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# DOES AGRICULTURE MATTER FOR ECONOMIC GROWTH OF UTTAR PRADESH (INDIA)?[1]

*Twenty-five years have passed since economic reform in India. It brought about many macroeconomic policy changes in the economy. Although these policy changes helped the manufacturing and services sector to grow, agriculture did not get any direct benefits from economic reforms. It was assumed that it would get indirect benefits due to changes in exchange and trade policy, liberal industrial licensing system and reduction in industrial protection, which would benefit tradable agriculture by ending discrimination against it and by turning the terms of trade in its favour. The present study examines the transformation in agriculture and basic contributory roles i. e. product, market, and factor contribution of agriculture in the economy of Uttar Pradesh. Further, a long run association and causal relation between agriculture and other economic sectors and sub-sectors are explored. An understanding of the relationship between agriculture and overall GDP growth becomes important from a policy maker's perspective, as it would guide the decisions in allocating the scarce resources to attain growth and development. Results show that Product, market, and factor contribution has increased over the years. Empirical estimates show that agriculture is a driver of the unregistered manufacturing sector, transport storage and communication sector; and overall economy as a whole. Public investment in irrigation should be accelerated, cost-effective and yield-raising technology should be accessible to medium and small farmers. Micro and small agro-based enterprises should be established according to specific regional crops, so they can work closely with the agriculture sector and reap the benefits of easy availability of raw material.*

**Keywords:** economic development, economic reform, time series analysis, cointegration, Uttar Pradesh, India, agriculture, transformation, Granger causality, macroeconomic policy

## 1. Introduction

Development economists have debated over the relative importance of various sectors as the key source of economic growth over the years. A number of studies have empirically analyzed the contributory role of agriculture in economic growth and development that suggested agriculture as an engine of growth while few economists have emphasized the importance of Industry in economic growth. Many economists presented the contributory role of agriculture in the economic development in different ways [1–13]. While another group of economist argued that industrial growth is required for the development of any economy [14–16], economic development is associated with the declining share of agriculture in the economy [17], and growth of the non-agriculture sector is supported by transfer of resources from agriculture sector [18].

Until 1991, India's macroeconomic policies were conservative. In the year 1991, the Government of India brought many macroeconomic policy reforms in the economy due to the financial crisis of the late 1980's. These policy changes compelled a significant structural change in the Indian economy and helped manufacturing and services sectors to grow, although, agriculture did not get any direct benefit from these economic reforms. It was presumed that agriculture would get benefitted indirectly due to changes in exchange and trade policy, the gradual dismantling of the industrial licensing system and reduction in industrial protection; which would benefit tradable agriculture by ending discrimination against it and by turning the terms of trade in its favour [19]. Agriculture policy comes under state government list in India.

India has a wide range of the climate across the country and different natural resources are found across the states. Therefore, a state-wise comprehensive study is needed on the contribution of agriculture to economic growth and development. Earlier, state wise economic performance has been evaluated in different studies [20–21]. In the present study, the role of agriculture in the economy of Uttar Pradesh in the post-reform period is analyzed. Uttar Pradesh is the fourth largest and most

Table 1

**Five-year compound annual growth**

| | CAGR of Sectoral Growth | | | | | | Sectoral Share | | |
|---|---|---|---|---|---|---|---|---|---|
| Period | AGL | IND | SERV | GSDP | | Year | AGL | IND | SERV |
| 1990–91 to 1995–96 | 1.83 | 4.04 | 2.97 | 2.77 | | 1990–91 | 41.16 | 22.01 | 36.82 |
| 1995–96 to 2000–01 | 2.76 | 3.38 | 5.06 | 3.81 | | 1995–96 | 39.45 | 22.58 | 37.97 |
| 2000–01 to 2005–06 | 2.14 | 6.05 | 6.49 | 4.91 | | 2000–01 | 33.44 | 22.65 | 43.90 |
| 2005–06 to 2010–11 | 2.54 | 8.24 | 10.15 | 7.76 | | 2005–06 | 27.67 | 24.82 | 47.51 |
| 2010–11 to 2014–15 | 3.62 | 3.53 | 7.55 | 5.75 | | 2010–11 | 21.55 | 25.72 | 52.73 |
| 1990–91 to 2014–15 | 2.59 | 5.93 | 6.62 | 5.27 | | 2014–15 | 19.91 | 23.44 | 56.65 |
| CV (1990–2015) | 100.16 | 80.17 | 46.97 | 49.61 | | | | | |

Source: Author's calculation based on CSO, MOSPI data.

populated state in India. In term of population, it is the fifth largest administrative unit in the world. An understanding of the relationship between agriculture and overall GDP growth becomes important from a policy maker's perspective, as it would help in the planning of state agricultural policy and decision regarding the allocation of scarce resources.

