

## **Agriculture in Bihar: the latent sector of development**

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**Abstract:** Bihar is the third most populous state in India with majority of its population depending on agriculture. Thus, agriculture yet forms the backbone of development. An average Indian still spends almost half of his/her total expenditure on food and roughly half of India's work force is still engaged in agriculture for its livelihood. Being both a source of livelihood and food security for a vast majority of low income, poor and vulnerable sections of society, its performance assumes greater significance in view of the proposed National Food Security Bill and the ongoing Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) scheme. The experience from BRICS (Brazil, Russia, India, China and South African) countries indicates that a one percentage growth in agriculture is at least two to three times more effective in reducing poverty than the same growth emanating from non-agriculture sectors. Thus with proper thrust on technologies, institutional direction, farm level support services, all delivery mechanisms, improved farm infrastructure including rural connectivity, Bihar could be developed as a granary of India. It can also be developed as the major hub of fruits, vegetables, and fisheries for both national and global markets. The entire economic growth processes in Bihar depends on the dynamics of agriculture. There are successful experiments in different parts of the country, which if adopted, can provide an answer to various problems which Bihar is facing in its race to higher productivity levels. Bihar can then surely catch up with the present productivity levels of rice and wheat in Punjab and other cherished goals in maize, pulses, oilseeds, horticulture and livestock production in the next few year Plans. The paper tries to prove that if agriculture is developed systematically then agriculture can be one of the major profit earning sectors for Bihar.

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### **I. Introduction**

Bihar the state having third largest population after UP and Maharashtra is a land of farmers and has a large proportion of population dependent upon agriculture for their livelihood. According to the 2011 census, 88.70 percent of populations live in rural areas where agriculture is the main occupation. The population is expected to reach 20 crore by 2025. Therefore, increase in demand for food will need to be met through higher agricultural productivity or by increasing food imports. Agricultural development is an integral part of overall economic development. At the time of independence, agriculture was the main source of national income and occupation in India. Therefore, it is a base of any development.

Agriculture yet forms the backbone of development. An average Indian still spends almost half of his/her total expenditure on food, while roughly half of India's work force is still engaged in agriculture for its livelihood. Being both a source of livelihood and food security for a vast majority of low income, poor and vulnerable sections of society, its performance assumes greater significance in view of the proposed National Food Security Bill and the ongoing Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) scheme. The experience from BRICS (Brazil, Russia, India, China and South African) countries indicates that a one percentage growth in agriculture is at least two to three times more effective in reducing poverty than the same growth emanating from non-agriculture sectors.

The concept of development is very wide. The challenge of development economies lies in the formulation of the economic theory and in application of policy in order to understand better and to meet these core components of development (A.P. Thirlwall, 1989). Agriculture plays a crucial role in a State's economy by establishing the framework for industrialization. In long terms, it must provide food for urban population; contribute to the market for industrial goods, security of food and rising surplus of production in excess of subsistence needs. The paper shall discuss in general the role of agricultural sector in the development process. The paper will discuss the transitional change in agriculture due to which the productivity ascended in the last 5 years. The paper will also highlight the change in cropping pattern and productivity of Bihar in last 12 years and suggest measures through which agriculture could help in development process of the growing state.

Bihar is endowed with fertile Gangetic alluvial soil with abundant water resources, particularly ground water resources. With different soil categories associated with different agro-climatic zones, the farmers in the state grow a variety of crops. Besides cereals, the state produces pulses, oilseeds, fibre crops, sugarcane, fruits, vegetables and other minor food crops. Recently there has been diversification in the production of crops, including the introduction of floriculture in many districts of the state, catering to the rising demand. It has a geographical area of 93.6 lakh hectares with three important agro-climatic zones — North-West, North-East and South. The North-West zone has 13 districts. The zone receives an annual rainfall of 1040-1450 mms. The soil is mostly loam and sandy loam. The North-East Zone has 8 districts. This zone receives rainfall ranging from 1200-1700 mms. The soil here is loam and clay loam. Finally, the South-Zone having 17 districts receives an average rainfall of 990-1300 mms and the soil consist sandy loam, loam, clay and clay loam.

Bihar has a glorious past. Dating back to 493 BC, the Bihar has been ruled by powerful rulers like Bimbisara, Ajatshatru , Ashoka and Chandragupta Maurya whose rise and success is related with the wise advice of Kautilya ( Chanakya- the great economist). Not only this, Bihar is also famous for the world reputed universities like Nalanda and Takshashila. The religions like Buddhism and Jainism originated in Bihar. Therefore, it is crystal clear that Bihar was one of the leading states of India with rich alluvial soil of Gangetic plain and affluent culture. Bihar was also a centre of attraction for the British as it had fertile land and cheap labour .In the period immediately following India's independence, per capita output in Bihar stood at 80% of the country's mean. Since then, however, the state has had a chequered history. By the early 2000s, the state's per capita GSDP had fallen to about a third of India's (Chanda 2011). However, in the past decades everything went wrong with the state law and order problems, low human capital investments, agricultural and industrial stagnation—the list is endless.

Although, in the last few years the economy has shown a turnaround, throwing new issues and enhancing people's aspirations but, despite this progress, rural Bihar is still far from benefiting fully from the opportunities generated by rapid growth. The state government is trying utmost to bridge the rural-urban divide by promoting higher agricultural growth. The support mechanisms for enhancement of agricultural development are being further strengthened, to ensure that growth of Bihar economy remains sustainable in the years ahead. Support services like irrigation, seed, fertilisers, farm mechanization, credit flows, and awareness programmes are being stressed to make agriculture more viable. The state government is exploring ways so that rural areas (all sections and communities within them) can participate fully in the growth process for a more prosperous Bihar.

The agricultural economy of Bihar presents a paradox of poor agricultural performance amidst plenty of natural resources, rich river streams, fertile soil of the Gangetic plain and hard working labour resources. As a result more than ¾ rth of the population in Bihar earn their livelihood from agriculture and its allied activities. To raise the prospects of development in Bihar, the vast potentials of agriculture and its allied sectors need to be exploited. Despite the productivity improvements in the agricultural sector over recent decades, it still remains low by national standards whereas the share of agriculture in GSDP in Bihar is higher than India . Although the growth rate of agriculture and animal husbandry during the last 5 years has been 3.73 percent, compared to 2.40 percent in previous 5 years, this sector requires special significance for the state's economy as nearly nine-tenth of its population living in rural areas primarily earn their livelihood from this sector.

