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Small Scale Subsistence Farming in Nalbari District of Assam, India and the Scope of Sustainable Development of the Households

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Abstract: Land is the free gift of nature to man for the sustenance of life and sustainable use of land resources is an inevitable choice for sustainable development. Maintaining productive land and healthy soils to ensure food security, sustainable development and restoration of degraded land is essential for the future of mankind. Small-scale farming does not require a large amount of land and this aspect enables the development of various crops and livestock in the neighbourhood. In the present study, Nalbari district of Assam, India has been taken and most of the inhabitants of case study villages in Nalbari district make their income from small-scale farming. Diversified uses of available land is one of the significant strategy adopted by households to remain sustained in their natural and human environment in the district. The sustainable use of land resource in the study area is based on indigenous knowledge systems. To compare various indicators generated from the primary survey of this study, standardization is required and Z-transformation method is used for standardizing indicators. Level of economic sustainability is high in Paramankhow, Mohina village (0.1 and above), medium in Haribhanga, Sataibari, No.1 larkuchi village (-0.25 to 0.1) and low in Tilana, Deharkatara, Paila, kachimpur, Suplekuchi, Sandheli, Barajal, Uttarkuchi, Barkuriha, Bajaliudaypur, Kalardia, Loharkatha, Chamata, Mohkhuli, Dahudi village (Less than -0.25). Based on composite Z score value, level of environmental sustainability is not high in the case study villages in Nalbari district. The type of soils and abundant rainfall are blessing for the commercial cultivation of different subtropical fruit crops such as Banana, Assam lemon, Mandarin orange, Coconut, Areca nut, Jackfruit, Papaya, Litchi, along with spice crops like Ginger, Turmeric, Chilli, Black pepper etc. in the district. The agriculture in entire district is organic by default, due to low use of agro chemicals in field and horticultural crops.

Keywords: Small-scale farming; Z transformation method; Organic agriculture; Environmental sustainability.

INTRODUCTION

All landscape change over time, either through human interference or by natural processes. It is essential that these changes are monitored and understood and that the uses to which the land is put are sustainable and that development meets the needs of the present without compromising the ability of future generations to meet their own needs(Farrington et al. 1970). Maintaining productive land and healthy soils to ensure food security, sustainable development and restoration of degraded land is crucial for the future of mankind (Pandi et al. 2016).

Nalbari district, Assam, India is the study place and many of the inhabitants in the case study villages in Nalbari district make their income from small-scale farming. Small-scale farming does not require a large amount of land and this aspect enables the development of various crops and livestock in the neighbourhood. Sustainable agriculture or subsistence farming of the district produces ample food without depleting the earth's resources or harming its environment, is a natural feature of small-scale farming. The sustainable use of land resource in the study area for economic, social growth is discussed with the help of Z score estimation from the primary data collected in 21 different villages considered for the study.

METHODS

To compare the various indicators generated from the primary survey in Nalbari district, Assam, India whose location map is shown in Figure1, standardization is required. Z-transformation method is used in this study for standardizing indicators into one standardized value with mean 0 and standard deviation. A few sample villages are selected for primary survey in the present study and, two categories of the village are selected – villages with small number of households (less than 500) and villages with more number of households (more than 500).

The pattern of economic sustainability of the study area based on indicators derived from the primary survey (Figure2).