## 2. Structure and Growth of the Uttar Pradesh Economy

Traditionally, India has been an agrarian economy, and same is the case with Uttar Pradesh. Most of the population, directly and indirectly, depends on agriculture for their livelihood. Western Uttar Pradesh was among the first region in which green revolution was initiated that helped the region to become a leader in food grain production. Uttar Pradesh produced 17.83 percent of India's total food grain in 2016–17. Wheat, rice, maize, millet, and pulses, such as beans, peas, and lentils, are the major food crops. Uttar Pradesh is one of the major producers of sugar cane in India. Cotton, oilseeds, jute, potatoes, and tobacco are other important cash crops. In 2016–17, Uttar Pradesh was the largest vegetable producer to the tune of 26.40 million tonnes. Having the large base of skilled labour, Uttar Pradesh is coming up as an emerging player in the IT industry, especially software, BPO, and electronics. U.P is gaining status in semiconductor industry development in Noida. The Investment policy 2004 and infrastructure investment policy 2012 provided an excellent investment climate. During 2000 to 2017, the state got US$ 614 million as FDI equity flow. But, on the other side, Uttar Pradesh is facing a serious debt problem, having a debt to GDP ratio of 30.1 percent, which is higher than the national average of 21 percent in 2015. According to a state government study, 93 percent of the businesses are small, hiring less than 10 employees. Only 0.01 percent of industries are employing more than 1000 employees. A wide range of disparity and high de-

pendence of agriculture on rainfall is observed in the state. Industrialization is highly skewed to the western region only.

At the time of the economic reform, the economy was dominated by agriculture sector having 41.16 percent share. Over the years, its contribution has declined while the share of the services sector has increased. Just after the economic reform, the growth of agriculture remained very low due to the transfer of resources away from the agriculture sector. The overall economic growth also remained 2.77 percent from 1990–91 to 1995–96. But in the late 1990s, agriculture was somewhat revived along with a high growth of the services sector, that leads to 3.1 percent per annum economic growth during 1995–96 to 2000–01. From 2000–01 onwards, the share of agriculture started declining sharply. The contribution of agriculture was 33.44 percent in 2000–01, which declined to 19.91 percent in 2014–15. In the same period, the share of services sector increased at a very high pace. It increased to 56.65 percent from 43.90 percent. Services sector experienced the growth rate of 6.49 percent and 10.15 percent in 2000–01 to 2005–06 and 2005–06 to 2010–11 respectively. Increasing share and the growth of services sector in the economy is attributed to the growth of construction and transport sectors. Other than these two sectors, newly developed IT industry in NCR of Uttar Pradesh has also contributed in the growth of services sector. Results of the coefficient of variation indicate that agriculture sector growth has been highly unstable during 1990–91 to 2015–16.

## 3. Transformation of Agriculture in Uttar Pradesh since Economic Reform

In this section, transformation in major agriculture indices such as the growth of food grain yield, net sown area, gross cropped area, cropping intensity, the share of GCA across various Crops has been examined. Further changing pattern of the use of consumable agricultural inputs like fertilizers, FYM, pesticides treated area, use of du-

