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# The Growth of the Agriculture Sector: An Empirical Analysis in Assam

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## ABSTRACT

The growth of the agriculture sector played a dynamic role in the development of developing economies. The sector significantly contributed to the total NSDP in the state Assam. The sector played a vital role in the rural economy of Assam. Therefore, the present research investigates the economic growth of the agriculture sector in the state Assam during the period 1970 to 2018. The research applied the classical growth model to investigate the annual average growth rate of the sector. The research applied Chow test as well as Andrews-Quandt test to investigate the structural break of the growth rate in the sector during the period. The research observed that all the sub-sectors of the agriculture sector have structural break in 1991 in Assam.

**Key words:** Agricultural growth, Structural break, Average growth rate, Economy

The agriculture sector contributes significantly to the overall development in the state Assam. It has many aspects. It is the principal source of employment for the large proportion of people in rural area. However, the rapid growth of the population leads to the change of the agricultural scenario in the state. The agriculture sector occupied the highest share of land in the state. Again, the share of net area as well as gross area of the sector continuously increased in the state. The sector significantly contributed to the income of the state. The sector possesses the fertile land which beneficial for the growth of the sector [1]. Similarly, the production of the sector significantly depends on the rainfall. The production of rice is the prime crop in the state. The uses of different types of fertilizers, pesticides etc. leads to the high growth of the sector in the state.

The agriculture sector played a vital role in the development of Assam. The contribution of the agriculture sector to the total NSDP of Assam increased almost three times higher in 2018 as compared to the year 1970. Though the sector failed to increase its sectoral share in the total NSDP of Assam, but the sector still contributed a large share to the total NSDP. However, the sectoral share of the agriculture sector to the total NSDP reduced from 44.56% to 17.32% during the period 1970 to 2018 in the state Assam [2]. The contribution of the sectoral share of the agriculture sector to the total NSDP of Assam is higher during the pre-reform period as compared to the post-reform period. The share of the agriculture sector to the total NSDP reduced from 44.56% to 33.76% during the pre-reform

period, i.e., 1970 to 1991. Similarly, the share of the agriculture sector to the total NSDP reduced from 33.98% to 17.32% during the post-reform period, i.e., 1992 to 2018 [3].

The development of the irrigation facilities is most important for the growth of the agriculture sector. The state facilitated different types of irrigation sources namely shallow tube wells, low lift pumps etc. for the growth of the sector. But the sector still faced water scarcity problem during cultivation periods. Similarly, the cropping intensity of the sector more or less stagnant in the state. However, the sector has the potential to improve the cropping intensity, agricultural yield etc. through improving the irrigation facilities. The improvement of such factors significantly determines the agricultural growth. Similarly, the mechanization of the sector has been improved in the state as compared to the traditional periods [4]. However, the sector still used traditional implements such as bullocks in the cultivation as well as harvesting process.

The agricultural sector of the state faced different types of problems namely floods and erosion, capital deficiency, marketing issues etc. Such problems stand as a hinderance to the economic growth of the sector. The sector faced capital deficiency due to different institutional problems. The agricultural farmers of the state faced credit problems during the cultivation periods. It is because of the inaccessible of the banking loan facilities to the farmers due to the lack of collateral in the hands of the farmers. As a result, the farmers are forced to take loans from some other unauthorized sources which again creates problems for them [5].

All these features of the agriculture sector in the state motivated to further investigate of the development of the sector. The purpose of the present research is to investigate the economic growth of the sector in the state Assam during the period from 1970 to 2018. The study also investigated the structural break of the growth rate of the sector. The paper

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decomposed into the following sections. After the introduction, the paper reviewed different research papers and highlighted it briefly in the section II. Then the research discussed different types of methodologies used in the present research work under section III. The paper analyzes the empirical results in the section IV. Finally, the paper concluded the research under section V.

## MATERIALS AND METHODS

The purpose of the present paper is to investigate the economic development of agriculture sector in Assam. Generally, economic development is perceived from economic growth. The annual average growth rate of the agriculture sector is a key measure of economic growth. Consequently, the present research estimated the economic average annual growth rate of the agriculture sector in Assam during the period 1970 to 2018 using the classical growth model.

