African Journal of Emerging Issues
Peer reviewed | Double blind | Interdisciplinary

African Journal of Emerging Issues
(AJOEI)
Online ISSN: 2663 - 9335
Available at: https://ajoeijournals.org

AGRICULTURE

EFFECT OF LAND DEGRADATION ON AGRICULTURAL PRODUCTIVITY IN WEST BENGAL, INDIA

[1*]Sunil Pal Krupnik, [2]Syed Kotal Rajnath & [3]Singh Reich Nirmala

[1,2,3]Jadavpur University.

Email of the corresponding author: sunilpalkrupnik@gmail.com

Publication Date: November 2022.

ABSTRACT

Purpose of the study: The purpose of the study was to examine the effect of land degradation on agricultural productivity in Kashmir, India.

Research methodology: The study used a descriptive research design. The study purposively sampled 384 farmers from West Bengal. The analysis of the data was done using descriptive and inferential statistics.

Conclusion: It is concluded that land degradation is negatively and significantly related to agricultural productivity. The issue of land degradation has led to a low level of agricultural productivity in many parts globally. Human activities are the ones that cause the land degradation. Land degradation can reduce the amount of rainfall experienced in an area, reducing agricultural productivity.

Recommendations: The study recommended that sustainable agricultural practices need to be developed to deal with soil degradation. Estimating short, medium and long-range costs and benefits associated with soil degradation mitigation is essential. The government needs to put more effort into regulating land degradation since there are few extension officers. The government should actively provide environmental education, particularly on land conservation practices. Strict policies need to be established to ensure that land degradation is discouraged.

Keywords: *Land degradation, agricultural productivity, West Bengal, India*

BACKGROUND OF THE STUDY

Land degradation is usually regarded as the temporary or permanent reduction in the production capacity of the land (Dwivedi, 2018). Over the past years, the agricultural sector has faced various dangers. Agricultural land is being turned into other non-agricultural purposes. The key issue currently is why agricultural land is reducing and how it is being used for other purposes. Xie, Zhang, Wu and Lv (2020) noted that the land used to do agriculture is reducing slowly. Poverty, high population growth, poor land utilization, low/no interest in farming, conventional irrigation systems, housing firms, etc., play a vital role in reducing agricultural land. Also, floods, droughts and salinity because of climate change are most common in India, resulting in land degradation (Gupta, 2019). Due to this, soil fertility, crop production, and food security are at a higher risk.

Land degradation is broadly regarded as a worldwide issue related to desertification in arid and semi-arid areas that account for around 46% of the earth's total surface area (Kumar, Babu, Anusha & Rajasekhar, 2022). Land degradation influences many people over a significant proportion of the globe's surface, which has led to many incidences of poverty and hunger. The reducing status of natural resources and environmental un-sustainability measures this. Globally, land degradation is expressed as any change or disruption to the land which is undesirable and influences human activities such as agriculture and settlements (Talukder, Ganguli, Matthew, VanLoon, Hipel & Orbinski, 2021).

Land and soil resource being degradation relates to national sovereignty concerns, while the indirect effects of degradation cut across from the village to the national level and influence food prices and security and ecosystem service provision in downstream areas, far away from the place of degradation (Lorenz, Lal & Ehlers, 2019). Moreover, these complex multi-scale linkages show a clear need to declare land degradation a worldwide concern. This requires international awareness, especially in driving investment to fund technology transfer and capacity building to regulate land issues. Global sustainable development and environmental sustainability are at high risk when there is a lack of sustainable usage and management of land resources.

Worldwide land degradation is most rapid when the land is converted for continuous cropping (Nendel, Hu & Lakes, 2018). As the agriculture industry becomes highly profitable and other conditions largely favorable, farmers invest highly in land use planning and management.

Measures and programmes might have a considerable effect during the transition when returns to investment in the soil can be realized in the short or medium term. The scenario is most important in marginalized places where the vulnerability of human and environmental systems overlaps. Where both the mixed crop and livestock system is growing, placing more individuals at risk of reduced production and highly variable rainfall, diversification through the combination of plants and animals, cash and food crops, and farm and non-farm income will remain to be an important way for farmers to minimize their risk when they encounter of these changes (Thanh, Le Van Thuy, Anh, Nguyen & Hieu, 2021).

Wang, Lin, Glendinning and Xu (2018) reported that industrialization, urbanization and infrastructure growth is gradually taking away areas of land from agriculture, forestry, grassland and pasture, and unused lands with wild vegetation. Opencast mining is another concern since it interrupts the soil's physical, chemical, and biological components and changes a particular area's socioeconomic features. The adverse impacts of mining are water scarcity due to the lowering of the water table, soil pollution, partial or total extinction of animals and plants, air and water contamination and acid mine drainage (Al-Taai, 2021). Mining is usually done by using excavators, therefore, bringing about the production of massive waste. Mineral production produces enormous quantities of waste and tailings/slimes and a significant area is degraded. Thus, the study examined the effects of land degradation on agricultural productivity in Kashmir, India.

