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Research Article

Population Growth, Agricultural Production and Productivity and Size of Holding: A Case Study of Cachar District of Assam.

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Abstract

In recent years, one of the major issues in the world, especially, in LDCs has been the alarming rate of poverty, unemployment, food security. In India this has been a huge problem due to increase the growth of population with fewer resources. Therefore, the need to provide adequate food for entire population becomes a huge concern to the entire populace. This grim condition was put forwarded earlier in the Classical Economist by Robert Tomas Malthus, an English Economist and Demographer. He predicted that population growth is exponential while agricultural productivity growth follows a linear trends, food demand would inevitably, eventually outstrip supply capacity thereby causing mass starvation. A.K Sen also reached on a same conclusion. Whereas, Economist Ester Boserup (1965) identified a proportional relation between population growth and agricultural productivity. The study focusses on the relationship between population growth, agricultural production and productivity and size of holdings. For identifying the relation between population growth and agricultural production and productivity and size of holding the data was collected through a questionnaire from 287 samples. The statistical tools applied for study were Multiple Regression analysis.

Keywords: Population growth, Productivity, Size of Holdings, Multiple Regression
JEL classification: Q15, C21, C31 C35 C93

1. Introduction:

One of the important consequences of fast growth rate of population is increasing pressure on agricultural land. Barak valley is not only one of the most densely populated areas of Assam, but also for entire North–East India. The growth of population in this valley has been rapid owing to both natural factors and impact of immigration in consequences of part of India. One way of measuring the increasing pressure of population is to find out per capita availability of cultivable land. But a more meaningful way of operational point is to find out the changes in the average size of holding. Population growth in general and growth of population in particular has a negative impact on the size of holding in present agriculture. This leads to certain difficulties and loss of efficiency in agricultural operation.

In recent years, one of the major issues in the world, especially, in LDCs has been the alarming rate of poverty, unemployment, food security. In India this has been a huge problem due to increase problem with fewer resources. Therefore, the need to provide adequate food for entire population becomes a huge concern to the entire populace. This grim condition was put forwarded early in the Classical Economist by Robert Tomas Malthus, an English Economist and Demographer. He predicted that population growth is exponential while agricultural productivity growth follows a

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linear trends, food demand would inevitably, eventually outstrip supply capacity thereby causing mass starvation. Thus, there is needed for population control to equilibrated supply and demand of food.

In recent times, this theory has been criticized by other Economist with many factors, which Malthus did not consider when putting forwarded this theory (Gazu Lakhotia, 2011). This has been subject to keen controversy as he was regarded as a Pessimistic Economist by others. These criticisms are based on his inability to relate his theories to the history of Western Countries as population has failed to grow as rapidly as he predicted in these areas and production as well as increased due to Technological advancement. As a result of this living standard of people has increased tremendously instead of falling as he predicted in his theory.

Another Economist Ester Boserup (1965) accused Malthus of basing his theory of the law of diminishing return which is applied to Agricultural production. She put forward an 'Invention push 'agricultural changes which make it possible to substitute Technological input like the use of fertilizers in Agricultural production, better seeds for production of quality foods and the use of agricultural machineries to increase food production.

Population growth has been resulted in the unsustainable use of natural resources, which is the basic foundation for livelihood without having concerned for the future. This has led to tremendous effect on our natural resources. Over the years, there have been several symptoms of Ecological stress like the declining agricultural land area, very low crop yield, soil erosion, which has forced so many migration activities to the cities and low standard of living by the poor. All these effort can produce long term, possible permanent damage to the environment, which in term would have a huge negative effort on agricultural productivity and production. The unequal distribution of agricultural land is often cited as a source of inefficiency in agriculture (Vollarth, 2007), most of these problems are closely related to a simple factor of human population, which had exceeds the carrying capacity of the land. Again subsidizing farmers to rent land without helping them in becoming well-equipped could result in resource misallocation towards larger farms using less-efficient labour-intensive technologies (Sheng et al, 2019).

The relationship between the farm size and productivity is not cleared among the Economist. While some hold the view that there is an inverse relationship between the farm size and productivity. Others argue that no such relationship between farm size and productivity. Some Economist also argues that such relationship is positive i.e. as the farm size increases, productivity also increases. A group of Economists hold the view that, productivity is neutral as between the different farm sizes. Some Economist adopted a midway. They argue that inverse relationship holds over certain range of size and not overall ranges of size. Thus, in relation to farm size and productivity we have different views. This debate was started by A.K Sen. He reached on a conclusion that, an inverse relationship between the size of the farmers and the productivity is existed in India. As the size of holding increases, productivity decline. This conclusion implies that, productivity is higher on small, rather than on large farmers. Many other Economists Deepak Mazumder, A. M. Khusero, G.R. Saini and C.H. Hanumantha Rao also analyzed the data and reached on the same conclusion. However, as rightly observed by Chand et al (2011) the lives of smallholding families can be improved only by building on their higher per acre agricultural productivity and by promoting off-farm rural employment as it has been found in India a from the initial years of the 21st century show that smallholdings in Indian agriculture still exhibit a higher productivity than large holdings.