**Annual Average Growth Rate:** The study applied the following classical growth model to estimate the average annual growth rate:

$$\ln y_t = \alpha + \beta t + \varepsilon_t$$

$\ln y_t$  = Natural logarithm of the net state domestic product of the agriculture sector in Assam.

$t$  = Time (various years)

The study applied the familiar Chow test method to investigate the structural break of the sector. The research applied the Chow test as well as Andrews-Quandt test to investigate the structural break. The Chow test has limitation since it is based on the known break point. For example, the new economic policy of India was implemented in 1991, then the year has been considered as a known structural break point in Chow test. But, Andrews-Quandt test based on the unknown break point is an appropriate method to investigate the structural break. The study applied the method to find the unknown break point of the sector in the state.

## RESULTS AND DISCUSSION

The research investigated the economic growth of the different sub-sectors of the agriculture sector of Assam during the period 1970 to 2018.

### Performance of the agriculture sector

The research observed that agriculture & allied activities sector achieved 1.81% of economic growth during the period 1970 to 2018. But the sector achieved higher growth rate during the post-reform period (3.62%) as compared to the pre-reform period (2.35%).

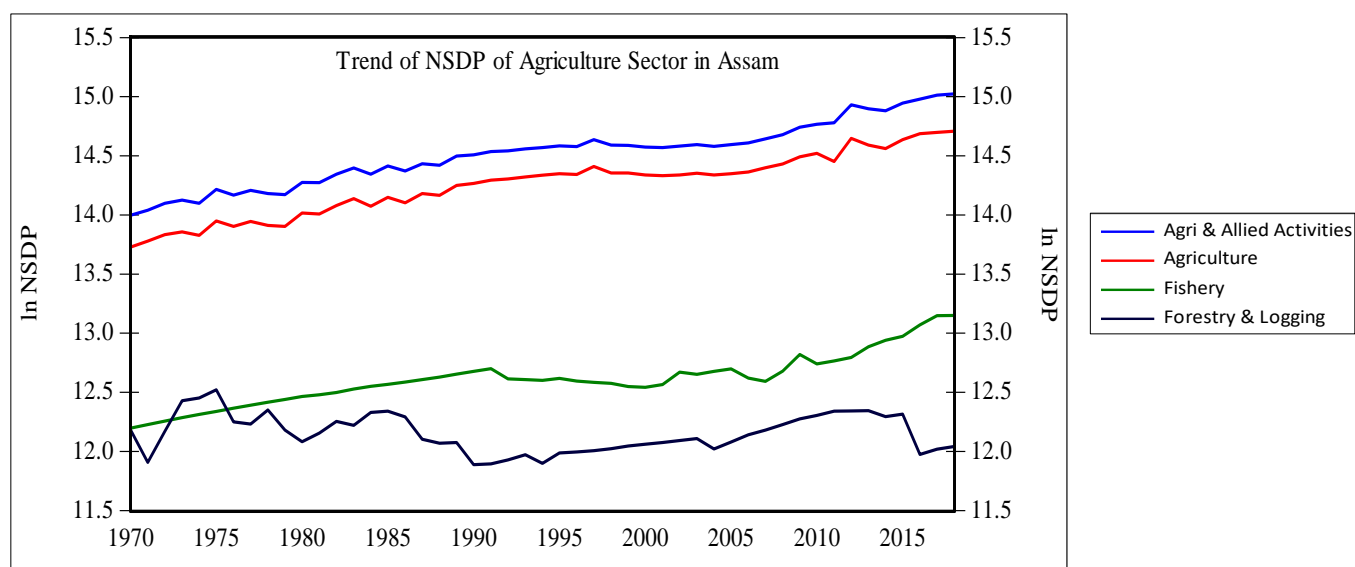


Fig 1 Trend of NSDP of agriculture sector in Assam during 1970 to 2019

Table 1 Annual average growth rate of agriculture sector in Assam since 1970 to 2018

Periods	Growth rate			
	Agriculture and allied activities	Agriculture	Forestry and logging	Fishing
Whole period (1970-2018)	1.8078	1.6641	-0.4988	1.6396
Pre-reform (1970-1991)	2.3457	2.7774	-2.1918	2.1470
Post-reform (1992-2018)	3.6165	2.2052	0.8816	3.6551

