

Understanding Agricultural Development of Bihar

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Abstract: In the present paper an attempt has been made to underline the climatic, weather and soil conditions of Bihar and to understand briefly the state of agriculture in Bihar using the secondary sources of data. It elaborates on climatic zones of Bihar, structure of land holdings and cropping pattern existing in the state. The varied climatic zones and soils determine to a great extent the cropping pattern of the state. The existence of different climatic zones and soils pose some challenges and also provide opportunities for the state agriculture. The small size of agricultural holdings inhibits the growth of agricultural production and productivity in the state by not allowing modern implements to be used. The paper also focuses on some major challenges confronted by agriculture sector of the state and suggestions to further improve the state of agriculture in Bihar. The state has vast potential for increasing production and productivity in both food grains and horticulture. The policy initiative requires in the area of tackling land issues, technology dissemination, marketing, rural infrastructure and crop diversification.

Key Words: Bihar, Agriculture, Agro-climatic zone, Weather conditions, Cropping pattern, Land use pattern

INTRODUCTION

The state of Bihar is endowed with very rich and fertile soil, abundant water, varied climate and abundant supply of hard working workforce. The farmers of Bihar are not only hard working but intelligent and innovative also. Agriculture is the vital source of wealth in the State with about 79% of its population engaged in agricultural pursuits which are higher than the national average. Agriculture and allied sector contributes about 19 percent of the GSDP. The rate of growth of Agriculture and allied sector has been 5.4 percent during 2005-10 and 3.7 percent during 2010-14. The major agricultural products of Bihar are cereals, pulses, oilseeds and cash crops. However, cereals dominate the cropping pattern. The rice wheat cropping system occupies more than 70% of the gross cropped area but productivity has remained low despite favourable soil, water and climatic conditions. The yield per hectare of rice is around 1500 kg/ha against the national average of 2100 kg/ha which significantly increased to 3523kg/ha. In

case of wheat the yield per hectare is 2797 kg/ha as against national average of 2619 kg/ha. The yield per hectare of maize and pulses are also higher than the all-India average (Bihar Agricultural Statistics, 2012-13). Bihar is the second largest producer of vegetables and seventh largest producer of fruits in India (Salam *et al*, 2013). According to report of Taskforce on Agriculture, Government of Bihar, 2015 the total vegetable production in Bihar is about 156.29 lakh tonnes. Potato, Onion, Tomato, Brinjal, and Cauliflower is the major vegetable crop of the state. Bihar is known all over India for its litchi and mango. The four most important fruit crops in Bihar are mango, guava, litchi and banana. In 2013-14, their production levels were mango (12.74 lakh tonnes), guava (2.39 lakh tonnes), litchi (2.34 lakh tonnes) and banana (14.36 lakh tonnes). Flower production in Bihar has increased recently, providing immense opportunity of employment and income in rural areas of Bihar. In 2013-14, about 99 tonnes of rose, 6799 tonnes of marigold, 317 tonnes of jasmine (Bela) and 536 tonnes of the

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tuberose were produced in Bihar. The water area of Bihar constitutes about 3.9 percent of the total geographical area. In 2004-05, the production of fish in Bihar was 2.67 lakh tonnes. The production grew continuously thereafter and reached the peak level of 4.32 lakh tonnes in 2013-14. Therefore, agriculture may be described as the most important source of livelihood and core competence of Bihar. Bihar's productive contribution in food grain, fruit, vegetables, spices and flowers can increase manifold with improved methods of cultivation and system management. Bihar has huge potential for agricultural development because the state is blessed with large plain and fertile land, abundant water resources and vast hard working manpower. The gap is due to some natural as well as human factors. Natural factors include distinct geographical reasons causing both the flood and drought conditions in the two parts of north and south Bihar. The perennial revivers like the Ganga, Gandak, Son, Punpun, Ghaghara, and Kosi are the nature's blessings to the state but the blessing turns to be curse due to failure of adequate and proper water management. It is a fact that Bihar leads in production of many crops, yet it has not realized its full potential due to several problems and challenges. In view of the above facts it is both a challenge and an opportunity for agriculture in Bihar to bridge the gap between its growth potential and its actual performance which indeed is difficult task.