## **II. The concept of Growth and Development**

The evolution of the concept of growth theory started in 1930s. It was sparked by the study of Colin Clark in 1939, which made quantitatively evident the gulf between European countries and the rest of the world. Economic development is often confused with economic growth. Economic growth is the rise in national or per capita income or product measured by Gross Domestic Product (GDP) or Gross National Product (GNP).Economic development is much broader concept than growth, as economic growth may not lead to the increase in the standard of living if not distributed evenly. For e.g. oil rich Middle East countries have increased per capita income but are still considered as under developed or developing. Following Clark's study, Simon Kuznets (1966) applied the current economic experience as contrasted with merchant capitalism or feudalism. Today, economic development is a combination of (1) self-sustaining growth (2) structural changes in patterns of production (3) technological upgrading (4) social, political and institutional modernization (5) widespread improvement in human conditions (Adelman2000).Kuznets gave first three characteristics and other two were added by T.W. Schultz (1962) and Dudley Seers (1969).According to Seers, development was a social phenomenon that included more than growth in per capita output. Therefore, education, health, population growth, urbanization, agricultural reform etc. all must come under development.

### Relation between Agriculture and Economic Development

Agriculture plays pivotal role in Bihar's economy and this sector's better performance is vital for inclusive growth. The dualistic models of Lewis (1954), Boeke (1953), Ranis and Fei (1961) are particularly important as these models presume that a less developed country is made up of two sectors-traditional and modern. The process of economic development unfolds as a result of interaction of these two sectors. According to Johnston and Mellor (1961) agriculture (traditional sector) has a number of functions to perform. It must provide food and labour for expansion of the modern sector and the savings to finance the expansion of the latter.

'Growth with inclusiveness' can be achieved only when agricultural growth accelerates and is also widely shared amongst people and regions of the country. All these factors point to just one option: that agriculture has to be kept at the centre of any reform agenda or planning process, in order to make a significant dent on poverty and malnutrition, and to ensure long-term food security for the people. In long terms, it must provide food for urban population; contribute to the market for industrial goods, security of food and rising surplus of production in excess of subsistence needs.

**Table 1: Indicators of Development, 2011**

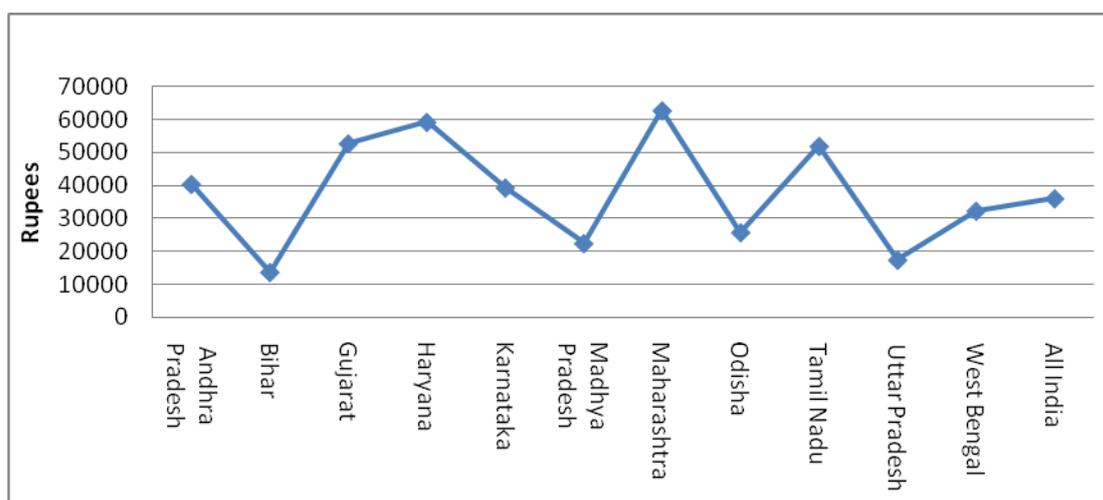
States	Per capita NSDP (Rs) ( at constant prices) (2004-05 prices) (2010-11)	Gross State domestic product ( at constant prices) (2004-05 prices) (2010-11) (crore)	Literacy (2011)	Population (2011) ( in Million)	GSDP in Agriculture and Allied sectors ( at constant prices) (2004-05 prices) (2010-11) (crore)
Andhra Pradesh	40366	381942 (7.8)	67.66	84.67	80330
Bihar	13632	144472 (3.0)	63.82	103.80	28151
Gujarat	52708	365295 (7.5)	79.31	60.38	NA
Haryana	59221	166095 (3.4)	76.64	25.35	257710
Karnataka	39301	279932 (5.7)	75.6	61.13	41383
Madhya Pradesh	22382	182647 (3.7)	70.63	72.60	NA
Maharashtra	62729	775020 (15.9)	82.91	112.37	66557
Odisha	25708	128367 (2.6)	73.45	41.95	22238
Tamil Nadu	51928	391372 (8.0)	86.33	72.14	31987
Uttar Pradesh	17349	394499 (8.1)	69.72	199.58	91682
West Bengal	32228	317786 (6.5)	77.08	91.35	6096
All India	35993	4885954	74.04	1210.19	700390

Source: CSO and Census 2011

Figures in the parenthesis denote percent share of GSDP

From the above table showing few development indicators of some selected states in India, it is clear that Bihar lies at the bottom line with PCI of Rs. 13632 which is lower than all the other selected states (Figure 1). Bihar's GSDP is only 3 percent of the total India's GDP; therefore, it is much below other states whose share range between 15-7 percent of GDP. Bihar's GSDP in agriculture is 4 percent of India's agricultural GDP, although more than 80 percent of population of Bihar is rural, its contribution in agricultural GDP is only 4 percent, which is really shocking. Considering other two indicators, it is clear that Bihar lies below the national average of 74.04 literacy rate and in population, its position are 3<sup>rd</sup> after U.P. and Maharashtra. Therefore, all the indicators prove that Bihar is yet much below in the ladder of development.