**Transformation in Major Agriculture Indices since Economic Reform**

| Agricultural indices | TE 1992–93 | TE 2002–03 | TE 2014–15 | | CAGR | |
|---|---|---|---|---|---|---|
| | | | | | TE 1992–93/ TE 2002–3 | TE 2002–03/ TE2014–15 |
| Growth of Food Grain Yield (Kg./Hectare) | 1709.8 | 1871 | 2154 | | 0.91 | 1.18 |
| NSA (1000' hec.) | 17258.2 | 17513 | 17284.7 | | 0.15 | −0.11 |
| GCA(1000' hec.) | 25478.43 | 26240.33 | 27003.6 | | 0.30 | 0.24 |
| cropping intensity | 147.63 | 149.8 | 156.2 | | 0.15 | 0.35 |
| **% Share of GCA (Across the various Crops )** | | | | | | |
| Rice | 21.6 | 22.9 | 23 | | 0.59 | 0.04 |
| \Wheat | 34.2 | 36.6 | 37.5 | | 0.68 | 0.20 |
| Pulse | 11.7 | 10.5 | 9.1 | | −1.08 | −1.19 |
| Total Food Grain | 79.7 | 79.9 | 78 | | 0.03 | −0.20 |
| Sugarcane | 7.4 | 8.2 | 8.4 | | 1.03 | 0.20 |
| Condiment & Spices | 0.3 | 0.3 | 0.3 | | 0.00 | 0.00 |
| Fruits & Veg. | 3.5 | 3.8 | 4.3 | | 0.83 | 1.04 |
| Total Food Crops | | 92.4 | 91.1 | | NA | −0.12 |
| Oil-seed | 4.4 | 3.2 | 4.2 | | −3.13 | 2.29 |
| Cotton | 0.1 | 0 | 0 | | −100.00 | NA |
| Fibers | 0.1 | 0 | 0 | | −100.00 | NA |
| Plantation | 0.3 | 0.7 | 1.5 | | 8.84 | 6.56 |

Source: Land use statistics, Directorate of Economic and Statistics, ( MoA &FW).
NSA; Net sown area, GCA, Gross cropped area.

rable agricultural inputs including electric pump set, power tiller, use of a tractor and institutional credit for agricultural purpose is analyzed. For the robustness of the results, triennium ending value has been used. Table 2 shows that in the 1990s, the growth of food grain yield was just 0.91 percent per annum while in the next 15 years, growth stood at the rate of 1.18 percent. Yield growth in Uttar Pradesh was less than the national average during TE 1993 to TE 2006 [19]. Before the green revolution, output growth was characterized by area growth. But due to the huge pressure of urbanization and industrialization, there are negligible chances of area growth now. Net sown area reveals a negative growth rate during TE 2002–02 to TE 2014–15. Growth in the gross cropped area brought some positive signals for Uttar Pradesh agriculture. It has increased at the rate of 0.35 per annum during the last 15 years. Cropping intensity has increased from 149.8 to 156.2 as a result of partial mechanization and adoption of fast-maturing varieties of crops. As far as the share of GCA across the various crops is considered, table 2 reveals that a marginal decline (-0.20 percent annum) has been recorded in the area under food grain during TE 2002–03/ TE 2014–15. A low growth rate of area under various crops shows that agricultural practices in Uttar Pradesh are structurally rigid and exhibit a traditional character of Indian agriculture. However, a marginal increase in area under sugarcane, fruits & vegetable oilseed, plantation crops, demonstrating a low level of diversification towards high-value crops.

The modernization and mechanization of agriculture is the leading driver of output growth in agriculture. Regarding the use of consumable input in agriculture such as Fertilizers, FYM, and Pesticides, data reveals that farmers are relying on chemical inputs. The compound annual growth of fertilizer was 8.4 and 3.8 percent during 1991–2001 and 2001–2011 respectively. A very high growth (13.9 percent) has been observed between the years 2001–2011, in the area treated with pesticides. The area covered under pesticides treatment has increased more than 3 times in Uttar Pradesh in the last 15 year as compared to the 1990s. About the use of durable input in agriculture, the growth of electric pumps turns out to be positive during 2001–2011 from negative during 1991–2001. Use of power tillers has been showing a declining trend; however, the rate of deceleration is very low during 2001–2011 as compared to 1991–2001. A huge growth in the use of tractor for agricultural purposes has been seen. The table 3 shows that growth rate in both periods was 17.6 percent and 33.8 percent. The increased use of tractors has reduced the time in ploughing and transporting the produce to the market. A drastic increase in agricul-