In the present paper an attempt has been made to underline the climatic, weather and soil conditions of Bihar and to understand briefly the

state of agriculture in Bihar using the secondary sources of data. The paper would also focus on some major challenges in agriculture sector confronting the state and policy measures to further improve the state of agriculture in Bihar.

CLIMATE AND WEATHER CONDITIONS OF BIHAR

Before we delve into the details of the status of agriculture in Bihar it is appropriate to know the state of climate, weather and soil conditions of Bihar as it is a well known fact that these are some of the most important determinants of agricultural production and productivity in a region. Climate change affects people, plants, and animals. Climate change has been observed to depress agricultural productivity. It may affect agriculture directly through higher temperatures, greater crop water demand, more variable rainfall, cold spells and in extreme cases occurrence of floods and draughts (Kumar, 2013). Bihar with a geographical area of about 94.2 thousand square km is divided by river Ganges into two parts, the north Bihar with an area of 53.3 thousand square km and the south Bihar having an area of 40.9 thousand square km. Based on soil characterization, rainfall, temperature and terrain, four main agro-climatic zones in Bihar have been identified as follows:

It is evident from Table - 1 that agro-climatic zone I and II is located in North Bihar and zone III is located South Bihar. Zone I is situated in the north western part of the state whereas zone II is located in the north eastern part. Zone I and II is flood prone area whereas zone III is drought prone

Table 1
Agro-climatic Zones of Bihar

S.No.	Agro-climatic zone	Districts
1.	Agro-climatic zone I(Northern West)	West Champaran, East Champaran, Siwan, Saran, Sitamarhi, Sheohar, Muzaffarpur, Vaishali, Madhubani, Darbhanga, Samastipur, Gopalganj, Begusarai
2.	Agro-climatic Zone II(Northern East)	Purnea, Katihar, Saharsa, Supaul, Madhepura, Khagaria, Araria, Kishanganj.
3.	Agro-climatic zone IIIA(Southern East)	Sheikhpura, Munger, Jamui, Lakhisarai, Bhagalpur & Banka.
4.	Agro-climatic zone IIIB(Southern West)	Rohtas, Bhojpur, Buxar, Bhabhua, Arwal, Patna, Nalanda, Nawada, Jehanabad, Aurangabad, Gaya.

Source: Department of Agriculture, Government of Bihar

Table 2
Type of Soil and Weather in each Climatic Zone in Bihar

Sl. No.	Agro-climatic zone	Soil	Total Rainfall (mm)*	Temperature (°C)	
				Max.	Min.
1.	Agro-climatic zone I (Northern West)	Sandy loam, loam	1040 - 1450 (1245.00)	36.6	7.7
2.	Agro-climatic Zone II (Northern East)	Sandy loam, Clay loam	1200 - 1700 (1450.00)	33.8	8.8
3.	Agro-climatic zone III (Southern East & West)	Sandy loam, Clay loam, loam, Clay	990 - 1240 (1115.00)	37.1	7.8

Source: Department of Agriculture, Government of Bihar

*Figure in brackets show the average rainfall

area. Potential wise all three agro climatic zones have vast untapped potential for increasing the productivity of food grain crops. Table - 2 depicts that across the state soil texture varies from sandy loam to heavy clay. However major part of the soil type belongs to loam category which is good for crop cultivation. The natural precipitation varies from 990 to 1700 mm. Most of the precipitation is received during the month of July to September. There are three crop seasons- Kharif, Rabi and Zaid. Rice, wheat and pulses are grown in all the districts however the choice of the crop and crop rotation varies across the agro climatic zone. Being located between 25 to 27 degree North latitude the climate of Bihar is of mostly sub-tropical. Nevertheless region close to Tropic of Cancer experiences tropical climate during summer. Like all the Indian states Bihar also reels under hot summer season during months of March to May. Average temperature is 35-40 degree Celsius throughout the summer months. April and June are the hottest months of the year. December to January is the winter season in Bihar because of its location is Northern hemisphere. The winter in Bihar is mild with average temperature being 5 to 10 degree Celsius. Bihar gets its maximum rainfall during South-West monsoon season which prevails from June to September. The average rainfall of Bihar is around 1200 mm. As far as soil resources are concerned Bihar has three types of soil: montane, alluvium and marshy/swampy soil of Tarai. However, due to rising temperature and reduced and erratic rainfall, increasing

the yield of various crops is a big challenge despite having a rich fertile land of different varieties.