LITERATURE REVIEW

Hossain, Krupnik, Timsina, Mahboob, Chaki, Farooq and Hasanuzzaman (2020) conducted research to explore the impacts of land degradation on agricultural productivity, planning and management in Mexico. A population of 50 households was interviewed and the gathered data was evaluated utilizing SPSS. Data was gathered utilizing a questionnaire. Findings indicated that crop farming, livestock, poultry, farm forestry and beekeeping were the main agricultural land use tasks done in the research region. A steep slope was considered for farm forestry (20%). Beekeeping was the least land use practice occupying around 2% of overall land use. The high land degradation (20%) was noted in the middle zone and the lowest land degradation (8%) was noted in the upper land. The research indicated that almost all farmers were aware of land degradation indicators within their environment and addressed them utilizing their indigenous environmental understanding. The small-scale farmers protected more land degradation by use of their local or

traditional methods like usage of organic manure, growing of trees, rotating crops, use of gabions and stone lines. Various regions had different land use and management practices because of their disparities in terrain and other physical and biophysical features. The research argues for place-based evaluations and knowledge on the landscape structure and local microenvironments in increasing understanding of local-level decision-making on land use planning and management by small-scale farmers in keeping livelihood security.

Bhatnagar (2022) reported that land degradation is due to complex interaction between, physical, chemical, biological, socio-economic and political spheres of regional, national or international nature. Land degradation impacts Brazilian economy and has a lot of adverse effects on agricultural productivity by decreasing the fertility of farming land. Land degradation is increasing in severity and extending to many regions of the globe, with higher than 21% of all farmed places, 29% of forests and 9% of grasslands are experiencing degradation. Many hectares of land annually are being degraded in all over climatic areas. About 3.1billion individuals are influenced by land degradation and desertification in many nations, affecting over 35% of the globe´s land surface. The worldwide arable and grazing land continues to reduce due to urbanization, un-sustainable agriculture methods and deforestation, and the other portion of the remaining arable and grazing land is under pressure from compaction by animals and farm implements, due to usage of fertilizers and pesticides, salinization, alkalization or acidification depletion of nutrients, water and wind erosion, deterioration of drainage. The agricultural effects of land degradation are, decrease of soil nutrients, soil erosion effects, decrease in crop yields, silting up of reservoir. It again leads to increased poverty, and results in reducing ecosystem resilience and provision of environmental services. Additionally, environmental decline as a result of land degradation negatively influences the health, well-being and livelihood opportunities of the people.

Chalise, Kumar and Kristiansen (2019) discovered that the two issues of land degradation and agricultural productivity has over the years become a topic of great importance in global discussion due to the challenges they pose to sustainable growth in world nations present. To deal with the effects of these problems, international community, world organizations, and scholars have tried to develop relation between the two issues. One of the associations between the two issues is reported to exist in rural places where poverty is high because of poor accessibility to societal resources and other types of inequality force rural individuals to over use immediate resources that

are readily available for subsistence or mini commercial agriculture. In many rural places, agriculture is the primary source of livelihood and environmental resources form the fundamental source. Some scholars have the perspective that this reliance on the environment resources quickly depletes resources when individuals are faced with poverty and high population growth rate. When these resources become finished the individuals once again go back into more poverty. Little attention is given to the effect of unsustainable agriculture on the environment; and the ways in which poverty is rampant in these rural places, educate rural farmers to abandon traditional resource management methods for immediate benefits. This study highlights the effect of land degradation on agricultural productivity and puts more effort on the importance of focusing on the problems of rural poverty in attaining effective sustainable development and management of land resources depended on for agriculture in the rural areas in Brazil.

Prăvălie (2021) performed research to determine the impacts of land degradation on agriculture in India. The research covered the areas of Maharashtra and Gujarat. The first task was to determine the spread of land degradation and its impacts on agriculture production. Secondly, was to examine the contribution of human activities in affecting the rapid development of land degradation in Maharashtra and Gujarat areas. The final activity was to examine the efforts and methods by the state to regulate the issue of land degradation. Data was gathered utilizing interviews, observation, questionnaires and secondary data. Questionnaires and interview guide were utilized to gather information from 100 peasants and 5 village officials. Data collected was analyzed using qualitative and quantitative techniques, qualitative method comprised of observation, interview and documents reading; while quantitative method comprised of statistical charts (bar graphs and pie charts). The results showed that land degradation has led to the reduction of agricultural productivity and hence food production has also reduced. Additionally the research indicated that the government has not put more efforts to regulate the issue of land degradation since there are few extension officers. The research made some recommendations to the government; villages ought to be assigned qualified extension officers. The government should actively provide environmental conservation education particularly on land conservation practices. Farmers should be encouraged to plant drought resistant crops like millet and sorghum to address the issue of food shortages which is due to the effects of land degradation.