**Transformation in the use of various Agricultural Inputs**

| Agricultural Input | 1991 | 2001 | 2011 | CAGR | |
| --- | --- | --- | --- | --- | --- |
| | | | | 1991–2001 | 2001–2011 |
| **Use of Consumable Agricultural Input** | | | | | |
| Fertilizers(105metric tons) | 14.8 | 30.5 | 42.8 | 8.4 | 3.8 |
| FYM ( 105 metric tons) | 637 | 146.4 | 60.8 | −15.1 | −9.3 |
| Pesticides Area treated (Mh) | 1.6 | 1.7 | 5.5 | 0.68 | 13.9 |
| **Use of Durable Agricultural Input** | | | | | |
| Electric Pump set (number in "000") | 1492 | 896 | 986 | −5.5 | 1.1 |
| Power Tiller (number in "000") | 411 | 299 | 293 | −3.5 | −0.2 |
| Tractor used for agriculture purposes (number in "000") | 287 | 1237 | 16975 | 17.6 | 33.8 |
| Institutional credit for Agri.purpose (Rs in Cr.) | 0.73 | 2591.5 | 32853.3 | 148.0 | 32.6 |

Source: Agriculture census ( MoA &FW).

ture credit has also been recorded, which is a good sign for the state economy. A study by [22] empirically proved that agricultural credit leads the agricultural growth and agricultural growth further reduces poverty and brings prosperity for the farming community. The above discussion reveals that agriculture in Uttar Pradesh has gone through a structural transformation with a paradigm shift in production and use of consumable and durable inputs.

## 4. Basic Contribution of Agriculture in Economy of Uttar Pradesh

Kuznet (1964) suggested four basic contributions of agriculture [4]. These are the product contribution or forward linkage effect; (2) the market contribution or backward linkage effect; (3) the factor contribution; (4) the foreign exchange contribution. In this section, a brief discussion of these contributions of agriculture in Uttar Pradesh's economy is presented. Product contribution of agriculture can be understood by the size of agriculture in the economy [18]. Despite the declining share in GSDP, agricultural contribution in terms of the real amount has increased by 1.87 times since 1991 economic reform. In food grain production, Uttar Pradesh has ranked first, producing 36.74 million tonnes in 1990–91, which increased to 45.74 million tones with the share of 18.13 of India's overall production in 2015–16 (Directorate of Economics & Statistics, DAC & FW). Per capita availability of items like egg and milk has increased by 2 times and 1.43 times respectively. Another important contribution of agriculture is to provide the raw material for textile, cotton, sugar, vegetable oil, leather goods, coffee, tea and food processing industries. These industries are directly dependent on agriculture for raw material. Mehta reported that there are 44740 agro-processing units in Uttar Pradesh. Agro-based industries constitute 25.81 percent of the total industries with a 23 percent share in total employment [23]. Agriculture offers a market for durable and consumable agricultural input industries in the rural areas. Engel's law says that with rising income, household consumption on non-food items increases. Agriculture is the major income generating activity in rural Uttar Pradesh. Agricultural growth leads to income growth of the farmers. This income growth further provides the market for FMCG and durable items. NSSO surveys reveal that in the rural areas of Uttar Pradesh, MPCE on non-food items has increased to 47 percent in the 68th (2011–12) round from 38.5 percent in the 50th (1993–94) round. During similar rounds, expenditure on durable goods has increased by 21.5 percent. It implies that in the rural areas, people have started spending on non-food items especially durable goods. Therefore, the rural market is certainly a potential market for many FMCG and durable items. There are two broad ways of factor contribution of agriculture. One is labour contribution, the other is a capital contribution. Lewis two-sector model suggests that agriculture sector releases labour to the modern sector [24]. NSSO survey (50th round, 1993–94) reported that 800 people out of 1000 are usually employed in the agriculture sector but in 2009–10, it declined to 625 out of 1000. A huge increment in employment generation by wholesale/retail trade, construction, and transport sector has been observed. It confirms the Lewis model of economic development. Regarding foreign exchange contribution, there is a lack of state-wise export data. Hence, the direct conclusion cannot be drawn. India has huge potential in cereals, sugar, meat and edible meat offal export [25]. These are the major items produced in Uttar Pradesh. Uttar Pradesh can reap the benefits of this potential by focusing more on quality production of these items for international markets.

## 5. Data and Methods

### 5.1. Data

The study is based on secondary data. Annual time series data of Gross State Domestic Product (*GSDP*) and *GSDP* from different sectors of Uttar Pradesh have been collected from reports and publications in National Accounts Statistics, published by Central Statistical Organisation (Ministry of Statistics and Programme Implementation, Government of India). Data has been taken from 1990 to 2015. Splicing technique has been used to convert all series on one base year.