LAND UTILIZATION PATTERN

Land use pattern plays a vital role in determining the total agricultural output. Bihar falls in the riverine plane of the Ganga basin Area. Because of this topographic nature, land put to agricultural use here is high as compared to other states in India. The table also shows that Bihar is a forest deficit state. There is immense pressure on land due to dense population and the pre-eminence of agriculture in the economy of the people. Since there is no scope to expand forest area, the only way for increasing tree cover is by bringing more non-forest land under tree cover. It is aimed to raise the tree cover in Bihar to 15% by the end of 2017. It is evident from Table - 3 that out of total geographical area, 57.12 lakh hectares is under cultivation which is around 60 per cent of the total land area of Bihar. It also shows that 23.58 lakh hectare area is put to cultivation more than once in a year. Therefore the Gross cropped area is 78.82 lakh hectares. The cropping intensity is 138 percent (Table - 4). Although the area under net sown area has increased marginally, Land under both fallow and current fallow have registered a decrease in 2007-08 from previous years. This indicates that, with growing population, the pressure on land is now even higher (Bihar Economic Survey, 2010-11).

Table 3
Land Use Classification in Bihar

<i>Sl. No.</i>	<i>Category</i>	<i>Area in Lakh hectare</i>
i.	Forest	6.21
ii.	Barren & non-cultivable land	4.36
iii.	Land put to non-agriculture uses	16.44
iv.	Cultivable waste land	0.45
v.	Permanent pasture	0.18
vi.	Area under misc. Crops	2.38
vii.	Other fallow (2 to 5 years)	1.30
viii.	Current fallow	5.13
ix.	Net area sown	57.12

Source: As Above

Table 4
Cropping Intensity (138%)

<i>Sl. No.</i>	<i>Category</i>	<i>Area in Lakh hectare</i>
i.	Gross cropped area	78.82
ii.	Area sown more than once	21.70

Source: As Above

The average size of land holdings is very small and scattered not only in Bihar but India also due to land ceiling acts, disintegration of joint family system and less opportunity of living in non-farm sector. The number of operational holdings has been consistently increasing since the first Agriculture Census in 1970-71. The number of holdings in India which was 71.0 million in 1970-71 increased to 137.8 million in the 2010-11 Census. So far as Bihar is concerned the distribution of holdings by size class as depicted in Table - 5 reveals that about 97 per cent of the farmers were under marginal and small categories having land size of less than 2 hectare. The number of agricultural holdings in Bihar has increased from 14657 million (2005-06) to 16191 million (2010-11) showing an increase of 10.47 per cent. The area of operational holdings also increased in the state from 6.251 million hectare (2005-06) to 6.388 million hectare (2010-11) showing an increase of 2.19 per cent. The average size of holdings in Bihar decreased from 0.58 hectare in 2000-01 to 0.39 hectare in 2010-11 (Agricultural Census, GOI, 2010-11). Predominance of such small farms poses serious

hindrances in the way of mechanisation and use of other modern implements for cultivation.

Table 5
Distribution of Holdings by Size Class in Bihar

<i>Category of farmers</i>	<i>No. of Holdings</i>	<i>Operational holding (in Ha.)</i>
Marginal (0-1Ha.)	1, 47, 44, 098 (91.06%)	36, 68, 727.64 (57.43%)
Small (1-2 Ha.)	9, 48, 016 (5.85%)	11, 85, 695.24 (18.56%)
Semi medium (2-4 Ha.)	4, 14, 664 (2.56%)	10, 72, 969.00 (16.80%)
Medium (4-10 Ha.)	81,484 (0.50%)	4, 14, 941.12 (6.50%)
Large (10-above Ha.)	3129 (0.03%)	45,227.71 (0.71%)
Total	1, 61, 91, 391 (100%)	63, 87, 560.71 (100%)