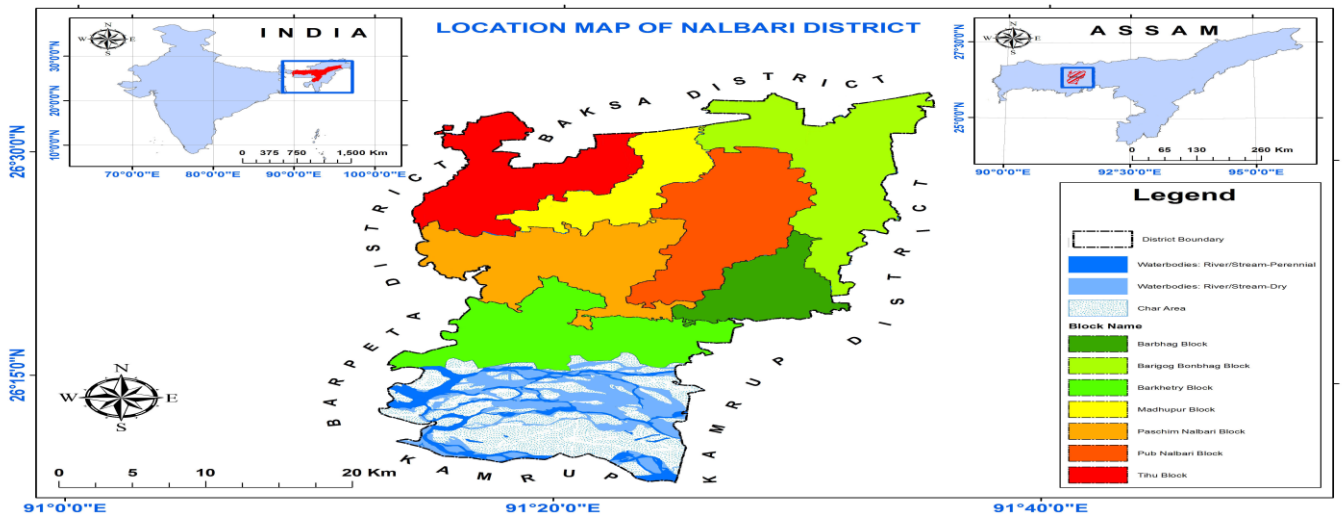

Figure1. Location of Nalbari district in the context of India

RESULTS AND DISSCUSIONS

Level of economic sustainability

The economic sustainability of a place is based on the utilization of natural resource and, the development of traditional agriculture and industries. Economic sustainability brings about an improvement in a country's entire social and economic processes of life.

Land is the most important natural resources for the survival and prosperity of human civilization. Land is the habitat of man and its wide use is crucial for economic, social and environmental advancement of all countries. As the pressure on natural resources intensifies, achieving sustainable development for the good of both society and the environment is a fundamental global challenge (Dhillon, R., & Moncur, Q. 2023). The economic sustainability of a nation is greatly influenced by the way and the extent to which land surface is used according to its capability and quality**.** The land management system is a function of population pressure and the type of land use.
The availability of resource and its utilization and management influences the level of economic sustainability of an area. Limited access to land is a very common approach to identifying smallholders (Eastwood et. al., 2007).

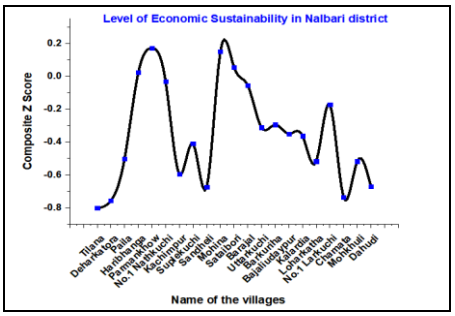

Figure2. Level of economic sustainability in the case study villages in Nalbari district, Assam, India

Figure 2 depicts that level of economic sustainability is high in Paramankhow, Mohina village (0.1 and above), medium in Haribhanga, Sataibari, No. 1 larkuchi village (-0.25 to 0.1) and low in Tilana, Deharkatara, Paila, kachimpur, Suplekuchi, Sandheli, Barajal, Uttarkuchi, Barkuriha, Bajaliudaypur, Kalardia, Loharkatha, Chamata, Mohkhuli, Dahudi village (Less than -0.25).

Level of social sustainability

Social sustainability combines design of the physical realm with design of the social world-infrastructure to support social and cultural life, social amenities, and

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systems for citizen engagement and space for people (Guastella et al. 2017).

Traditional themes of social sustainability such as employment and poverty are now substituted by soft and few measurable ideas such as joy and happiness, social interactions and maturity (Hendiani S. et al. 2020). A place without social sustainability cannot be termed as sustainable.

Social sustainability a condition and a process that improves a community's quality of life (Colantonio et al. 2010).Social sustainability is compatible with harmonious evolution of civil society, fostering an environment conducive to the compatible cohabitation of culturally and socially diverse groups encouraging social integration with improvements in the quality of life for all segments of the population (Eizenberg and Jabareen 2017).Adequate land utilization and management of a particular place helps in maintaining social sustainability which is examined in the present study(Figure 3 and Table1).