### 5.2. Econometrics Approach and Formulas Used

For the purpose of the analysis of the long-run association between agriculture and others sector growth, Cointegration approach has been employed. In the time series analysis, simple correlation some time provides spurious correlation. For the application of cointegration, time series should be stationary. Therefore, the nature of the time longitudinal data is examined by using Augmented Dickey and Fuller (*ADF*) Test. Subsequently, Johansen and Juselius maximum likelihood technique, based on VAR model is applied for cointegration [26]. The test of stationarity has been carried out by estimating the following regression equation:

$$\Delta Y_t = \beta_0 + \psi Y_{t-1} + \sum_{i=1}^{m} \beta_i \Delta Y_{t-1} + \mu_t. \quad (1)$$

Whereas *i* varies from 1 to *m*.

Equation (1) shows the random walk model with drift.

Here the hypothesis used for inference is following:

H0: $\psi = 0$ (non-stationary series), H1: $\psi \neq 0$ (stationary).

Generalized cointegration equation is given below.

$$\Delta Y_t = \mu + \sum_{I=1}^{L-1} AGL_t Y_{t-k} + \Pi Y_{t-1} + \varepsilon_t. \quad (2)$$

Where $Y_t$ is a ($n \times 1$) column vector of the variables. $\mu$ is a ($n \times 1$) vector, which may include a linear trend term, an intercept term, or both. $\Pi$ is the coefficient matrics, which contains information about long run the adjustment to change in $Y_t$. $\Delta$ is the first difference operator. Akaike's information criterion (AIC) is employed to determine the lag length (*k*). $\varepsilon_t$ is the error term. The $\lambda$ max test and the trace test are the two methods for examining the cointegration in the Johansen cointegration test.

Further, Granger causality has been analyzed to confirm causal relations between agriculture and other economic sectors in the short run. This test predicts how much of the current value of different economic sectors is explained by the past value of the agricultural sector and vice-versa. Generalized equation is as follows

$$X_t = \alpha_0 + \sum_{i=1}^{k} \Phi_i AGL_{t-1} + \sum_{j=1}^{k} \Psi_j X_{t-j} + \varepsilon_t. \quad (3)$$

Similarly $X_t$ is, causing $AGR_t$ if some coefficient, $\Theta_i$, is non-zero in the following equation.

$$AGL_t = \beta_0 + \sum_{i=1}^{k} P_i X_{t-1} + \sum_{j=1}^{k} \delta_j AGL_{t-j} + \mu_t. \quad (4)$$

Where *X* is used for *GSDP* (gross state domestic product), *IND* (Industrial sector), *MAN* (manufacturing sector), *MANR* (manufacturing registered), *MANUR* (manufacturing unregistered), *S.S* (Services Sector), *TSC* (Transport, Storage and Communication).

The Compound Annual Growth Rate (*CAGR*) is estimated by the following formulas (5)

$$CAGR = \left[ \left( \frac{V_0}{V_n} \right)^{1/n-1} \right] - 1. \quad (5)$$

Where $V_0$ is the base year value, $V_n$ is the value in the last year; *n* is the number of years.

## 6. Results

The objective of this empirical analysis is to examine whether agriculture is cointegrated with other economic sectors and sub-sectors such as services, manufacturing (registered), manufacturing (unregistered) Transport, Storage, and Communication. If cointegration exists between agriculture and other sectors, it implies that agriculture is moving with other sectors in the long run. Thereafter, to understand the causal flow from agriculture to other sectors, Granger causality has been explored with the null hypotheses that "agriculture sector growth does not cause the growth of other sectors". Rejection of the null hypothesis signifies that the growth of the agriculture sector causes the growth of other sectors.

The *ADF* unit root test is used to examine the stationarity of a univariate series of *GSDP* from agriculture, Overall *GSDP*, and series of other sectors and sub-sectors. Table 4 presents the results of the *ADF* test revealing that all the series cannot reject null hypotheses "there is unit root" at level but rejects at first difference at 5 percent level of significance. It indicates that all the series are integrated at *I* (1). It fulfills the sufficient condition to apply Johansen test of cointegration. Results of Johansen cointegration of reduce rank regression using the vector error correction models are presented in Table 5. The Johansen $\lambda_{trace}$ and $\lambda_{max}$