**Figure1: Per capita income for Selected States in India**



Per capita incomes are an important feature of economic underdevelopment and the distribution of income in the states of India is skewed. Agriculture accounts for a significant fraction of production in developing countries. Mainly, the substantial output is produced for self-consumption and so may not be picked up in the data. Agriculture is a giant informal sector and ,therefore, tax authorities have no way to observe how much output a farmer produces, and even if they do, they cannot prove it in a court of law, so agriculture often goes untaxed. Likewise, it is difficult to implement the minimum wages for labuorer pension plans, unemployment insurance and organized old age security are all very difficult aspects in agriculture.

Underdevelopment is a state of factor imbalance reflecting a lack of adjustment between the availability of factors and technology of their use, so that it is impossible to achieve full utilization of both capital and labour simultaneously. An underdeveloped structure is ,therefore, a situation in which ‘full utilization of available capital is not sufficient condition for complete absorption of working force at a level of productivity corresponding to the technology prevailing in the dynamic sector of the system’. Furtado attempted to define underdevelopment by imbalances between factors of production and factor underutilization.

### III. Performance of Agriculture

Agriculture where 69 percent of population is still rural is considered to be the backbone of Indian economy and agricultural contribution to the National Income was estimated at about 57 per cent in the early fifties. But the share declined to 22 percent in 2000-01. Therefore, between 1961-2000-01, there was a 26 percentage point decline in the share of agriculture in GDP. The table below shows the trend of agriculture in last 6 decades and the present status:

**Table 2: Sectoral Composition of GSDP in India**

Year	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01	2010-11(QE)	2011-12 (AE)
Agriculture	53.1	48.7	42.3	36.1	29.6	22.3	14.5	13.9
Industry	16.6	20.5	24.0	25.9	27.7	27.3	27.8	27.0
Services	30.3	30.8	33.8	38.0	42.7	50.4	57.7	59.0

Source: calculated, CSO data

Therefore, it is clear that contribution of agriculture and allied sectors is gradually declining, whereas, that of industry and services is increasing. But as India is an agrarian country so growth in agriculture and allied sectors is a matter of prime concern for inclusive growth. The average annual growth rate of agriculture was 3.3 per cent in Eleventh plan which is slightly lower than the targeted growth rate of 4 per cent.

#### **Bihar’s Scenario:**

In recent years, Bihar has acquired considerable attention throughout the country and even abroad for its remarkable performance in the development front. For a state which had suffered stagnation for long and which had almost resigned to its perpetual backwardness, this was a turning point, leading to new hopes and aspirations. These changes were possible because of the state government's firm commitment to an agenda of development which is both speedy and inclusive. To fulfill this agenda, the state government had not only utilised its limited resources most prudently, but had also strengthened its administrative machinery and introduced a number of institutional reforms. The results clearly show that the past growth process of the state's economy is not a short term phenomenon, but the beginning of a long term stable growth process.

Bihar is gaining back its lost pride in the last few years. The data on state income shows that the economy of Bihar has been showing a steady growth trend for the last 6 years. During the first 5 years after separation of Jharkhand in 2000, the economy had grown at an annual rate of 4.42 percent at constant prices. However, the economy witnessed a turnaround due to policies pursued by the present state government and, as a result; the economy grew at an annual rate of 11.36 percent during the period 2004-05 to 2010-11. Thus, the recent growth process can be termed as 'revival of a stagnant economy'. Due to different changes now the economy can claim to be at a 'taking off' stage' to a sustained development path. The buoyancy in the economy can be easily sustained by the inter linkages in its various sectors.

Agriculture would continue to play an integral part of the development process, as around 88 percent of the population still live in villages and they would continue to depend on agriculture as a prime source of their livelihood. The state cannot progress without a satisfactory growth of its agricultural sector. At each stage of development, one must be careful that right kind of inputs are available at the right time for the growth of agricultural sector, and adequate quantity of food grains is available to meet the demand for food. Or else, the resulting disequilibrium would pose a threat with a higher inflationary pressure. In this direction, the state

government is not only stressing for a second Green Revolution based on bio-technological improvement, but also putting forth a concept of 'Rainbow Revolution'. The economy would also focus on increasing the production of pulses, vegetables, fruits, milk, fish and animal husbandry, alongside cereals. A strategy is being chalked out for enhancing the income and promoting the welfare of agricultural producers.

Any economy which is mainly based on primary sector's income is very vulnerable to changes, and has to face tough competition in the race of development. An analysis of agricultural development is incomplete unless it is looked in terms of overall process of macro-economic development. Agriculture is the single largest private sector occupation in Bihar. Hence, the goal of the agricultural production system should be to maximize income of land owning and landless rural populace to improve their livelihoods.

**Table 2: TA of Gross State Domestic Product (GSDP) at Factor Cost (2004-05 Prices) (2001-10) (Rs. Crore)**

Sectors	TA 2001-04	TA 2004-07	TA 2007-10
Agriculture and Allied	22707	25126	27537
Industry	8828	12040	18573
Services	42546	45735	67010
Total GSDP	73964	82901	113121

Source: Economic Survey of Bihar, GOB

TA: Triennium Average

Therefore, on the basis of triennium averages of 9 years, (table 2), it can be proved that after service sector, the major contributor of GSDP in Bihar is agriculture and allied sector. One remarkable point to be noted is that the triennium average shows that the share of agriculture is gradually declining over the years compared to the other two sectors. From 2001 to 2010, the share of agriculture falls from 30 to 24 percent, whereas, the share of industry and service sector increases from 12 to 16 percent and 58 to 59 percent. (Figure 2). Therefore, the importance of agriculture is declining and needs special attention to develop it as a highly productive sector.