Chien (2021) conducted research to investigate the impacts of land degradation on agriculture in Germany. Two regions were chosen from the country while a town community was purposively chosen from each of the region. Stratified sampling method was utilized to choose almost 55% of the villages in every town and population of 200 participants were utilized in the research. The results from the research were: erosion (M=3.40), high usage of inorganic manure and agrochemicals (M=3.56) and building of roads and houses (M=3.53), were major reasons for land degradation in the region. High cost of input in agriculture (M=3.64) and rural urban movement were main impacts of land degradation in the area. Proof of the impacts of land degradation in the region was: Mean farm size reduced from 2.6 in 2010 to 0.96 hectares in 2015. The number of participants keeping goat reduced from 79.5% to 50.2% while the number of participants planting cassava reduced from 95% to 70.2% between these periods. A lot of the participants indicated that afforestation (80.1%), regulated cattle rearing (69.8%) as methods they utilize to avoid land degradation in the region. The research noted the importance to in cooperate land management and conservation strategies into agricultural extension programme so that farmers may be equipped and included practically in conservation/management of land for increased agricultural production.

Eswaran, Lal and Reich (2019) argued that land degradation with its effect on individuals has been one of the obstacles that pose a big risk to man and the socio-economic growth of his environment. It needs prompt faster and urgent attention which is needed to overcome and mitigate the impact of this scenario to attain sustainable growth. The goal of the research is to evaluate the effect of land degradation on agricultural production in Karnataka region with the aims of evaluating the cause and impact of land degradation, the soil preservation practice used and suggestions possible preventive and control strategies of land degradation for agricultural land uses. Primary and secondary information were used for the research. 220 questionnaires were given out to the participants for the attribute data needed. The research indicates that land degradation has led to disruption on the soil, roads, transport and the farmland in the research region. The research suggests that reforestation of farmland ought to be embraced on immediately for enhanced food production. Agro forestation need to care of intensive and sustainable land use practices to attain higher output. The region needs to have a proper master plan, refuse disposal van, construct sanitary land fill sites for good hygiene and measures to avoid any haphazard growth.

RESEARCH METHODOLOGY

The study used a descriptive research design. The collection of the data was done using a purposive sampling technique. Thus, the study purposively sampled 384 farmers from West Bengal, India. The analysis of the data was done using descriptive and inferential statistics. The study used tables to present the summary of the results.

FINDINGS

Correlation Analysis

The results presented in Table 1 describe the correlation analysis

Table 1: Correlation Analysis

		Agricultural productivity	Land Degradation
Agricultural productivity	Pearson Correlation	1.000	
	Sig. (2-tailed)		
Land Degradation	Pearson Correlation	-.414**	
	Sig. (2-tailed)	0.000	0.000

The correlation results from Table 1 show that land degradation is negatively and significantly associated with agricultural productivity (r=-.414, p=.000). This concurs with Chien (2021), who reported that land management and conservation strategies should be encouraged and agricultural extension programmes will equip farmers and direct them practically in conservation/management of land for increased agricultural production.

Regression Analysis

This section included model fitness, analysis of variance and regression of coefficient. The results presented in Table 2 shows the model fitness

Table 2: Model Fitness

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.414a	0.278	0.178	0.000058

The results from Table 2 indicate that land degradation was found to be satisfactory in explaining the agricultural productivity in India. This was supported by the coefficient of determination, also known as the R square of 0.278. This indicates that land degradation explains 27.8% of the variations in the agricultural productivity in both small- and large-scale farmers in India.

Table 3: Analysis of Variance

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	9.45	1	9.45	321.18	.000b
	Residual	11.21	382	0.029		
	Total	20.66	383			

The result in Table 3 shows that the overall model was statistically significant. The findings show that land degradation is a good predictor in explaining agricultural productivity among India's small- and large-scale farmers. This was supported by an F statistic of 321.18 and the reported p-value of 0.000, which was less than the conventional probability significance level of 0.05.

Table 4: Regression of Coefficient

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	0.445	0.035		12.71	0.057
Land Degradation	-0.608	0.251	0.552	2.42	0.003

Based on the results presented in Table 4, it was noted that land degradation is negatively and significantly related to agricultural productivity (β=-0.678, p=0.003). This was supported by a calculated t-statistic of 2.42, which is larger than the critical t-statistic of 1.96. Eswaran, Lal and Reich (2019) articulated that the reforestation of farmland ought to be embraced immediately to protect the land from being degraded. Agro forestation is needed to take care of intensive and sustainable land use practices to attain higher output. Land degradation can reduce the amount of rainfall experienced in an area, reducing agricultural productivity.