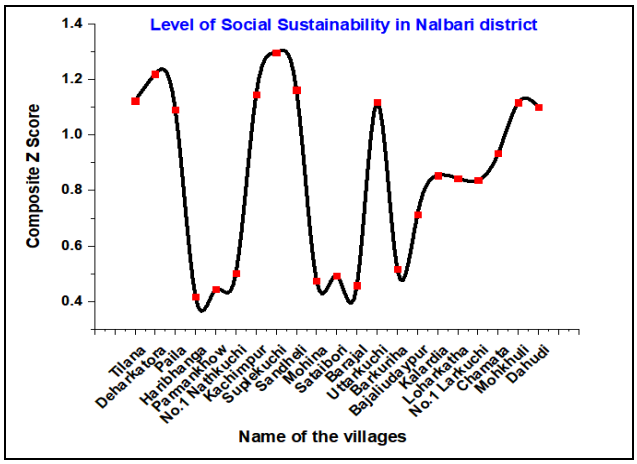

Figure3. Level of economic sustainability in the case study villages in Nalbari district, Assam, India

Table1 shows the different types of households (in %) and diversification of residential land uses (in %).

Table1. Level of social sustainability in the case study villages in Nalbari District *(Source: primary survey, 2016-2021)*

Name of the case study villages	% of the resource poor households (marginal and small land holding)(x_1)	% of the Household with Kitchen garden(x_2)	% of the household with Homestead Garden(x_3)	Nutritional density(x_4)	% of the Household with Pucca house(x_5)	% of the household with courtyard(x_6)	% of Diversification of residential land uses(x_7)
Tilana	85.71	90.62	34.37	23.24	51.19	98.80	1.28
Deharkatora	84.61	75.00	37.5	12.60	46.15	100	1.16
Paila	85.18	70.58	35.29	54.23	71.11	96.29	1.07
Haribhanga	58.84	88.43	52.60	11.75	73.78	99.39	0.90
Parmankhow	58.33	68.42	57.89	9.38	80.55	100	0.99
No. 1 Nathkuchi	74.61	90.29	56.31	85.78	82.23	99.49	0.89
Kachimpur	81.41	79.62	34.25	9.85	45.94	98.64	1.16
Suplekuchi	80	54.16	33.33	7.76	41.33	98.66	1.20
Sandheli	83.11	74.07	33.33	32.72	54.54	98.70	1.06
Mohina	57.14	89.81	50	10.49	47.61	99.04	1.22
Sataibori	57.14	86.20	51.72	9.07	50	97.32	1.27
Barajal	56.74	87.39	51.26	7.84	53.02	99.53	1.14
Uttarkuchi	71.42	57.14	42.85	16.57	33.33	95.23	1.15
Barkuriha	67.39	91.42	48.57	42.04	80.43	99.45	1.05
Bajaliudaypur	68.75	87.5	37.5	13.44	66.66	100	1.05
Kalardia	66.66	90.90	9.09	9.26	26.66	100	1.15
Loharkatha	72.11	79.50	3.27	45.63	62.53	99.15	1.11
No. 1 Larkuchi	71.75	98.07	5.76	22.79	49.61	98.47	1.15
Chamata	81.48	90.97	22.91	54.79	62.16	98.94	1.22
Mohkhuli	81.39	93.75	25	15.38	36.04	95.34	1.26
Dahudi	83.16	91.89	21.62	13.77	50	98.97	1.21

Sandheli, Uttarkuchi, Mohkhuli, Dahudi, village (above 1), medium in No. 1 Nathkuchi, Barkuriha, Bajali udaypur, kalardia, Loharkatha,No. 1 Larkuchi village (0.5 to 1) and

Environmental awareness is gaining more importance in recent years because of environmental crisis. Thus, the present day needs environmentally conscious citizens who can save mother earth from artificial and natural disaster.

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Awareness can create a positive attitude towards environment as well as sustainable development. It is thus realized that rehabilitated environments play a central role in the provision of ecosystem services and achieving the UN's Sustainable Development Goals (Yirdaw et al. 2017).

Environmental sustainability is considered as strategic and most important in the recent decades as the world environment is degrading and human lives are in constant threat. Environmental sustainability is an important dimension of sustainable development. In the case of the environmental sustainability indicator, it is important to highlight the role of agricultural activity as a vehicle for promoting sustainability. That is, it appears that farmers are the ones who represent the highest values, maintaining the trend around them. This study focused the role of farmer in preserving the landscape and protecting biodiversity.