Figure 2: TA of Gross State Domestic Product (GSDP) at Factor Cost (2004-05 Prices) (2001-10)

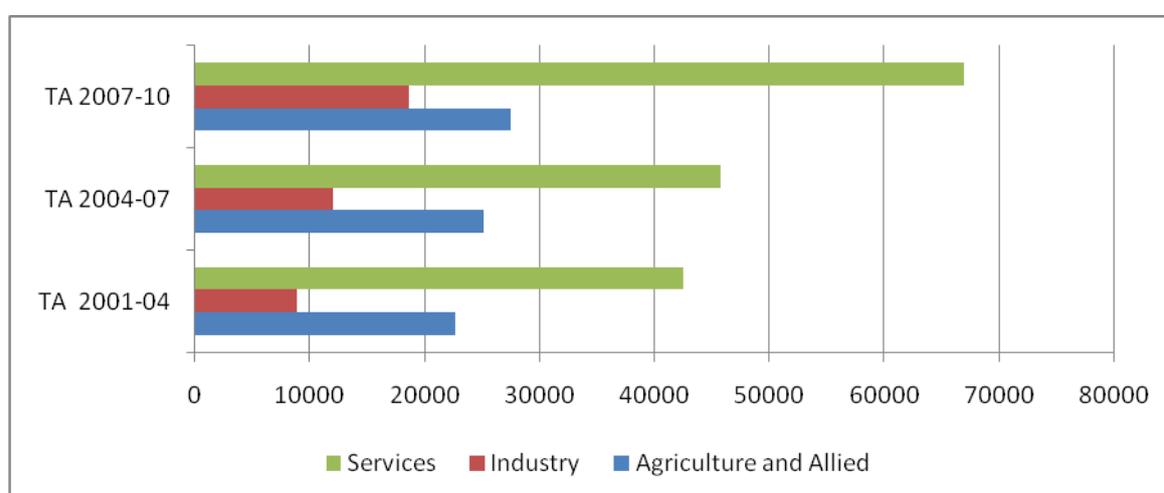
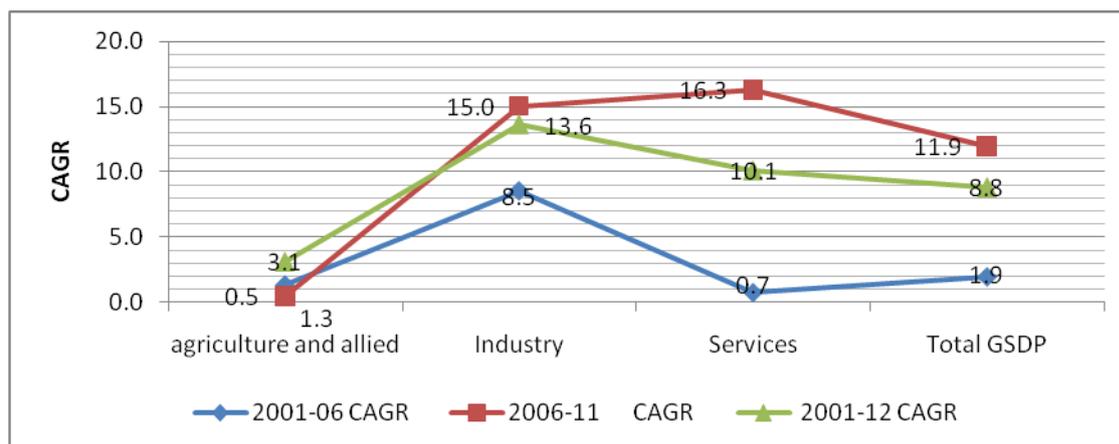


Figure 3: CAGR of GSDP in three phases



Taking the CAGR of three major sectors viz. agriculture, industry and services, for three periods i.e. from 2001-06 and from 2006-11 and total 2001-11, it is clear that in all the three time periods, the contribution of agriculture was the lowest. Secondly, there is gradual fall in agricultural growth rate from 2001-06 to 2006-11, as clear from the above figure. As Bihar has agro-based economy and majority of rural population depend on agriculture, the growth of agricultural sector should also be an earnest concern. Until and unless, this sector is improved, there will be increase in poverty and disguised unemployment.

#### Scenario of Primary, Secondary and Tertiary Sector in Bihar

As Bihar has an agro-based economy, therefore, agriculture and allied sector is the main source of income. Along with the production of cereals, even production of fibre crops and oilseeds must be enhanced. It is clear that cash crops are major source of income for any agrarian economy, and in order to develop agro-based industries, growth of cash crops must be expedited.

The primary sector has undergone significant structural changes in the form of decrease in share in GSDP from 32.24 percent in 2001-02 to 22.46 percent in 2011-12 indicating a shift from traditional agrarian economy to modern service oriented one (Figure 4). It is quite clear that with the development process, even the share of primary sector is replaced by tertiary sector but secondary sector which is another important sector is showing an increase in a slow pattern.

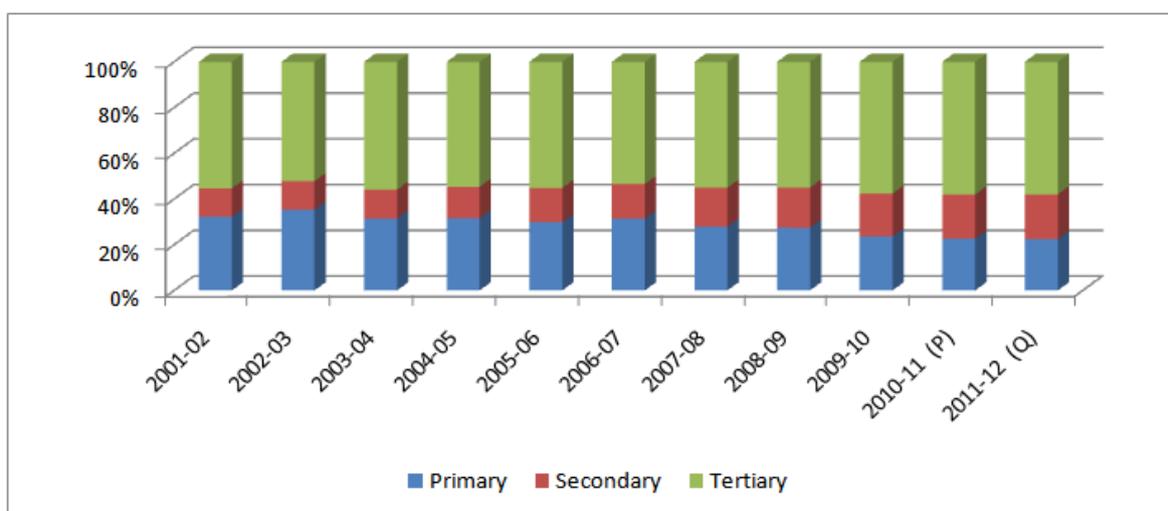


Figure 4: Sectoral Composition of GSDP of Bihar at Factor Cost (2004-05 Prices)