2. Review of Literature:

Small-scale farmers play an important role for food security and poverty alleviation. However, whether and how these small farms can survive under globalization is a hot debated topic (Fan and Chan-Kang, 2005). On the early attempts to examine the relationship between farm size and productivity A.K.Sen(1962) stated that agricultural productivity per acre decreased with increase in

size of land holdings. The inverse relationship was derived based on size class data; and Sen himself was however, aware of the limitation of his conclusion since he was using only aggregated data. Sen (1964) subsequently gave three alternative lines of explanation for this phenomenon, (i) technique-based, (ii) labour-based, and (iii) fertility-based. Hanumanta Rao (1964) observed that the inverse relationship between farm size and productivity is a confirmed phenomenon in Indian agriculture. The relationship between productivity and size of farm and found that in the majority of cases, an inverse relationship existed; however, it was not statistically significant Krishna Bharadwaj (1974). Another important contribution to this debate is by Chadha (1978) who looked at farm level data for three agro-climatic regions in the Punjab for the year 1969-70. He found that the inverse relationship had ceased to hold in the more dynamic zones. Rudra and Sen (1980) found that Indian agriculture with regard to the relationship between farm size and productivity; negative relation may hold in certain parts of the country at certain times but not everywhere and every times. Madhusudan Ghosh (1989) examined the changes in the agrarian structure of rural West Bengal during the seventies. He hypothesised that in a dualistic agrarian structure in which large farms under-utilise land due to shortage of family labour and small farms under-utilise family labour due to scarcity of land, a reduction in the degree of inequality in the distribution of operational land would favourably affect agricultural productivity. He suggested that a reduction in inequality of land distribution through appropriate land reforms would result in higher agricultural productivity in West Bengal. Raj Krishna (1994). A study by Chattopadhyay and Sengupta (1997), using farm level disaggregated data for 1989-90 for West Bengal, suggests that "the inverse relation between farm size and productivity becomes stronger in the agriculturally developed regions of West Bengal compared to the relatively less developed regions. This is possibly due to the effects of green revolution on smaller size farms. The conclusions of this study have however been questioned by Dyer (1998). Dorward (2007) in an interesting study on the relationship between farm size and agricultural productivity in smallholder agriculture in sub-Saharan Africa found a positive relationship between farm size and productivity in both labour-scarce and land-scarce smallholder farming. On a critical examination of the data and methodology, Dyer concludes that the study by Chattopadhyay and Sengupta is defective. He however suggests that more disaggregated farm level data analysis needs to be carried out, especially using larger sample sizes. Further, a wider range of data need to be collected which relates centrally to peasant differentiation, technological dynamism and the development of capitalist form of agriculture. In a study in Ethiopia Josephson et al (2014) found high rural population density resulting from increased population growth was associated with smaller farm sizes that had a positive effect on input demand, represented by increased fertilizer use per hectare. Overall, increased input use did not lead to a corresponding increase in staple crop yields, and thereby farm income declined as population density increased.

Thus there are only few studies on the present issue in Assam with special reference to Cachar District of Barak Valley, in fact there has been no work on the relationship between population growth and agricultural productivity, population growth and size of holding in Cachar district of Assam. Therefore, the study relates to a new area and it has a novelty of approach.

3. Objectives of the Study:

The objectives of the study were as follows:

1) To study the relationship between the population growth and size of holding by standard statistical method;
2) To study the impact of changes in the average size of holding on agricultural productivity; and
3) To study policy implication from the analysis of data obtained from our case study.

4. Hypothesis:

1) Population growth has resulted in overcrowded agriculture and reduces the efficiency of agricultural productivity.

2) Population growth has resulted reduced size of agricultural land.

5. Data and Methodology:

The study is based on primary data. For evaluating the objectives of the study, primary data are collected by survey using well-structured and pre-tested questionnaire. The primary data related to growth rate of population, agricultural production and productivity and size of holdings were collected. Respondents were personally interviewed to ensure accuracy and comprehension.