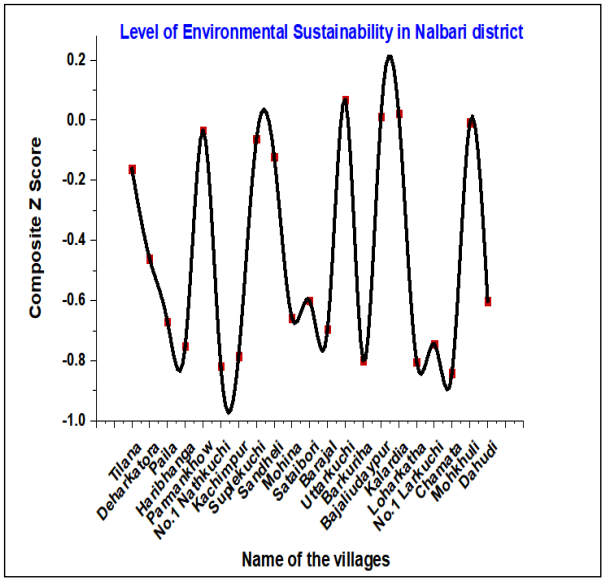

Figure4. Level of environmental sustainability in the case study villages in Nalbari district, Assam, India
in the study.

Environmental sustainability involves ecosystem integrity, carrying capacity and biodiversity. Environmental sustainability is one of the biggest issues faced by the mankind at present. Ever increasing human population and increment in per capita consumption has put great constraint on the natural resources. In addition to this, urbanization, industrialization and modern agricultural practices have created constrains to environment and sustainability.

Figure 4 shows that, based on composite Z score value, the level of environmental sustainability is not high in the case study villages in Nalbari district. The level of social sustainability found medium in Tilana, Sandheli, Uttarkuchi, Bajaliudaypur, Kalardia village (-0.25 to 0.1). In Deharkatara, Paila,Haribhanga, Paramankhow, No. 1 Nathkuchi, Kachimpur, Suplekuchi, Mohina, sataibari, Borajal, Barkuriha, Loharkatha, No. 1 larkuchi, Chamata, Mohkhuli, Dahudi village , level of environmental sustainability is found low (Less than -0.25) in the study. Level of sustainable development of the case study villages varies from one to the other. Among the case study villages, Barajal village has low level of density in respect of economic, social and environmental development. Tilana, No.1 Nathkuchi and No.1 Larkuchi villages have higher level of economic, social and environmental sustainability in comparison to the other villages surveyed

Development and potential agri sector

Paddy cultivation is the principal crop of the district. This crop is grown thrice in a year as winter paddy (sali rice), autumn paddy (Ahu rice) and as summer paddy (boro rice). The area under summer and autumn paddy is low in the district mainly due to high cost of cultivation and less remunerative return. Thus, adoption of scientific methods will boost up the rice production in the district as well as economy of the district.

The type of soils and abundant rainfall are blessing for the commercial cultivation of different subtropical fruit crops such as Banana, Assam lemon, Mandarin orange, Coconut, Areca nut, Jackfruit, Papaya, Litchi, along with spice crops like Ginger, Turmeric, Chilli, Black pepper etc. in the district. These crops are mainly grown in homestead gardens popularly known as *Bari*, to meet out their domestic demands and only the surplus if any, is sold in markets. There is a high demand for horticultural crop in Assam as well as in Nalbari district like Areca nut, Banana etc.

Spatial pattern of sustainability in the 21 numbers of case study villages has been shown (figure 5).

Organic agriculture is an ample opportunity for in the district. The agriculture in the entire region is organic by default, due to low use of agro chemicals in field and horticultural crops.

A little effort can open up new vistas in the export oriented agricultural scenario of the district.