Source: Agricultural Census (2010-11), Ministry of Agriculture, GOI, New Delhi

Cropping Pattern in Bihar Agriculture

Cropping pattern refers to the proportion of area under various crops at a point of time. The crop statistics published by the governments are used to denote the cropping patterns. Cropping pattern is, however, a dynamic concept as it changes over space and time. The cropping pattern of a region is closely influenced by the climatic conditions, socio-cultural, economic, historical and political factors. The physical limit on the cropping pattern may however be overcome by the use of technology. In Bihar, agro-climatic conditions vary from one region to another so the cropping pattern would tend to vary from one region to another. The cropping pattern in this state is dominated by cereals. Apart from food-grains, the state produces oilseeds, fibre crops, sugarcane, fruits, vegetables and other crops. Recently, high value horticulture viz floriculture and aromatic plant cultivation has caught the imagination of the farmers because of its increasing demand. The important cropping sequence of different zones is given as under:

In Table 7, the cropping pattern of Bihar has been presented. The figures reveal that the agricultural economy is still very much oriented

Table 6
Zone-wise Cropping Sequence in Bihar

Zone - I	Rice - Wheat, Rice - Rai, Rice - Sweet Potato, Rice - Maize (Rabi), Maize - Wheat, Maize - Sweet Potato, Maize - Rai, Rice - Lentil, Rice-linseed
Zone - II	Jute - Wheat, Jute - Potato, Jute - Kalai, Jute - Mustard, Rice - Wheat - Moong, Rice - Toria
Zone - III	Rice - Wheat, Rice - Gram, Rice - Lentil, Rice - Rai

Source: Department of Agriculture, Government of Bihar

Table 7
Cropping Pattern in Bihar (Percentage of Area)

Crops	2000-01	2001-02	2002-03	2003-04	2004-05	2005-06	2006-07	2007-08	2008-09
Foodgrains	94.47	94.34	94.42	94.28	94.37	94.35	94.29	94.47	94.52
Cereals*	90.00	90.15	90.15	90.27	89.91	91.31	91.09	91.56	91.55
Pulses*	10.00	9.85	9.85	9.73	10.09	8.69	8.91	8.44	8.45
Oilseeds	2.04	1.98	1.84	1.90	1.91	1.99	1.97	1.95	1.89
Fibre Crops	2.25	2.16	2.31	2.41	2.24	2.15	2.12	2.12	2.06
Sugarcane	1.24	1.52	1.44	1.40	1.47	1.51	1.61	1.47	1.53
Total Area	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Source: Department of Agriculture, GOB

Note*: % relate to area of Cereals & Pulses to total area under Food Grains

towards subsistence production. The area under food grains during the period 2000-01 to 2008-09, has been around 94.5 percent. Within the food grains, the percentage share of cereals in the total area has shown a marginal increase at the cost of area under pulses. The oilseeds, fibres and sugarcane together account for barely 5 percent of the cropped area and their individual shares in the total cropped area show only marginal changes. The average area under sugarcane has increased marginally at the cost of oilseeds and fibre crops. It is evident that there is no scope for further increase in the cultivable area under food grains. Thus,

increasing the yield and cropping intensity are the best options for accelerating the growth of agricultural production in the state.

Table 8 below shows that there is significant improvement in the productivity of different crops over the years. However, it is far below the best producing states in the country. In view of the more or less stable cropping patterns and fixed area of arable land the only option is to increase productivity by adopting improved variety of inputs and more intensification of agricultural practices.

Table 8
Comparative Account of Crop Productivity (Kg/Ha)

Crop/Year	2005-06		2012-13		
	Country	Bihar	Country	Bihar	Best State
Rice	2102	1075	2102	2523	3989 (Punjab)
Wheat	2619	1379	2619	2797	4577 (Punjab)
Maize	1938	2098	1938	3975	4959 (A. P.)
Pulses	598	748	598	1052	1073 (Jharkhand)
Foodgrains	2125	1239	1715	2644	4258 (Punjab)

Source: Report of Taskforce on Agriculture (2015), Government of Bihar

Table 9 below reveals a different story as compared to data produced in Table – 8 in the sense that in Table – 8 the productivity of different crops are shown to be increasing over the period from 2005-06 to 2012-13 while the total production of these crops has declined over the years which is evident from Table 9. In 2009-10, Bihar produced 3599 thousand tons of rice, 4571 thousand tons of

wheat and 1478 thousand tons of maize. The production of rice and pulses has shown a declining trend. In 2000-01 the production of rice was 5444.37 thousand tons which declined to 3599.25 thousand tons. Similarly, production of pulses has declined from 619.44 thousand tons (2000-01) to 472.46 thousand tons in 2009-10.