The research observed that agriculture sector achieved 1.66% of growth during the period 1970 to 2018. However, the sector achieved high growth rate during pre-reform period (2.78%) than the post-reform period (2.21%). The agriculture sector of the state faced different problems due to which the sector achieved smaller growth rate in Assam. Flood and river erosion is one of the primary causes of reduction of agriculture growth in the state. The problem significantly losses the agricultural production. The government of Assam reported that the state faced serious flood problems in the year 1972, 1977, 1988, 1998, 2002, 2004 and 2012. The report noted that significant share of cropped area affected due to the flood

problems in the state. In addition to the flood problem, river erosion problem substantially affected the agricultural land in the state. The problem also affected numbers of villages which leads to the huge amount of land losses especially in the rural economy [6].

Again, fragmentation of land holdings is one of the serious causes of reduction of agricultural growth in Assam. The numbers of marginal farmers continuously increased in the state. The use of modern technologies, implements, significantly depends on the area of land possess. The cost incurred to the use of modern technology in the small size of land is greater as compared to the large size of land. Again, the

accessibility of the institutional credit to the marginal farmers is smaller as compared to the large size farmers. It intends the marginal or small size farmers to use traditional implements in the production process. However, the marginal farmers tend to borrow from the non-institutional sources namely traders, money lenders etc. which again creates some problems to the marginal farmers. Similarly, area used for the agricultural activities tends to be decreases in the state during the post-reform period as compared to the pre-reform period. Such causes lead the sector to achieve smaller growth rate in the state [7].

Unfortunately, forestry and logging sector achieved negative growth rate i.e., -0.50% during the period 1970 to 2018. The sector highlighted negative growth rate (-2.19%) during pre-reform period. But the sector achieved positive growth rate during post-reform period (0.88%). The sector earned a significant amount of income from the forest resources. The state covered five national parks (recently the state covered two more national parks), 17 wildlife sanctuaries, 3 proposed wildlife sanctuaries, 4 tiger reserves, 5 elephant reserves 2 biosphere reserves and 2 world natural heritage sites (Kaziranga National Park and Manas Wildlife Sanctuary). The

sector contributed significant amount of income to the state from such forest resources due to the growth of the such points as a tourist attraction. Again, the legal exploitation of other forest resources such as sand, stone, clay etc. increased in the state which substantially contributed to the state income especially during the post-reform period.

The research observed that fishing sector achieved 1.64% of economic growth during the period 1970 to 2018. However, the sector achieved higher economic growth during the post-reform period (3.66%) as compared to the pre-reform period (2.15%). The amount of fund invested for the development of fishery sector increased in the state. The government of Assam sanctioned numbers of bills to the public for the fish production. Again, the government of Assam provided numbers of individual fisheries to the beneficiaries for the growth of the fish production. Similarly, different types of implements such as fishing net, modern technologies accessible to the fisherman in the state [8]. The sector also improved its traditional method of fish production to the modern fish cultivation technique such as integrated farming technique, biofloc fish farming etc. The development of the sector in such a way leads to the larger growth sector in the state.

Table 2 High and low growth sectors in the economy (1970-2018)

Classification of growth rates	Sectors
High ( $> 5\%$ )	Nil
Medium ( $2\% \leq \text{and} < 5\%$ )	Nil
Low ( $0\% \leq \text{and} < 2\%$ )	Agriculture (1.6641%) and Fishing (1.6396%)
Negative ( $< 0\%$ )	Forestry (-0.4988%)

Table 3 High and low growth sectors in the economy (1970-1991)

Classification of growth rates	Sectors
High ( $> 5\%$ )	NA
Medium ( $2\% \leq \text{and} < 5\%$ )	Agriculture (2.7774%) and Fishing (2.1470%)
Low (Low ( $0\% \leq \text{and} < 2\%$ ))	NA
Negative ( $< 0\%$ )	Forestry (-2.1918%)

Table 4 High and low growth sectors in the economy (1992-2018)