#### IV. Performance of Crops in Bihar:

Bihar's fertile soil and natural endowments and availability of ground water has helped the farmers to grow variety of crops including fruits, flowers and vegetables which will add up to their income. The table below shows that major crops in Bihar show high volatility in production, from 2000-01 to 2009-10, the compound annual rate of growth is showing a declining trend in rice, whereas, for wheat and maize, the growth rate is positive. The reason behind volatility could be the atrocity of weather. Every year, Bihar is hit by draught or flood, and both of these have adverse effect on agriculture. The trend of rice production over the years has not been consistent. There exists much variation in the production of rice over the years. This is due to fact that around 50 percent of net sown area is bereft of irrigation and dependent on rain. The average production figures are around 50 lakh tonnes each year. On the other hand, wheat and maize show a growing trend. The average annual wheat production level was 40-45 lakh tonnes between 2000-01 to 2009-10. The annual growth rate of wheat production for these years turns out to be 1.1 percent. Similar is the case with maize. The average annual production level between 200-01 to 2009-10 is around 15 lakh tonnes. The annual growth rate for production of maize for the reference period comes out to be 1.9 percent. The pulses show a declining rate of growth. The oilseeds during 2000-01 to 2009-10 grew at the rate of 1.8 percent, whereas fibers grew at the rate of 0.8 percent during the same period.

**Table 3: Production of Major Crops in Bihar (2000-01 to 2009-10)**

('000 tonnes)

Year	Cereals				Pulses			Oilseeds	Fibers
	Rice	Wheat	Maize	Total	Kharif	Rabbi	Total		
2000-01	5444.37	4437.96	1497.29	11379.62	98.71	520.73	619.44	130.93	1381.64
2001-02	5202.81	4391.08	1487.92	11081.81	85.23	461.81	547.04	123.69	1103.74
2002-03	5085.57	4040.61	1292.01	10418.19	81.41	477.50	558.91	104.93	1096.84
2003-04	5447.79	3688.94	1473.57	10610.30	82.37	474.44	556.81	123.55	1286.26
2004-05	2625.13	3279.94	1491.18	7396.25	84.08	387.32	471.40	116.31	1370.98
2005-06	3495.93	2763.32	1361.11	7620.36	78.23	368.85	447.08	134.36	1472.29
2006-07	5131.17	4149.02	1754.41	11034.60	85.03	366.39	451.42	140.77	1505.21
2007-08	4472.68	4974.66	1857.01	11304.35	80.06	392.88	472.94	144.20	1452.38
2008-09	5771.39	4638.94	1701.93	12112.26	69.67	457.75	527.42	122.42	1127.28
2009-10	3599.25	4570.82	1478.62	9648.69	77.60	394.86	472.46	143.50	1277.67
CAGR	-2.1	1.1	1.9	-0.2	-2.2	-2.6	-2.5	1.8	0.8

Source : Department of Agriculture, GOB

#### V. Cropping Pattern

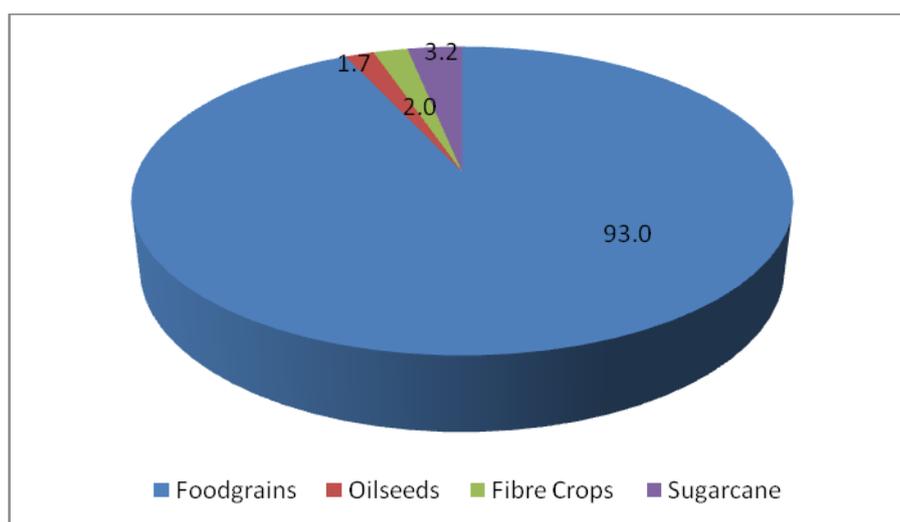
Changes in cropping pattern in terms of acreage allocation among different crops are the integral part of agricultural development of any region. The diversifications in any particular geographical area are based on the changing social, economic, technological, geographical and institutional structure of that region. Cropping patterns of a region are decided by and large, by a number of soils and climatic parameters which determine overall agro-ecological setting for nourishment and appropriateness of a crop or set of crops for cultivation. Even potential productivity and monetary benefits act as guiding principles while opting for a particular crop/cropping system. Along with this, even infrastructural facilities also play an important role at micro level. The agricultural economy in Bihar is still very much oriented towards subsistence production. Out of the total area, about 93-94 percent is under foodgrains production. Within the foodgrains, the percentage share of cereals in the total area (86 per cent) has shown a marginal increase at the cost of area under pulses. Table 4, portrays that the cropping pattern of various crops for the period 2007-08 to 2011-12. Under foodgrains, the percentage share of rice is around 45 percent, whereas, that of wheat and maize lies around 30 and 10 percent. The acreage under pulses have shown a marginal decline from 8.0 percent in 2007-08 to 7.4 percent in 2011-12. The oilseeds, fibres and sugarcane together account for only 7.0 percent of the total area. The cropped area under sugarcane shows a marginal increase at the cost of oilseeds. The cropped area under fibre crops has marginally diminished from 2.1 percent in 2007-08 to 2.0 percent in 2011-12. From the table, we can draw an inference that still Bihar follows the traditional pattern of production where rice is higher than all other crops and this also gives a ray of hope as that day is not far away when Bihar will be sufficient in providing food security to its habitants.

