

## Editorial

# Maize Economy of Bihar, India: Agro- Climatic Zone Wise Study

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Besides the fact that Maize, a cereal famous as “Queen of Cereals”, has good potential to promote development of farming household and overall rural economy through improving the level of nutrition for both human beings and livestock [1] and its linkages towards industries , livestock economy [1-3] and trade, maize economy scenario in Bihar has not been satisfactory in recent years. A regional shift in production has been observed from north to south. Bihar, Uttar Pradesh and Madhya Pradesh were the major maize producing states in 1990s, but during the past two decades, southern states, especially Andhra Pradesh and Karnataka, have become the major maize-producing states [4] and role of Bihar in India’s maize production is shrinking. However, promotion of maize economy can be a passive side route to the development of agriculture and overall rural economy of Bihar.

Bihar is one of the traditional maize-growing states in India. Maize is the third most important food grain crop in Bihar. Presently, Bihar is the third largest producer of maize in India, and contributing about 8 per cent to the Indian maize production of 22.26 million tonnes (Mt) in 2012-13. Maize yield in Bihar was lower than West

Bengal, Andhra Pradesh and Punjab, besides the fact that more than 65 percent of total area (second largest) used for maize cultivation in Bihar is irrigated. Though, maize is cultivated in almost all districts and in all types of agro-ecological regions of Bihar. However, 11-13 districts together account for more than three-fourths of maize area as well as production of the state, mainly fall in the agro-climatic zones I and II (Table 1). These districts are historically flood-prone areas during rainy season and fall north of the Ganges, having several seasonal river tributaries. Also, only seven districts, viz. Begusarai, Khagaria, East Champaran, Bhagalpur, Madhepura, Saharsa and Samastipur constitute about half of the total maize acreage in the state, and six districts, viz. Madhepura, Khagaria, Saharsa, Bhagalpur, East Champaran, Katihar, together account for over 50 per cent of the total maize production (Table 2). Overview of disaggregate level data shows three different maize production scenario existing in Bihar: 1. districts having large area under maize production with comparatively high production and high productivity (Such as Madhepura, Saharsa, Bhagalpur, etc.), 2, districts having comparatively larger area under maize cultivation with comparatively low productivity (such as Begusarai, Vaishali, Purnea, Samastipur, etc.) and 3, districts having small area under maize production with high productivity (Such as Arwal, Madhubani, Kishanganj, Sitamarhi, etc. (Table 3).

Agro- climatic zone wise data reflects that association between maize production, poultry & fisheries (Table 4) is not satisfactory in agro- climatic zones II and III. Comparison of the level of diversification towards maize in different agro- climatic zones shows that diversification is low in agro- climatic zone I besides the fact that this zone is similar in nature to zone II. Effect of maize on nutrition is also not very significant in Bihar as most of the districts of zone I

**Table 1:** Agro-ecological regions, soil types, average rainfall and mean temperature and Maize Economy in maize-growing Districts in Bihar (2011-12).

Agro-eco-sub-region ecosystem	Districts	Soil type	Rainfall	Temperature		Share in Total Maize production	Productivity	Share in Total Maize Acreage
				Max.	Min.			
Agro-climatic zone I (Northern West)	West Champaran, East Champaran, Siwan, Saran, Sitamarhi, Sheohar, Muzaffarpur, Vaishali, Madhubani, Darbhanga, Samastipur, Gopalganj, Begusarai	Loam and sandy loam.	1200-1700 mms	36.6	7.7	36.4	2.98	45.2
Agro-climatic Zone II (Northern East)	Purnea, Katihar, Saharsa, Supaul, Madhepura, Khagaria, Araria, Kishanganj.	Loam and clay loam.	1200-1700 mms	33.8	8.8	48.4	4.6	38.7
Agro-climatic zone IIIA (Southern East)	Sheikhpura, Munger, Jamui, Lakhisarai, Bhagalpur, Banka.	Sandy loam, loam, clay and clay loam.	990-1300 mms	37.1	7.8	11.6	3.78	11.3
Agro-climatic zone IIIB (Southern West)	Rohtas, Bhojpur, Buxar, Bhabhua, Arwal, Patna, Nalanda, Nawada, Jehanabad, Aurangabad, Gaya.	Sandy loam, loam, clay and clay loam.	990-1300 mms	37.1	7.8	3.2	2.6	4.7

**Source:** Author’s Calculation.

**Table 2:** List of Districts according to Productivity of Maize (2011-12).

Category	Districts
<b>High maize productivity Districts (Maize grain yield:&gt;4 t/ha)</b>	Madhepura, Saharsa, Khagaria, Sitamarhi, Supaul, Bhagalpur, Araria and Katihar constituting about 40 per cent of total maize area in the state
<b>Medium maize productivity Districts (Maize grain yield:2-4 t/ha)</b>	Nalanda, Banka, Muzaffarpur, East Champaran, Arwal, Lakhisarai, West Champaran, Madhubani, Siwan, Vaishali, Kishanganj, Samastipur, Gopalganj, Nawada, Sheohar, Saran, Darbhanga, Jehanabad, Purnea, Jamui, Kaimur, Begusarai, Gaya, Rohtas, Patna, Buxar and Sheikhpura constituting about 48 per cent of total maize area in the state.
<b>Low maize productivity Districts (Maize grain yield &gt;2 t/ha)</b>	Bhojpur, Munger and Aurangabad representing about 2 per cent of total maize area in the state.

Source: Author's Calculation.

**Table 3:** List of Rank wise Districts as per respective share in Maize Acreage, Production Share in Bihar and Productivity (2011-12).