Study Area: This study has been carried out in fourteen villages of Cachar District covering five development blocks namely: Narshingpur Block, Salchapra Block, Kalain Block, Udharband Block, and Borjaeanga Block. From each block data were collected from two villages, constituting 287 samples. The present study seeks to examine the population growth and agricultural productivity and size of holding in Cachar district of Assam. This case study also intended to highlight of socio-economic status Cachar district, and purposive sampling method is followed in data collection. The study is limited to Cachar district of Assam only.

Methodology: For analyzing Socio-Demographic Profile of Individuals and Household Characteristics of the Micro Finance Institutions simple arithmetic mean, percentage and standard deviation tools are applied. Similarly for explaining perception based analysis among respondents, simple percentage was calculated. Lastly, for identifying the relation between population growth and agricultural production and productivity and size of holding Multiple Regression technique is applied.

6. Results and Discussions:

This section deals with the results and discussions in the form of: (6.1.) Socio-Demographic Profile of Individuals and Household Characteristics, and (6.2) Regression results of Population Growth Agricultural Production and Productivity and Size of Holdings. (6.3) the relationship between Population Growth and Size of Land Holdings:

6.1: Socio-Demographic Profile of Individuals and Household Characteristics of the Micro Finance Institutions

Table 1 below presents Socio-Demographic Profile of Individuals and Household Characteristics of the respondents of 10 villages (287 respondents) of Cachar District of Assam:

Table 1. Socio-Demographic Profile of Individuals and Household Characteristics

Variable	Percentage(%)/Mean ±SD
• Age (Years) [Mean ±SD]	36.16 ±11.36
• Maximum age (Years)	65.00
• Minimum age (Years)	20.00
Caste:	
• General	37.64
• OBC	51.93
• SC	8.30
• ST	2.13
• Age at marriage (Years)[Mean ±SD]	20.20±2.61
• Maximum Age at marriage (Years)	30.00
• Minimum age at marriage (Years)	17.00
Social Status:	
• BPL	37.89

• APL	62.11
Educational Qualification: • Matriculation • Higher Secondary • Graduate • Post Graduate • Others	 40.00 20.00 32.73 3.64 3.64
Type of House: • Semi Pakka • Pakka	 36.16 63.84
Availability of Electricity	100.00
Cooking Fuel Used: LPG	100.00
Source of Drinking Water: • Public tap/ Stand pipe • Ponds, Tube well or Bore well	 83.73 16.27
Availing any of Govt. aided facility	77.19

Source: *Calculated by authors on the basis of Primary Data.*

Table 1 presents Socio-Demographic Profile of Individuals and Household characteristics of the respondents. It is clear from the table that mean age of the respondents is 36.16 years where maximum and minimum ages are 65 and 20 years respectively. Among the respondents majority that is 51.93% belong to OBC, 7.36% belong to general category, 8.30% belongs to SC and 2.13% belongs to ST category. Mean age at marriage 20.20 years with maximum 30 and minimum 17 years among the respondents. Among the respondents 81.82% are BPL are 18.18% found APL. In case of educational qualification most of the respondents are found Matriculate (40%), followed by Graduate (32.73%), Higher Secondary (20%), Post Graduate and Others (3.64%) each. None of the respondents are found illiterate and all were availing electricity and clean source of fuel, LPG (100%). In case of house type it is found that 36.16% have semi-pakka houses and only 63.84% have pakka houses. 83.73% household drinking water from Public tap/ Stand pipe sources and 16.27 % from Ponds, Tube well or Bore well. It is also found that though 37.89% of the respondents are BPL and 62.11% of the respondents are APL and 77.19% stated to avail any government aided facility.

6.2. Regression results of Population Growth Agricultural Production and Productivity:

We run a family of regressions to explain Amount of Credit on Socio-Economic Factors. Which are presented in table (2)

Multiple Linear Regression:

In this study dependent variable is the Agricultural productivity and the independent variable is the Population Growth. The Multiple linear regression takes the following form:

Y_C (Agricultural Productivity) = α (intercept) + β X (Population Growth) + μ (error)

The test of significance is depending on the dependent variable and independent variable. In this study dependent variable is Population Growth and the independent variable is the Agricultural Productivity.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.889[a]	.791	.790	9841.146
a. Predictors: (Constant), DV: Population Growth, IDV: Agricultural Productivity				

Sources: *Computed from Field Survey*

In this study, to measure the impact of the Population Growth on Agricultural Productivity, regression was applied. The model explained is 79% of the variance (R Square = .791) and shown in the above table 2.

Table 3: ANOVA

Model	Sum of Squares	Df	Mean Square	F	Sig.
Regression	109214919784.491	1	109214919784.491	1127.692	.000[b]
Residual	28860753894.176	298	96848167.430		
Total	138075673678.667	299			
a. Dependent Variable (DV): Agricultural Productivity					
b. Predictors: (Constant), and independent variable Population Growth					

Sources: *Computed from Field Survey*

Table 3 (ANOVA) table shows whether the IDVs have a significant impact on the DVs. The significance value is less than 0.05 (0.000), which reflects one of more of the IDVs significantly influence the DV.