**Table 4 : Cropping Pattern in Bihar (2007-08 to 2011-12)**

Crops	Percentage of area				
	2007-08	2008-09	2009-10	2010-11	2011-12
Foodgrains	94.5	94.7	94.9	92.3	93.0
Cereals	86.5	86.8	86.8	83.2	85.6
Rice	47.6	48.5	45.9	41.9	45.8
Wheat	29.2	29.2	31.1	31.1	29.8
Maize	9.0	8.7	9.4	9.6	9.6
Total Pulses	8.0	8.0	8.1	9.1	7.4
Kharif Pulses	1.1	0.9	1.0	0.9	0.8
Rabi Pulses	6.9	7.0	7.1	8.1	6.6
Oilseeds	1.9	1.8	2.0	1.9	1.7
Fibre Crops	2.1	1.9	2.1	2.1	2.0
Sugarcane	1.5	1.5	1.1	3.7	3.2
Total Area	100.0	100.0	100.0	100.0	100.0

Source : Department of Agriculture, GOB

Figure 5: Cropping Pattern in Bihar (2011-12)



Bihar is a land-locked state and agriculture is the riskiest and largest private sector occupation in Bihar . Hence, the goal of the agricultural production system should be to maximize the income of land owning and landless rural populace to improve their livelihoods. There is a need to develop effective risk management strategies to cover potential losses in yield and hence incomes. Thus, to achieve the desired levels of productivity, immediate steps are needed to improve infrastructure – such as power, rural roads and marketing in particular and, arrange for the supply of quality seeds, balanced use of fertilizers, adequate machinery, required changes in land policy, a farmer friendly extension service and an effective credit delivery system in keeping with adequate credit absorptive capacity of the farmers in Bihar. All these could provide a bright future for Bihari farmers.

**Agricultural Productivity:**

To achieve the desired levels of productivity, immediate steps are needed to improve infrastructure – such as power, rural roads and marketing in particular and, arrange for the supply of quality seeds, balanced use of fertilizers, adequate machinery, required changes in land policy, a farmer friendly extension service and an effective credit delivery system in keeping with adequate credit absorptive capacity of the farmers in Bihar. All these could provide a bright future for Bihari farmers.

**Table 5: Productivity of Different Crops**

(Quintals / hectare)

Year	Rice	Wheat	Maize	Pulses	Oilseeds
1992-93	14.15	21.30	21.50	7.09	7.05
1993-94	13.52	21.08	20.61	7.38	7.07
1994-95	12.18	20.06	20.14	6.15	6.84
1995-96	15.95	22.09	22.35	8.35	6.35
1996-97	14.90	19.61	19.72	7.29	7.38
1997-98	14.54	20.91	19.54	9.10	8.55
1998-99	15.43	22.03	22.37	7.96	7.32
2000-01	14.89	21.73	24.54	8.35	7.44
2001-02	14.65	20.65	25.04	7.88	8.41
2002-03	14.19	18.96	22.35	8.04	7.66
2003-04	15.23	17.61	23.93	8.19	8.79
2004-05	7.91	16.09	23.88	7.09	8.86
2008-09	12.88	23.34	28.23	18.05	10.15
2009-10	15.99	20.43	26.76	17.37	9.99
2010-11	10.94	24.26	32.25	8.68	10.94
2011-12	24.63	30.49	36.83	9.91	13.08
CAGR	0.32	0.76	3.21	3.71	3.75

Source: Economic Survey of Bihar

Thus, the above table shows the productivity of different crops in Bihar and on the basis of compound annual growth rate, it could be said that all these crops are showing positive trend. Although there are some fluctuations in the productivity of rice and wheat but pulses, maize and oilseeds are maintaining the same state. There is not any wide variation in their productivity.

Agriculture is the single largest private sector occupation in Bihar and is considered to be the riskiest business. Hence, the goal of the agricultural production system should be to maximize income of land owning and landless rural populace to improve their livelihoods. The vulnerability to income and consumption shocks makes it imperative to develop formal agricultural insurance mechanisms to cope with such risks. The traditional yield insurance schemes have failed in managing the risks of the poor farmers as evident from their historically high payouts and poor penetration rates. There is a need to develop effective risk management strategies to cover potential losses in yield and hence incomes. Given the low average yields of most commodities, the huge gaps between the demonstrated and generally realized yields, the low farmers' income and widespread rural poverty on one hand, and the richness of the natural resources and the socio-political expediency to liberate the people of Bihar from the poverty and hunger trap on the other, as usual will not yield the desired results. A holistic system based approach is needed to simultaneously enhance the productivity, profitability, equity and environmental sustainability through integrating crop, cash crop, horticulture, livestock, fisheries, agro forestry, watershed-based soil and water management, social capital formation, agro-processing and marketing in an end-to-end mode.

### **How to increase agricultural productivity?**

There should be a specific programme to multiply the best quality breeder seeds and distribute them to farmers. Seed Corporation should be revamped and other agency on the pattern of Tarai Seed, 'Pusa Beej' should be started. Seed village concept should also be encouraged by providing breeder seed and technological inputs. Successful experiments have been conducted in Bihar under Zero Tillage, Bed Planting, System of Rice Intensification (SRI) and Site Specific Nutrient Management Systems. Along with, efforts should be made to promote contract farming in maize, and horticultural crops for which the State has huge potential. Dairy Cooperatives being a success in Bihar needs further support expansion and to enhance the health and productivity of livestock. Even the poultry and fisheries need expansion and revitalization.