Table 9
Production of Major Crops in Bihar (in 000 tons)

Years	Cereals				Pulses		
	Rice	Wheat	Maize	Total	Kharif	Rabbi	Total
2000-01	5444.37	4437.96	1497.29	11379.6	98.71	520.73	619.44
2001-02	5202.81	4391.08	1487.92	11081.8	85.23	461.81	547.04
2002-03	5085.57	4040.61	1292.01	10418.2	81.41	477.5	558.91
2003-04	5447.79	3688.94	1473.57	10610.3	82.37	474.44	556.81
2004-05	2625.13	3279.94	1491.18	7396.25	84.08	387.32	471.4
2005-06	3495.93	2763.32	1361.11	7620.36	78.23	368.85	447.08
2006-07	5131.17	4149.02	1754.41	11034.6	85.03	366.39	451.42
2007-08	4472.68	4974.66	1857.01	11304.4	80.06	392.88	472.94
2008-09	5771.39	4638.94	1701.93	12112.3	69.67	457.75	527.42
2009-10	3599.25	4570.82	1478.62	9648.69	77.6	394.86	472.46

Source: Economic Survey (2011-12), Government of Bihar

HORTICULTURE

Horticulture is the branch of agriculture that deals with the art, science, technology, and business of growing plants. It includes the cultivation of medicinal plants, fruits, vegetables, nuts, seeds, herbs, sprouts, mushrooms, algae, flowers, seaweeds and non-food crops such as grass and ornamental trees and plants. The major fruit crops grown in Bihar are Mango, Guava, Litchi, Banana, etc. apart from these major crops minor crops like Makhana, Pineapple, Betelvine are also grown. Almost all the districts of North Bihar particularly Muzaffarpur, East Champaran and Samastipur have good potentiality in respect of litchi cultivation. Similarly Makhana, an important fruit of Bihar is also grown intensively in the districts of Darbhanga, Madhubani, Saharsa, Katihar, Araria and Purnea.

According to Bihar State Horticulture Mission Report, 2015 the area of **fruit crops** in Bihar 2005-06 was 291.610 thousand hectares which increased to 307.52 thousand hectares in 2008-09. Similarly,

production also increased from 3068.425 thousand metric ton to 3853.88 thousand metric ton in 2008-09. The productivity also increased from 11.11 metric ton per hectare in 2005-06 to 13.22 metric ton per hectare in 2008-09.

The area under **vegetables** increased from 498.529 thousand hectare in 2005-06 to 519.12 thousand hectare in 2008-09. The production of vegetables was 7654.435 thousand metric ton in 2005-06 which increased to 8329.025 thousand metric ton in 2008-09. The productivity increased from 15.34 metric ton per hectare in 2005-06 to 16.044 metric ton per hectare in 2008-09. There was an increase of 4.13 per cent in the area of vegetable cultivation; production increased by 8.8 per cent and productivity increased by 4.5 per cent during the above period. Almost all vegetable crops like solanaceous, cucurbits, beans, cole crops, okra, onion and other root crops are widely grown in the state.

Area, of **flowers** also increased significantly from 2005-06 (297.35 thousand ha) to 2008-09(337.84

thousand ha). The production and productivity of flowers also increased during the said period. The major commercial flowers like Marigold, Rose, Tuberose, Gladiolus and Jasmine are cultivated in Bihar. The aromatic plants like Japanese Mint, Lemongrass, Pamaroja, J. citronella have been promoted by Horticulture Mission for commercial cultivation among farmers. There was increase in area, production and productivity in **spices** during 2008-09 (15.35 thousand ha) as compared to 13.20 thousand ha in 2006-07. The area under Aromatic crops has also increased, however, the data regarding production and productivity is not available. Chilli, Turmeric, Coriander, Ginger, Garlic & Methi are the major spices grown in Bihar.

In the light of the above statistics it may be argued that Bihar has the opportunity to have varied types of agro climatic conditions, congenial for growing almost all the horticultural crops. The value addition in horticultural produce is higher than other agricultural crops so its popularity is growing in Bihar. However, there is an urgent need to focus primarily on increasing both production and productivity through adoption of improved and appropriate technologies for ensuring quality, including genetic up gradation of all horticultural crops and addressing challenges of climate change. Special emphasis should also be given for adoption of area based cluster approach towards developing regionally differentiated crops, which are agro-climatically most suitable for the State/region. Availability of good quality planting material should receive focused attention. Efforts should also be made to establish and upgrade nurseries and Tissue Culture Units. This may be supplemented through plantation development programmes through addition of new areas under improved varieties to meet both domestic and external market demand.