Sl. No	Area Share	Production Share	Productivity	Sl. No	Area Share	Production Share	Productivity
1	Begusarai	Madhepura	Madhepura	20	Patna	Lakhisarai	Samastipur
2	Khagaria	Khagaria	Saharsa	21	Lakhisarai	Sitamarhi	Gopalganj
3	East Champaran	Saharsa	Khagaria	22	Nalanda	Nalanda	Nawada
4	Bhagalpur	Bhagalpur	Sitamarhi	23	Sitamarhi	Patna	Sheohar
5	Madhepura	East Champaran	Supaul	24	Gaya	Gaya	Saran
6	Saharsa	Katihar	Bhagalpur	25	Munger	Bhojpur	Darbhanga
7	Samastipur	Begusarai	Araria	26	Bhojpur	Munger	Jehanabad
8	Purnea	Samastipur	Katihar	27	Jamui	Jamui	Purnea
9	Katihar	Araria	Nalanda	28	Kishanganj	Kishanganj	Jamui
10	Vaishali	Purnea	Banka	29	Nawada	Nawada	Kaimur
11	Saran	Vaishali	Muzaffarpur	30	Buxar	Buxar	Begusarai
12	Araria	Muzaffarpur	East Champaran	31	Sheohar	Sheohar	Gaya
13	Muzaffarpur	Saran	Arwal	32	Jehanabad	Arwal	Rohtas
14	Darbhanga	Supaul	Lakhisarai	33	Madhubani	Jehanabad	Patna
15	Siwan	Darbhanga	West Champaran	34	Arwal	Madhubani	Buxar
16	Gopalganj	Siwan	Madhubani	35	Aurangabad	Aurangabad	Sheikhpura
17	Supaul	Banka	Siwan	36	Sheikhpura	Kaimur	Bhojpur
18	Banka	Gopalganj	Vaishali	37	Kaimur	Rohtas	Munger
19	West Champaran	West Champaran	Kishanganj	38	Rohtas	Sheikhpura	Aurangabad

Source: Author's Calculation.

**Table 4:** Maize and Livestock Economy in Different Agro-Eco-Sub Region Ecosystem (2011-12).

Agro-eco-sub-region ecosystem	Percentages of area under maize production in total net cropped area	Per 1000 population							Per Capita Maize Availability per one lakh population	Population density
		cow	Buffalo	Pig	Sheep	Goat	Poultry	Fish Production		
Agro-climatic zone I	13.8	79	54	3	0	97	83	0.004	1.94	1335
Agro-climatic Zone II	22.67	191	70	6	2	196	30	0.004	6.47	1013
Agro-climatic zone IIIA	19.21	182	57	5	2	125	36	0.003	2.95	730
Agro-climatic zone IIIB	2.11	94	75	10	6	61	58	0.003	0.29	980

Source: Author's Calculation.

and zone II are facing high infant mortality problem in Bihar (Table 5). This problem is more severe in the zone II, where per capita maize availability is highest among all zones and negates the relationship between nutrition and maize in Bihar.

Risks including price risk (e.g., the risk that the price that they receive for their output will be higher or lower than average in a given year), yield risk (e.g., the risk that a pest infestation or drought or flood will cause yields to be lower than average), input supply risk (e.g., the

risk of a water shortage or a labour shortage at a critical point in the production process) and other types of risks (e.g., the risk of a family member getting sick or a tractor breaking down) [5] affects the farm economy. The types of risk and constraints the farmer faces are not just macroeconomic; they often take the form of limited availability of inputs, such as fertilizer, water, labour, or capital. Here, it is important to understand how macroeconomic factors including land, labour, capital and product market can explain the unsatisfactory association

**Table 5:** List of Rank wise Districts as per respective share in Maize Production in Bihar and Infant Mortality Rate (2011-12).

District	Respective rank as per IMR *	Respective rank as per share in maize production in the state **	District	Respective rank as per IMR *	Respective rank as per share in maize production in the state **
Araria	28	9	Madhubani	20	34
Aurangabad	3	35	Munger	12	26
Banka	5	17	Muzaffarpur	30	12
Begusarai	2	7	Nalanda	13	22
Bhagalpur	16	4	Nawada	7	29
Bhojpur	4	25	Patna	1	23
Buxar	22	30	Purnea	32	10
Darbhanga	10	15	Rohtas	14	37
E. Champaran	23	5	Saharsa	33	3
Gaya	19	24	Samastipur	21	8
Gopalganj	11	18	Saran	18	13
Jamui	26	27	Sheikhpura	29	38
Jehanabad	17	33	Sheohar	8	31
Kaimur	24	36	Sitamarhi	36	21
Katihar	27	6	Siwan	6	16
Khagaria	35	2	Supaul	34	14
Kishanganj	31	28	Vaishali	9	11
Lakhisarai	15	20	W. Champaran	25	19
Madhepura	37	1			

Note: \* Rank 1 represents lowest IMR in Bihar. \*\* Rank 1 shows highest share in maize production in Bihar.

Source: Author's Calculation.

between maize production, poultry & fisheries in Bihar in general and agro- climatic zone II in particular, low level of diversification towards maize production in agro- climatic zone I and III and low linkage between maize and nutrition in overall Bihar in general and zones I and II in particular.

Policy makers have been making frantic efforts to make farming a gainful sector as a source of livelihood in Bihar. Studies are expected to provide valuable benchmark information to regarding maize production dynamics existing in Bihar to enable them consider its production as a viable option. As for farmers who are already cultivating the crop, studies will go a long way in providing information on ways of boosting production and increase profitability. In order to increase the production of maize and its linkages, sound micro and macroeconomic farm policies are needed. These require prior to their formulation, an understanding of the constraints in maize production. This will obviously go a long way in generating employment opportunities, improve livestock economy, improve the food security status and generate additional money for household in

general and state in particular.

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