An efficient and optimum use of modern inputs like quality seeds, chemical fertilizers and other macro and micro nutrients, is the key to productivity improvement on a sustainable basis. Thus, farmers should be enabled to access and use modern farm inputs in an optimal and efficient manner. Large scale demonstration, use of nutrient and water based soil and tissue test should receive major emphasis. There are soil testing technology but do not have capacity to function. Revamping the laboratory for efficient delivery system is essential. Efforts should be made to promote organic production technology including use of bio-fertilizers & bio-pesticides. Twenty-first century agriculture is knowledge and technology based and human capital development is a must. Approaches to knowledge and technology adoption by the farmers are directly related to the level of their education. Dilapidated condition of human development institutions and weak institutional structure are a road block in the overall development of Bihar. Education and health should, therefore, be given the first priority for Bihar's farm population.

### **Development of Proper marketing and infrastructure:**

Bihar produces large quantities of fruits, vegetables and livestock products, but do not have proper infrastructure to support value addition and marketing. The state should develop commodity specific agro-export zones and give necessary support to their marketization. With proper development of markets, cooling arrangements in storage and transportation, processing and maintenance of quality, through grading, standardization, packaging, etc., products like litchi, mango, makhana and banana and a few vegetables can be exported to other states and even beyond the country, which will help improve farmers' income.

### **Stress on Diversified Farming**

Traditional crop farming alone cannot provide adequate employment and income to a growing rural population. Already with the population pressure of 1038Lakh (8.6 % of All State Population) on land of Bihar **94163sq. km (2.9% of Total area in India)** is quite high. Therefore, the state should develop location specific plans for accelerated and diversified growth. Diversification could be for crop varieties as well as other produce. More areas could be brought under pulses, oilseeds, maize and diversification to horticulture, livestock and fisheries should find greater role. Horticultural diversification should cover fruits, vegetable, mushroom, flower, medicinal and aromatic plants. There is a scope for coconut, oil palm and cashew in the state. This would involve not only proper planning activities, but also the creation of necessary infrastructure, institution and policy support. Fisheries and poultry, the two most important areas having a high potential, need special attention. Districts with high productivity of gram and oilseeds call for urgent action to increase the area under these crops. Government can provide support either directly or indirectly through incentives to the private sector for supply of seed/planting material, marketing, processing, etc.

### **Revival of Sugar Mills**

Bihar has immense potential for sugar and allied industries, particularly in ethanol and captive power generation. Keeping in view the vast scope of its expansion, the state government has decided to encourage the sugarcane based industries in the state, which will go a long way in strengthening the rural economy. Sugarcane an important cash crop for farmers in North Bihar can provide additional employment and surplus power. More than Rs. 600 crore has been invested by the sugar companies for capacity expansion and their daily crushing capacity has consequently increased from 37 thousand tonnes in 2005 to 68 thousand tonnes at present. Of the total cultivable area of 54 lakh hectares in the state, only 4.41 percent is covered under the sugarcane cultivation, and there is ample scope for increasing the area under sugarcane cultivation. Prior to independence, there were 33 sugar mills in the state, which produced 40 percent of the country's total production of sugar. As against this, the state's share in sugar production now stands at only 3-4 percent, and the number of sugar mills has reduced to 28, of which 18 are sick and closed, 15 under Bihar State Sugar Corporation Ltd. and 3 under BIC Group of

the Centre. Under BIC group, two sugar mills at Chanpatia and Bara Chakia have gone into liquidation; the third one is under the process of rehabilitation. As regards 15 closed units under the state sector, 8 have been handed over to the private sector through tenders in four rounds.

The table below shows the status of Sugar Mills in Bihar:

**Table 6 : Performance Level of Sugar Mills in the three crushing years**

Name of Sugar Mill	Sugarcane Crushed (lakh qntl.)	Sugar Produced (lakh qntl.)	Recovery (Percentage)	Sugarcane Crushed (lakh qntl.)	Sugar Produced (lakh qntl.)	Recovery (Percentage)	Sugarcane Crushed (lakh qntl.)	Sugar Produced (lakh qntl.)	Recovery (Percentage)
	2009-10			2010-11			2011-12		
Bagha	31.61	3.92	9.67	42.06	4.12	9.80	50.61	4.99	9.84
Harinagar	63.49	6.33	9.96	98.42	9.25	9.40	94.61	8.96	9.47
Narkatiagunj	51.65	5.19	9.51	68.15	6.52	9.57	78.79	7.65	9.71
Majhulia	26.89	2.56	9.32	42.96	3.93	9.15	44.87	4.23	9.30
Motipur	closed			1.26	0.09	7.14	Closed		
Sasamua	17.06	1.61	9.23	19.69	1.81	9.19	21.09	2.06	9.51
Gopalganj	25.16	2.42	9.25	32.87	3.12	9.49	39.19	3.72	9.50
Sidhwalia	21.64	2.25	9.11	39.64	3.72	9.38	47.01	4.43	9.43
Riga	22.21	2.02	9.10	48.11	4.46	9.27	48.13	4.48	9.31
Hasanpur	12.63	1.15	9.09	20.91	1.95	9.33	31.17	2.95	9.48
<b>Sub Total</b>	<b>272.34</b>	<b>27.45</b>	<b>10.08</b>	<b>414.06</b>	<b>38.97</b>	<b>9.41</b>	<b>455.47</b>	<b>43.47</b>	<b>9.54</b>
New Sugar Mills									
Lauriya	-	-	-	-	-	-	15.29	0.66	4.32
Sugauli	-	-	-	-	-	-	17.54	0.97	5.53
<b>Sub Total</b>							<b>32.83</b>	<b>1.63</b>	<b>4.96</b>
<b>Total</b>	-	-	-	-	-	-	<b>488.3</b>	<b>45.10</b>	<b>9.24</b>

Source : Department of sugarcane; GOB

The remaining 10 working mills in the state are under the private sector, but the condition of Motipur sugar mill has been quite shaky and it remained closed during 2011-12. In the crushing season of 2011-12, two sugar mills at Sugauli and Lauria which were handed over to HPCL on lease, went into production. Thus, altogether 11 sugar mills were operational in 2011-12 and a total of 488.30 lakh quintals of sugarcane were crushed. Thus, if properly treated sugar industry can grow as an important industry of Bihar.