MAJOR CHALLENGES FACING THE BIHAR AGRICULTURE

It has been discussed in the above paragraphs that agriculture is an important contributor in the state GDP and it serves as the largest source of livelihood to the people of Bihar. The state of Bihar is endowed with variety of agro-climatic regions along with a variety of soils suitable for raising variety of crops

– both cereals and non-cereals. It is also endowed with vast reservoir of water-both surface and underground, notwithstanding the erratic and irregular onset of monsoon affecting production and productivity of agriculture sector in Bihar. There are certain major challenges faced by agriculture in Bihar which may be mentioned as follows:

- **Small size of cultivable land:** More than 91 percent of all holdings fall in the category of marginal holdings with farm size less than 1 hectare. Moreover, these small sized plots are scattered. The small and fragmented land holdings do not allow modern methods of cultivation and it deprived of the benefit of economies of scale.
- **Excessive dependency on vagaries of monsoon:** State agriculture still heavily depends on monsoon. In the last several years, there has been drought or drought like situation in the state. Kharif crops are almost a gamble leaving little prospect for investments in costly inputs. Canal Irrigation is available in limited areas. is scanty. Bihar irrigation is majorly dependent on diesel based tube wells which escalate the cost of production.
- **Inadequate dissemination of technological knowledge:** There are two agricultural universities, five agricultural colleges, one horticulture college, one agriculture engineering college, one dairy technology college and one veterinary college in the state. All the 38 districts have a functional Krishi Vigyan Kendra (KVK). ICAR has also a presence with eastern states regional headquarter at Patna. Besides, National Research Centre for Litchi and Makhana are established in state. However, State productivity remains low because of the slow adoption of modern technologies by the farmers. Dominance of cereals in cropping pattern reflects on the subsistence nature of state agriculture. Institutional extension system faces the challenge to take latest technologies to farmers' field.

- **Lack of Infrastructure:** Bihar has since long been suffering from inadequate infrastructure facilities. There is problem of shortage of road connectivity specially those connecting urban to rural areas. Shortage of cold storage, warehousing and godowns result into distress sell by farmers particularly the perishable goods. Power availability to agriculture sector is inadequate, erratic and untimely.
 - **Lack of institutional credit:** The farmers, particularly the small and marginal ones are mainly dependant on non-institutional sources of funds because they lack the collateral required by banks and other formal sources of credit. Slow pace of implementation of kisan credit card leave large number of farmers dependant on high cost non institutional lending sources seriously impeding use of modern agricultural inputs and adoption of modern technology.
 - **Inadequate Marketing and Processing:** Marketing and processing infrastructure are not adequate, so the farmers do not get adequate or remunerative prices for their products affecting their income.
 - **Lack of proper water management:** State agriculture is mainly dependent on Monsoon. A heavy rainfall lead to flood and a deficient rainfall leads to drought. The paradox of flood and drought occur simultaneously almost every year making agriculture highly vulnerable and unstable. Unless we evolve a scientific and sustainable water management system the water requirement of the state cannot be addressed on a permanent basis along with solving the problem of flood and draught.
- brought under cultivation with appropriate state interventions.
- The dissemination of latest crop production technology must be facilitated among the farmers, specially the poor farmers. Region and Agro Climatic specific crop, variety and technology may be identified and promoted. Generation of appropriate agricultural technology and its dissemination to the farmers are becoming more and more challenging in the context of the climate change. Both the numbers and the quality of the technically qualified person in agriculture are grossly inadequate. There is a need to step up investment in agricultural research, education, extension. New initiatives initiated by Bihar Agricultural University such as Kisan choupal, Kisan Gyan Rath and direct video conferencing with farmers have proved immensely useful.
 - Agricultural planning is much dependent on the statistical input generated through age old system. It needs a relook with appropriate input from remote sensing technologies.
 - Seed is one of the most critical input of agriculture but its supply is quite inadequate and untimely. There is a need to substantially increase investment in public sector seed production, processing and Marketing. Local seed companies may also be promoted to reduce the dependence on multinational seed companies. In addition to the crop seed planting material for horticultural crops are important. Similarly animal breeds and fish fingerlings are important for their productivity and quality.
 - Sugarcane is the major cash crop in Bihar. Climate change, declining soil health, emerging new disease and pest, labour scarcity and abiotic stresses are severely affecting cane productivity and sugar recovery. Sugarcane seed replacement rate is only about 10 % against the desired