Table 5

**Johansen's Cointegration Tests for Agriculture and Other Economic Sectors**

| Sectors | Trace Statistics | | | Max-eigen statistics | |
|---|---|---|---|---|---|
| | $\lambda_{trace}$ | P-value | | $\lambda_{max}$ | P-value |
| **Agriculture and GSDP** | | | | | |
| Ho: $r = 0$ | 17.935 | 0.005 | | 17.383 | 0.004 |
| Ho: $r \leq 1$ | 0.552 | 0.520 | | 0.552 | 0.520 |
| **Agriculture and Manufacturing (Registered)** | | | | | |
| Ho: $r = 0$ | 25.078 | 0.000 | | 24.294 | 0.000 |
| Ho: $r \leq 1$ | 0.784 | 0.433 | | 0.784 | 0.433 |
| **Agriculture and Manufacturing (Unregistered)** | | | | | |
| Ho: $r = 0$ | 32.493 | 0.000 | | 30.731 | 0.000 |
| Ho: $r \leq 1$ | 1.762 | 0.217 | | 1.762 | 0.217 |
| **Agriculture and Services** | | | | | |
| Ho: $r = 0$ | 25.236 | 0.010 | | 22.598 | 0.004 |
| Ho: $r \leq 1$ | 2.638 | 0.650 | | 2.638 | 0.650 |
| **Agriculture and Transport, Storage and Communication** | | | | | |
| Ho: $r = 0$ | 32.714 | 0.002 | | 28.972 | 0.001 |
| Ho: $r \leq 1$ | 3.741 | 0.779 | | 3.741 | 0.779 |
| **95 % critical value** | | | | | |
| Ho: $r = 0$ | 12.321 | | | 11.229 | |
| Ho: $r \leq 1$ | 4.129 | | | 4.130 | |

Notes: Significant at * 0.05 and ** 0.10 levels; values in parentheses indicate MacKinnon-Haug-Michelis (1999) *p*-values.

Table 6

**Granger causality test between agriculture and other economic sectors**

| Null Hypothesis | *F*-Statistic | *P*-value | |
|---|---|---|---|
| **Agriculture and GSDP** | | | |
| GSDP does not Granger Cause AGL | 1.763 | 0.202 | AGL → GSDP |
| AGL does not Granger Cause GSDP | 4.683* | 0.024 | |
| **Agriculture and Manufacturing (Registered)** | | | |
| MAN (Registered) does not Granger Cause AGL | 1.411 | 0.271 | Inconclusive |
| AGL does not Granger Cause MAN (Registered) | 1.630 | 0.225 | |
| **Agriculture and Manufacturing (Unregistered)** | | | |
| MAN (Unregistered) does not Granger Cause AGL | 1.042 | 0.374 | AGL → MANUR |
| AGL does not Granger Cause MAN (Unregistered) | 3.241** | 0.064 | |
| **Agriculture and Services** | | | |
| Services Sector does not Granger Cause AGL | 6.444* | 0.009 | AGL ↔ SS |
| AGL does not Granger Cause Services Sector | 2.894** | 0.085 | |
| **Agriculture and Transport, Storage and Communication** | | | |
| TSC does not Granger Cause AGL | 0.354 | 0.707 | AGL → TS&C |
| AGL does not Granger Cause TSC | 2.843** | 0.089 | |

* indicates significant at 5 % level, ** indicates significant at 10 % level.

analysis estimates reject the null hypothesis of non-cointegration ($r = 0$) at 0.01 level of significance for all sectors and sub-sectors with *GSDP* from the agricultural sector. It concludes that growth of the agriculture sector has adequate capability to predict the growth of other economic sectors and subsectors.

Since the cointegration analysis only reveals the long run relationship between the variables, Granger causality analysis is further employed to determine the direction of the causal relationship among the agriculture sector and other economic sectors and subsectors. The results indicate that agriculture sector has uni-directional causality with overall gross state domestic product, the unregistered manufacturing sector, and transport, storage & communication sector; while a bi-directional relationship is found between agriculture and services sector. The estimates of agriculture and manufacturing (registered) show in-

conclusive results. It implies that agriculture has been supporting the growth of gross state domestic product, the unregistered manufacturing sector, and transport, storage & communication sector. Agriculture and services sector are mutually driving the growth of each other. Broadly, an industrial unit having less than 10 employees comes under unregistered manufacturing. According to ASI survey (2005–06), there were 9301 industrial units in Uttar Pradesh, among which, 25.81 percent are agro-based industries. An ASSOCHAM report (2016) reveals that out of 44 lakh MSME units in Uttar Pradesh, more than 90 percent are unregistered. Food products units have 15 percent share in total MSME units (Directorate of Industries, Uttar Pradesh, 2011–12). In addition, there are 3 percent leather products based MSME units in total MSMEs. It shows that more than 18 percent units directly depend upon agriculture for raw material. It confirms the causal relation between agriculture and unregistered manufacturing sectors.