CONCLUSION

It is concluded that land degradation is negatively and significantly related to agricultural productivity. The issue of land degradation has led to a low level of agricultural productivity in many parts globally. Even if agriculture is the main economic activity in many regions of India, production has been decreasing due to land degradation issues. Human activities are the ones that cause the process of land degradation. Land degradation and agricultural productivity have, over the years, become an area of great importance globally due to the challenges they pose to sustainable growth in the world presently. Land degradation can reduce the amount of rainfall experienced in an area, reducing agricultural productivity.

RECOMMENDATIONS

The study recommended that sustainable agricultural practices deal with soil degradation. Estimating short, medium and long-range costs and benefits associated with soil degradation mitigation is essential. Enforcement of regular soil-quality monitoring at the local level plays an important role. The government needs to put more effort into regulating land degradation since there are few extension officers. The villages ought to be assigned, qualified extension officers. Also, the government should actively provide environmental education, particularly on land conservation practices. Strict policies need to be established to ensure that land degradation is discouraged.

REFERENCES

Al-Taai, S. H. H. (2021). Soil pollution-causes and effects. In IOP conference series: earth and environmental science. *Journal of Agriculture* ,48(11), 583-591

Bhatnagar, R. (2022). Desertification and Land Degradation: Concept to Combating. CRC Press. *International Journal of Agriculture* and *Conservation*, 6(8), 72-83

Chalise, D., Kumar, L., & Kristiansen, P. (2019). Land degradation by soil erosion in Nepal: A review. *Soil Systems*, 3(1), 12-18

Chien, C. (2021). *Simulation of GHG Impact and Calf Production from Converting Degraded Croplands to AMP Grazing in Southeast USA* (Doctoral dissertation, Harvard University).

Dwivedi, R. S. (2018). An Introduction to Land Degradation. In Geospatial Technologies for Land Degradation Assessment and Management (pp. 149-170). CRC Press.

Eswaran, H., Lal, R., & Reich, P. F. (2019). Land degradation: an overview. Response to land degradation. *Journal of Agriculture and Management*, 37(2), 41-49

Gupta, G. S. (2019). Land degradation and challenges of food security. *Journal of Agriculture* 46(13), 118-125

Hossain, A., Krupnik, T. J., Timsina, J., Mahboob, M. G., Chaki, A. K., Farooq, M., ... & Hasanuzzaman, M. (2020). Agricultural land degradation: processes and problems undermining future food security. In Environment, climate, plant and vegetation growth (pp. 17-61). Springer, Cham.

Kumar, B. P., Babu, K. R., Anusha, B. N., & Rajasekhar, M. (2022). Geo-environmental Monitoring and Assessment of Land Degradation and Desertification in the Semi-arid regions using Landsat 8 OLI/TIRS, LST, and NDVI approach. Environmental Challenges, 8, 100578. *Journal of Agriculture*,49 (7), 67-79

Lorenz, K., Lal, R., & Ehlers, K. (2019). Soil organic carbon stock as an indicator for monitoring land and soil degradation in relation to United Nations' Sustainable Development Goals. *Journal of Land Degradation & Development, 30(7), 824-838.*

Nendel, C., Hu, Y., & Lakes, T. (2018). Land-use change and land degradation on the Mongolian Plateau from 1975 to 2015—A case study from Xilingol, China. *Journal of Land Degradation & Development,* 29(6), 1595-1606.

Prăvălie, R. (2021). Exploring the multiple land degradation pathways across the planet. *Journal of Agriculture* ,48(7), 509-512

Talukder, B., Ganguli, N., Matthew, R., VanLoon, G. W., Hipel, K. W., & Orbinski, J. (2021). Climate change-triggered land degradation and planetary health: A review. *Journal of Land Degradation & Development, 32(16), 4509-4522.*

Thanh, B. N., Le Van Thuy, T., Anh, M. N., Nguyen, M. N., & Hieu, T. N. (2021). Drivers of agricultural transformation in the coastal areas of the Vietnamese Mekong delta. *Journal of Environmental Science & Policy*, 12(2), 49-58.

Wang, J., Lin, Y., Glendinning, A., & Xu, Y. (2018). Land-use changes and land policies evolution in China's urbanization processes. *Land use policy*, 7(5), 375-387.

Xie, H., Zhang, Y., Wu, Z., & Lv, T. (2020). A bibliometric analysis on land degradation: Current status, development, and future directions. *Journal of Agriculture and Land*, 9(1), 28-31