypothesis Testing

Structural equation modeling is applied to examine the relationship among sustainability dimensions and green innovation. First order confirmatory factor analysis explained that there are latent factors which are fitted with their observed variables. Direct relationships checked after measurement model fitness and it is explored that environmental sustainability is significantly contributing in establishing green innovation. In the case of environmental sustainability, the value of the coefficient is 0.181.

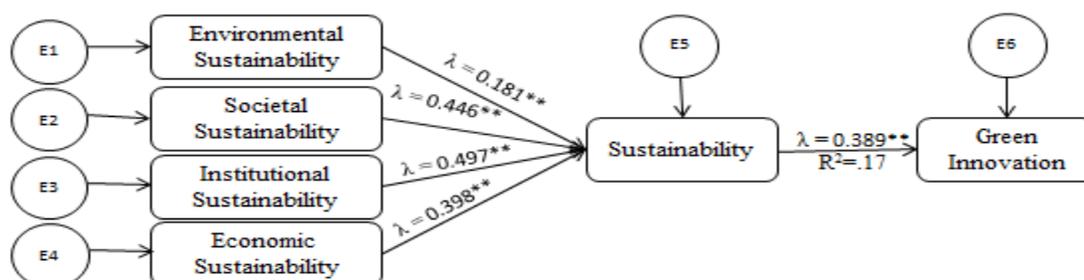


Figure II – AMOS Output

This is an indication of the contribution to variations in green innovation. Societal sustainability is making changes more holistically in green innovation because this is a more important variable. Societal sustainability is significant at 95% of the level of confidence interval, which is the indication of the main determining factor. Institutional sustainability is showing significance with green innovation, which means that it also has a contribution to make variations between green innovations. The coefficient value of institutional sustainability and green innovation is 0.497, which is also one of the main factors. In addition, economic sustainability is a necessary fragment of overall sustainability.

Table 3: Direct Hypothesis

			$\beta$	S.D	T-stat	Prob
ENS	→	GI	0.181	0.131	2.232	0.019*
SS	→	GI	0.446	0.121	3.003	0.009*
IS	→	GI	0.497	0.656	2.192	0.019*
ES	→	GI	0.398	0.201	2.414	0.020*
SUS	→	GI	0.389	0.199	2.399	0.018*

\*Significant at 0.05 Level

In this analysis, it has also shown a significant contribution to making changes towards green innovation, but the contribution is comparatively less than societal and institutional sustainability. Finally, the general confirmatory factory analysis of the second order showed the aptitude of the model and the four dimensions are a significant part of sustainability. So, sustainability has also shown its importance for green innovation. The total value of R-square shows that these four dimensions have a 39% variation in green innovation. The F-statistics have importance, which is indication of the fitness of the model in the prescribed model.

## 5. Discussion and Conclusion

Green innovation and sustainability are necessary part of business administration literature (Albort-Morant et al., 2016). Sustainability goods and services are necessary to produce without compromising social and environmental aspects (Boons & Ludeke-Freund, 2013). These factors are very important in many fields that indicate environmental stability as a natural resource in the livestock industry. Therefore,

as a result of traditional innovation, green innovation should be prioritized. It is a new part of the research and educational field of research (Cuerva et al., 2014). It is the latest and emerging theories, tools, and mechanisms or management systems that contribute to solve ecological issues.

This examination has demonstrated that specific sustainability measures develop ways to make investments in green innovation. First, it focuses on the exploration of its determining factors that demonstrated that ES and IS were the most critical determinants. In addition, social sustainability clarifies the inclination for green innovation. In contrast to the misuse of green innovation, interest in green development is identified in all aspects with societal sustainability. It appears that through organizational investing activities are reacting to the demands of customers (Huang et al., 2016), and this investment meet requirement for companies that offers an extraordinary opportunity to meet requests of clients without compromising the environmental community (Albort-Morant et al., 2016).

Historical studies proposed that the social aspect of green innovation demonstrated the economic production effectiveness with respect to green environmental procedures that are necessary to improve human capital, solve health problems and reduce unemployment by providing job opportunities (Khan et al., 2016). This study also emphasized social sustainability because it focused on the investment of green innovation instead of its exploitation. Environmental sustainability was also interested in the decision of green development. Despite the fact that organizations have a more noticeable familiarity with the effect of their exercises on earth, which persuades them towards green developments, it seems that there is still a need to encourage ecological learning. This can be recognized using the green administration frameworks and quality administration frameworks (Hojnik & Ruzzier, 2016; Cuerva et al., 2014).

The concluding observations showed that there is coherence between the deterrents of green innovation and that all dimensions of sustainability contributed significantly and positively to establishment of green innovation. Social and institutional sustainability contributes more, while the contribution of environmental and economic sustainability is also worth mentioning. The investigation additionally has critical ramifications for policymakers, authorities, and government employees regarding the momentum determinants of green innovation. Paula et al. (2013) demonstrated that authorities and leaders information of the steed business was the most noteworthy issue in the discourse between the business and society, with authorities neglecting to take the requirements and development capability of livestock industries into adequate record in their arranging and basic leadership. The consequences of this examination bolster the thought that diverse associations can illuminate leaders, authorities, and subjects as to specific potential outcomes inside this business. The consequences of the examination can be utilized to better interface this business division with society.

Each research study is based on strength and weakness. This study was conducted only in livestock industries of Pakistan. The respondents are few and it is difficult to contact the majority population interconnected with this profession, so it is also lemmatized to make generalizable the research finding for all other nations. In addition, this study focused on four dimensions of sustainability and a single aspect of green innovation. Future studies could possibly be generalized by focusing on the categorical data collection of all livestock domains and in the comparison of the crossing countries as well. One more aspect could also enrich future studies with the incorporation of Green Economy Innovation Index. Moreover possibly, relationships in the form of innovations with economic growth could be explored (Cancino et al., 2018).

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