Up to a large extent, employment in the unregistered manufacturing sector depends upon the growth of agriculture sector. Most of the crops are grown under a specific climate and a high variation is found in India across different regions. Most of the agricultural products are perishable in nature; therefore, well-organized transportation, storage, and communication systems are required for higher form, place and time utility. Increasing per capita income of the people change their tastes and preferences. This increase the demand for different food varieties in different regions. Consumers are demanding food which is grown all over the country. Transportation and storage closely work with the agriculture sector to fulfill the demand. As a result, a huge business and employment opportunities are generated in these two sectors. Other components of the services sector such as trade, hotels & restaurants and construction sector are directly and indirectly related to the agriculture sector. Empirical results verify that agriculture is one of the major drivers of the services sector. Causality runs from services sector to the agriculture sector. Because a developing services sector increases the incentive of farm produce and encourages the farming community for more production.

## 7. Conclusion and Policy Implication

Development economists have debated over the relative importance of various sectors as the key source of economic growth over the years. The contribution of agriculture varies between time periods within an economy. Economic reform of 1991 brought many macroeconomic policy changes in the Indian economy. Agriculture did not directly get benefitted from economic reforms, but it was expected to get indirect benefit due to changes in exchange and trade policy, the gradual dismantling of the industrial licensing system and reduction in industrial protection, which was assumed to benefit tradable agriculture by ending discrimination against it and by turning the terms of trade in its favour. In the changing economic environment and declining intervention of government in economic regulation, the role of agriculture in economic growth is a subject of the research. The present study analyzed the basic contributory role of agriculture in the economy of Uttar Pradesh since economic reform. Further, using cointegration and Granger causality test, this study empirically determines whether agriculture has been a driver of growth of the Uttar Pradesh economy.

Uttar Pradesh is the fourth largest in term of area and the most populated state of India. In term of population, Uttar Pradesh is the fifth largest administrative unit in the world. Agriculture in the state has transformed drastically since the economic reforms. Its share in the economy has declined from 41.16 percent in 1991 to 19.91 percent in 2014–15 of *GSDP*. Growth rate during this period has remained low at 2.59 percent per annum and highly unstable. The services sector has become the dominating sector of the economy. Cropping pattern has been slightly diversified to high-value crops. Output growth has been characterized by yield growth instead of area growth. Use of chemical input, tractor, and credit for agricultural purposes has been increasing, especially since 2000–01. Empirical results reveal that agriculture growth has been closely associated with the growth of other economic sectors and subsectors. Furthermore, Granger causality estimate indicates strong evidence that agriculture is a driver of the service sector, unregistered manufacturing sector, transport, storage & communication sector and the economy. Agro-based industries are directly dependent on agriculture for raw material. Most of them are unregistered manufacturing units and agriculture acts as an engine of growth for these unregistered industries. Agriculture sector avails the services of transportation and storage sector and creates business and employment in these sectors. It can be concluded that agricultural growth is a prerequisite for sustainable growth and development of the economy.

The findings of the study have some policy implications. The above discussion reveals that agriculture growth matters for the growth of other sectors. The government should emphasise on the

development of the agriculture sector. But due landlocked state yield growth led agriculture development is the best option for the policymakers. Therefore, public investment in irrigation should be accelerated, cost-effective and yield raising technology should be accessible to medium and small farmers. To increase the soil fertility, micro-nutrient treatment should be provided to the soil. Micro and small agro-based enterprises should be established according to specific regional crops which can work closely with the agriculture sector and reap the benefits of easily available raw material. Measures should be taken to increase the producers' share in consumers' surplus that can motivate farmers to grow more. A surge in incentive to the farmers would provide a potential rural market for FMCG and durable goods in rural areas.

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