POLICY MEASURES

- Since there is limited scope for increase in cultivable area, intensification of cropping may be increased. Current fallow and other fallow land may be

level of 33 %. Sugar sector needs a revival package.

- Agriculture marketing is one area which needs focused attention. The basic infrastructure such as the dry and cold storage are grossly inadequate in states like Bihar. Procurement of food grains must be assured and to make it effective FCI and CWC must create adequate storage infrastructure and FCI should make arrangements to procure food grains including Maize and pulses from the farmers.
- Small farm agriculture is a compulsive situation and to make it viable is the highest challenge. Integrated farming may be a solution and it needs to be encouraged. Animal husbandry and fisheries are the key sectors besides crops and horticulture.
- Organic farming technologies may be promoted to utilize the locally available resources. It would bring optimality in the use of chemical fertilizers and save money on subsidy also. Bihar has a robust vermi compost and bio fertilizer programme which needs to be replicated. Similarly green manure programme should vigorously be popularized and implemented.
- Farm mechanization saves cost and improves both quantity and quality of crops. Important measures should be evolved to use machines and modern implements even on smaller plots of land.
- Bihar has large untapped irrigation potential. There should be national policy to help states to harness the irrigation potential and any investment on this count should be supported through a national programme.
- Flood and drought have become recurrent feature in Bihar. Paradoxically, north Bihar is ravaged by flood and south Bihar by drought in same year. Similarly wild animals such as blue bull are proving

a threat to agriculture. In such an unstable situation farmers are hardly able to make an investment and therefore agriculture largely remains traditional and subsistence. There is an urgent need to have a comprehensive policy to mitigate risk of contingent situations in agriculture.

SUMMARY AND CONCLUSION

The state of Bihar is endowed with very rich and fertile soil, abundant water, varied climate and abundant supply of hard working workforce. The farmers of Bihar are not only hard working but intelligent and innovative also. Agriculture is the vital source of wealth in the state with about 79% of its population engaged in agricultural pursuits which are higher than the national average. Agriculture and allied sector contributes about 19 percent of the GSDP. The major agricultural products of Bihar are cereals, pulses, oilseeds and cash crops. However, cereals dominate the cropping pattern. The rice-wheat cropping system occupies more than 70% of the gross cropped area but productivity has remained low despite favourable soil, water and climatic conditions. Bihar has mainly three climatic zones and their associated variety of soils which are suitable for particular type of crops. Bihar falls in the riverine plane of the Ganga basin Area. Because of this topographic nature, land put to agricultural use here is high as compared to other states in India. There is immense pressure on land due to dense population and the pre-eminence of agriculture in the economy of the people. The average size of land holdings is very small and scattered not only in Bihar but India also due to land ceiling acts, disintegration of joint family system and less opportunity of living in non-farm sector. In Bihar, agro-climatic conditions vary from one region to another so the cropping pattern would tend to vary from one region to another. The cropping pattern in this state is dominated by cereals. Apart from food-grains, the state produces oilseeds, fibre crops, sugarcane, fruits, vegetables and other crops. Bihar produces a variety of crops including cereals, pulses, vegetables, fruits, flowers and spices etc. However, the state agriculture faces some major challenges like large number of small and marginal

holdings, lack of proper water management, inadequate dissemination of technical knowledge, inadequate credit facility to small and marginal farmers and inadequate infrastructural facility etc. Therefore, the urgent need of the hour is to increase investments in rural infrastructure for water management/soil conservation/ construction of roads to link rural area with urban area etc. With appropriate technology, infrastructure and policy support, it is possible to reverse the declining trend in food grain production and check the migration of the people from Bihar to other states. Adequate policy support is needed to augment the production of non-cereals and horticultural products. As these products are high in value and can create immense employment opportunities; they can be highly instrumental in reducing rural poverty in Bihar to great extent.

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