### **Bihar : the Granary for India**

In order to promote Bihar as a granary of India, proper thrust on technologies, institutional direction, farm level support services, all delivery mechanisms, improved farm infrastructure including rural connectivity is needed. It can also be developed as the major hub of fruits, vegetables, and fisheries for both national and global markets. The entire economic growth processes in Bihar depends on the dynamics of agriculture. There are successful experiments in different parts of the country, which if adopted, can provide an answer to various problems which Bihar is facing in its race to higher productivity levels. Bihar can then surely catch up with the present productivity levels of rice and wheat in Punjab and other cherished goals in maize, pulses, oilseeds, horticulture and livestock production in the next few year Plans.

Fortunately for Bihar, the State has trained agricultural labour from Punjab. The Bihari labour, who were responsible for the first Green Revolution of Punjab will now provide the momentum for the Second Green Revolution in their home State. Thus, there is a need for awakening with commitment to convert the weaknesses into opportunities and revamp agriculture which is a sole source of economic development. Bihar also needs to put a special focus on system of organic farming in the light of experiences available in India. This would bring faster results for increased productivity

### References

- [1]. Aslam, M., Hashmi, N.I., Majad, A. and Hobbs, P.R. (1993) Improving wheat yield in the rice-wheat cropping system of the Punjab through zero tillage. *Pakistan Journal of Agricultural Research*, **14**(1): 1-7
- [2]. Balakrishnan, P. and M. Parameswaran (2007), "Understanding Economic Growth in India: A Prerequisite", *Economic and Political Weekly*, 42: 2915-2922
- [3]. Battese, G.E. (1992) Frontier production functions and technical efficiency: A survey of empirical applications in agricultural economics. *Agricultural Economics*, **7**: 185-208
- [4]. Chand Ramesh (2001), "Emerging Trends and Issues in Public and Private Investments in Indian Agriculture: a State wise Analysis", *Indian Journal of Agricultural Economics*, **56** (2), 161-184
- [5]. Chand Ramesh (2003), "Government Intervention in Foodgrain Markets in the Changing Context", Policy a. Paper 19, National Centre for Agricultural Economics and Policy Research, New Delhi
- [6]. Coelli, T.D., Rao S.P., O'Donnell, C.J. and Battese, G.E. (2005) , *An Introduction to Efficiency and Productivity Analysis*, Second Edition, Springer. 131p
- [7]. Devi, K.S. and Ponnarasi, T. (2009) An economic analysis of modern rice production technology and its adoption behaviours in Tamil Nadu. *Agriculture Economics Research Review*, **22**: 341-347
- [8]. Farrell, M.J. (1957) The measurement of productive efficiency, *Journal of the Royal Statistical Society*, **120**(3): 253-290
- [9]. Government of Bihar (2012-13) Economic Survey of Bihar, Department of Finance, Bihar
- [10]. Government of India (2011-12) Economic Survey of India, Ministry of Finance, New Delhi
- [11]. Government of India (1961), Annual Report, Planning Commission of India, New Delhi
- [12]. Government of India (2008), Agricultural Statistics at a Glance, Directorate of Economics and Statistics, Ministry of Agriculture, New Delhi
- [13]. Government of India (2008), National Account statistics (Back Series). Central Statistical Organization, Ministry of statistics and Programme Implementation, New Delhi
- [14]. Government of India (2008), National Account statistics, Central Statistical Organization, Ministry of Statistics and Programme Implementation, New Delhi
- [15]. Greene, W. H. (2007), *Econometrics Analysis*. New Delhi: Pearson Education
- [16]. Gujarati, D. N. (2004), *Basic Econometric* New Delhi: Tata McGraw – Hill
- [17]. Hobbs, P.R., Singh, Y., Giri, G.S., Lauren, J.G. and Duxbury, J.M. (2002) Direct-seeding and reduced-tillage options in the rice-wheat systems of the Indo-Gangetic Plains of South Asia. In: *Direct Seeding: Research Strategies and Opportunities*, Eds: S. Pandey, M. Mortimer, L. Wade, T.P. Tuong, K. Lopez, and B. Hardy. International Rice Research Institute, Manila. pp. 201-215
- [18]. Idiong, I.C. (2007) Estimation of farm level technical efficiency in small-scale swamp rice production in Cross River State of Nigeria: A stochastic frontier approach. *World Journal of Agricultural Sciences*, **3**(5): 653-658
- [19]. Kumar, P. (1998), "Food Demand and Supply Projections for India", Agricultural Economic Policy Series 98-01, Indian Agricultural Research Institute, New Delhi
- [20]. Maddala, G.S. (2001) *Introduction to Econometrics*. John Wiley & Son, Ltd. 636p
- [21]. Meeusen, W.J. and Broeck, V.D. (1977) Efficiency estimation from Cobb-Douglas production functions with composed error. *International Economic Review*, **18**(2) 435-444
- [22]. Mishra, S. N. and Ramesh Chand (1995), "Private and Public Capital Formation in Indian Agriculture: Comments on Complementarity Hypothesis and Others", *Economic and Political Weekly*, **30** (24): A-64 –A-79
- [23]. Murthy, K N (2000), "Changes In Taste and Demand Pattern for Cereals", *Agricultural Economic Research Review*, Vol. 13(1): 26-53
- [24]. Pradhan, R. P. (2007), "Indian Agriculture in the Globalization Era: The Performance and Determinants", *Journal of Global Economy*, **3**(1): 3-12
- [25]. Radhakrishna, R. and C. Ravi (1992), "Effects of Growth, Relative Price and Preference of Food and Nutrition", *Indian Economic Review*, **27**(special issue in memory of Sukhamoy Chakravarty): 303-323
- [26]. Rao, C.H. Hanumantha (2000), "Declining Demand for Foodgrains in Rural India: Causes and Implications", *Economic and Political Weekly*, **22** (January): 201-206
- [27]. Rao, V. M. (1996), "Agricultural Development with a Human Face", *Economic and Political Weekly*, **31**(26): A-52 - A-62
- [28]. Sharma, K. L. (1977), "Measurement of the effect of area, yield, and prices in the increase of value of crop output in India", *Agricultural Situation in India*, **32**(6)
- [29]. Subramaniam, A. (2008), *India's Turn: Understanding the Economic Transformation*. New Delhi: Oxford University Press