Table 4: Coefficients

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	7028.855	1177.292		5.970	.000
Population Growth	10055.918	299.451	.889	33.581	.000
a. Dependent Variable: Agricultural Productivity					

Sources: *Computed from Field Survey*

Table 4 shows that population growth has resulted in overcrowded agriculture and it has also increased the efficiency of agricultural productivity. Here null hypothesis is rejected and alternative hypothesis is accepted that population growth has not effected on agricultural productivity.

6.3: Perceptions of Respondents the Relationship between Population Growth and Size of Land Holdings:

Table 5 presents opinion and perceptions about the Relationship between Population Growth and Size of Land Holdings:

Perceptions of Respondents the Relationship between Population Growth and Size of Land Holdings	Yes (%)	No (%)	Cannot Say (%)
Have you observed an increase in the population of your region over the past 5 years?	79.67	9.33	11.0
Do you believe that the increase in population has influenced the size of land holdings in your region?	39.67	17	43.33
Have you noticed changes in the use of land (e.g., agriculture, urban development) due to population growth?	62.67	30.67	6.67
If you own land, have you faced any challenges in managing your land due to population growth?	41.67	53.33	5
Do you perceive any economic impact on landowners as a result of population growth?	51.67	48.33	0
Have there been community discussions or initiatives regarding the interplay between population growth and the size of land holdings?	98	2	0
Are there government policies or interventions addressing the relationship between population growth and land holdings in your region?	1.75	98.25	0

Source: Calculated by authors on the basis of Primary Data.

Table 5 above presents perceptions of the respondents that is the relationship between Population Growth and Size of Land Holdings. When asked about an increase in the population of your region over the past 5 years 79.67% respondents were found satisfied while 9.33% were not and 11%were found can't say. Among the respondents 39.67% believe that the increase in population has influenced the size of land holdings while 17% were not agreed and 43.33% respondents could not state anything about it. 62.67% of the respondents were noticed changes in the use of land (e.g., agriculture, urban development) due to population growth while 30.67% were not. When asked about any challenges in managing your land due to population growth, 41.67% agreed but majority that is 53.33% did not agree while 5% respondents could not state anything. Any economic impact on landowners as a result of population growth, 51.67% respondents agree, while 48.33% disagree. Among respondents 98%

found that community discussions or initiatives regarding the interplay between population growth and the size of land holdings, while 2% did not found. Finally 1.75% of respondents agree that government policies or interventions addressing the relationship between population growth and land holdings while 98.25% were found less interested.

7. Conclusion and Policy Recommendations

The population growth in Cachar district of Assam has posed challenges and opportunities for agricultural production and productivity, and size of holdings. As the population expands, there is increased demand for food, placing pressure on agricultural systems. To sustainably address this, policies should focus on promoting modern farming techniques, providing access to technology, and investing in agricultural infrastructure. Moreover, addressing the issue of landholding size is crucial. Small landholdings limit the adoption of mechanization and modern farming practices. Policy interventions should aim at land consolidation, promoting cooperative farming, and ensuring equitable distribution of resources to enhance productivity. Moreover, a comprehensive population management strategy is essential. Encouraging family planning, improving healthcare, and fostering education can help in achieving a balance between population growth and sustainable resource utilization. Collaborative efforts between governmental and non-governmental organizations are pivotal to the success of such initiatives.

The issue of landholding size significantly influences productivity and environmental outcomes. Policies should prioritize land consolidation, encourage cooperative farming models, and ensure equitable resource distribution to optimize land use and enhance overall agricultural productivity. Sustainable farming practices and the promotion of climate-resilient crops must be central components of these policies to mitigate environmental degradation. The should be included implementing population management strategies, emphasizing family planning, improving healthcare, and promoting education for achieving a balanced demographic growth. Collaborative efforts between government and non-government entities are essential to success. Policymakers should prioritize environmentally sustainable agricultural practices, promoting efficient land use and fostering a resilient agricultural sector that meets the needs of a growing population while safeguarding the environment for future generations.

In conclusion, the intricate interplay between population growth, agricultural production, productivity, environment, and landholding size demands a holistic and integrated approach for sustainable development. Rapid population growth exerts pressure on food resources and necessitates strategic policies focused on advanced agricultural practices, technology dissemination, and farmer education. Concurrently, addressing the environmental impact of agricultural activities is imperative for long-term sustainability.

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