Classification of growth rates	Sectors
High ( $> 5\%$ )	NA
Medium ( $2\% \leq \text{and} < 5\%$ )	Agriculture (2.2052%) and Fishing (3.6551%)
Low ( $0\% \leq \text{and} < 2\%$ )	Forestry (0.8816%)
Negative ( $< 0\%$ )	NA

The research categorized the growth of the different sub-sectors of the agriculture and allied activities sector on the basis of its growth rate. The research observed that none of any sub-sectors achieved either high growth or medium growth rate during the period 1970 to 2018. Agriculture as well as fishing sectors achieved low growth rate in the state. Unfortunately, forestry highlighted negative growth rate. Similarly, none of the any other sectors achieve high growth rate during either pre-reform or post-reform period. However, agriculture and fishing sectors improved its performance and achieved medium growth rate during both pre-reform and post-reform period. The forestry sector highlighted negative growth rate during pre-reform period. But the forestry sector developed and achieved its growth from negative to the positive growth rate in the state

during the post-reform period [9].

#### Structural break in the growth rate

The research investigated the structural break for the different sub-sectors of the agriculture and allied activities sector in the state Assam during the period 1970 to 2018. The research applied Chow test as well as Andrews-Quandt test to investigate the structural break in the sectoral growth rate. The Chow test is based on the known break point. The new economic policy of India has been implemented in Indian economy in the year 1991. Therefore, the research considered year 1991 as the known break point. The following table highlights the results of Chow test of the different sub-sectors:

Table 5 Chow statistic with specified break year 1991

Sectors	F-Statistics	P-Value	Remarks
Agriculture and allied activities	3.561055	0.0367	Significant
Agriculture	9.225517	0.0004	Significant
Forestry	11.46796	0.0001	Significant
Fishing	11.27773	0.0001	Significant

The research observed that all the sub-sectors of the agriculture & allied activities sector have the structural break in the year 1991. The research also applied Andrews-Quandt test to observe the unknown break point of all the sub-sectors in the state during the period 1970 to 2018. However, the result of the test is different than the Chow test. The research observed that

different sectors have different break point. For example, agriculture sector has the break in 2000 while forestry sector has in 1987. Again, fishing sector has the break in 1997. The following table highlights the result of Andrews-Quandt test of the different sub-sectors:

Table 6 Andrews-Quandt test statistic

Sectors	Maximum LR F-Statistics	P Value	Year
Agriculture and allied activities	35.39222	0.0000	2000
Agriculture	33.55798	0.0000	2000
Forestry	15.12837	0.0000	1987
Fishing	27.34649	0.0000	1997

Table 7 Classification of growth rates on the basis of known structural break

Classification of growth rates	Sectors	
	Structural break in 1991	No structural break
Low ( $0\% \leq$ and $< 2\%$ )	Agriculture, Fishing	Nil
Negative ( $< 0\%$ )	Forestry	Nil

The research categorized all the sectors on the basis of the growth rate of the sectors as well as results of the Chow test. The research observed that though agriculture and fishing sectors achieved smaller growth rate during the period from 1970 to 2018, but the sectors highlighted structural break in 1991 [10]. Similarly, forestry sector of Assam which failed to achieve positive growth rate during the period 1970 to 2018 has the structural break in 1991.

## CONCLUSION

The research observed that agriculture sector failed to achieve larger growth rate in the state during the period 1970 to 2018. However, the sector achieved the larger growth during pre-reform period as compared to the post-reform period. The sector faced different problems such as floods & erosion, fragmentation of land holdings, decrease of agricultural land

area etc. which impacts on the growth of the sector. Again, the research observed that forestry and logging sector achieved high growth rate during post-reform period. It is because, the sector significantly earned from its different forest resources such as national parks, sands, stones etc. Similarly, due to the importance of the government of Assam in favor of the fishing sector, lead the sector as larger growth rate sector as compared to the other agricultural sub-sectors in the state during the post-reform period. The improvement of the fishing technique from traditional to the modern substantially improve the growth of the sector. Therefore, on the basis of such observations the research suggested that the Government of Assam requires to initiate more appropriate agricultural policies for the development of the agriculture sector. The government also requires to focus on the flood and erosion problem for the benefits of the agriculture sector in the state.

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