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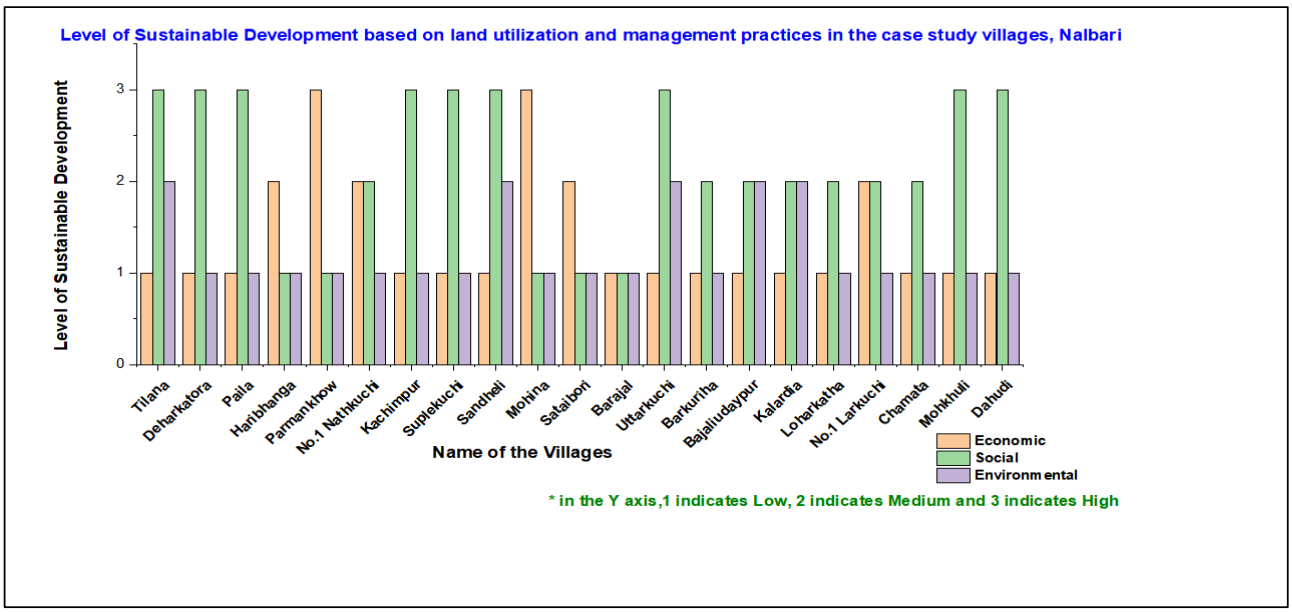

Figure5. Spatial pattern of sustainability in the case study villages in Nalbari district, Assam, India

Diversification and growth

Diversification of agriculture has to be a major element in the strategy for accelerating agricultural growth of Nalbari district, Assam, India. Though the district enjoys abundant rainfall, uneven distribution of rainfall over time hinders the production in rain fed areas. Watershed management, rainwater harvesting and ground water recharge can help augment water availability in rain fed areas. Micro–irrigation is also important to improve water use efficiency in areas where water availability is limited.

With the changing demand scenario, diversification of crops and cropping system has become imperative in the district. For most crops optimal farm is small in scale and most gain in terms of both sustainable productivity increase and rural poverty reduction

In view of the preponderance of small and marginal farms in the district, it becomes the responsibility of the research system to generate technologies tailored to the needs of the small and marginal farms, in order that they may be diffused easily within the social system. For this, capacity building, skill upgradation and entrepreneurship development program for the inhabitants are needed.

Vertical expansion of cultivation with multi-cropping, using comparatively less land is only viable options left to farmers.

CONCLUSION

Most of the inhabitants in the case study villages in Nalbari district, Assam, India makes their income from small-scale farming. Small-scale farming does not require a large amount of land and this aspect enables the development of various crops and livestock in the neighbourhood. Sustainable agriculture or subsistence farming of the district produces ample food without depleting the earth's resources or harming its environment, is a natural feature compatible with sustainable growth of the households. Indicators typically involve social, economic and environmental measures in order to capture the three major aspects of sustainability and Z transformation method is used in this study to analyse various level of sustainability. With the development in the agricultural sector; land resource of the district will enhance its potentiality for sustainable development. The agriculture in the entire region is organic by default, due to low use of agro chemicals in field and horticultural crops. It can open up new vistas in the export oriented agricultural scenario of the district. There is a vast scope of area expansion as well as productivity increase of almost all the major crops in Nalbari district. Knowledge and skill development of rural people both in agriculture and non - agriculture sectors is essential for achieving economic and social goals.

Acknowledgement

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Conflict of Interest

There are no conflicts of interest declared by the authors.

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