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Emerging Issues of Bihar Agriculture in the Present Digital Era: An Overview

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A B S T R A C T

The paper aims to analyze the agriculture and its emerging issues in the digital era under the state of Bihar as major objective. The study utilized secondary sources of data to attain the set objective. It is well known that the state of Bihar is an economically backward state in the country but agriculture is the backbone of economy. At present, majority of the population depend on agriculture for their livelihood. In the study period a significant increase in production was observed which was mainly due to state government initiatives, increase in MSP price and use of digital mode of transactions. The main issues prevails in the agricultural sector was productivity that is still very low. Pulses area and production is on decline trend, slow adoption of improved technologies and digital techniques are the important factors which is responsible for slow growth of agriculture in the state. Cropping pattern also indicates traditional practices of agriculture in present era that indicates that modern techniques are required. The study suggested for appropriate crop planning, scientific management and adoption of digital mode in agriculture for the betterment of farmers and state income. Therefore, the state government, agricultural department of the state, agricultural universities, and NGOs will have to come forward for the overall growth of agriculture in the state.

Introduction

Bihar is an agricultural state where more than 90 percent people directly or indirectly depends for livelihood. In the state about 55.00 percent of the total geographical area under agricultural use and per capita land available for cultivation is around 0.11 hectare. Only agriculture and allied sector is able for absorption of growing population for

livelihood. Still in the state nearly 52 percent people are lives in poor condition due to poor industrialization and crop productivity. For the search of livelihood annually more than 50 lacks farmers migrated for works in different states (5). It was noticed that due to lack of works in other states farmers again returns back in their home and created additional pressure on this agriculture sector. The share of primary, secondary and tertiary sector in the GSVA was 21.30, 19.70 and 59.00 per cent respectively. The relative share of agricultural sector in state's GSDP has registered declined due to increase in share of tertiary sector since last decades. The share of crop sector in total GSVA was 10.64 per cent during 2018-19. Bihar has around 8.60 per cent of India's population and only 3.80 percent of land area. In the total geographical area 9359.57 thousand hectares only 56.0 per cent (5241. 97 thousand hectares) net sown area. In the state more than 70 per cent population engaged in agricultural operations. Due to efforts taken by state and central government in the way of Road maps since 2008, Prime minister kisan sammannidhi yojana and Jal – Jeevan Hariyali (Climate Resilient agriculture) and recent iii rd Agricultural Road map 2017-22 with provision of 1.54 lakh crore for development of agriculture and allied sectors played an important role in the production performance of crop and horticulture. The production of cereals in 2018-19 was 163.12 lakh tones which indicates a significant increase from past years (1,2).

The fragmented and small land holdings (more than 97 per cent) erratic rainfall, socio economic capability & disparity, very low average land holding size 0.39 hectares and only 14.20 per cent of land holdings owned by female (gender bias), climatic factors, technology adoption clearly indicates the problems in agriculture in the state and this is the cause of low intensity of cropping 144 per cent and poor productivity till date. In the state around 76 per cent men were migrated due to search and perform the agricultural and other works. In last two decades from 2008 to 2017 an additional road length build about 130799km and out of it 92204 km was rural road (3,4). After introduction and implementation of National Horticulture Mission in 2005 a significant encouraging development in vegetables production was observed. Since the year 2005-06 the state government adopted and use of e- governance in almost field and received several awards from the central government in digital field.

The food processing, dairy sector, sugar industries, manufacturing sector are emerging sectors in the state and responsible for the maintain of income level, livelihood and nutritional level of the people resides in the state of Bihar.

To cope up with situation the state government taken measures and started to give emphasis on livestock, horticulture, floriculture, fisheries, medicinal, other cash crops, value addition, processing, etc. for engaging the unemployed persons of the state for providing better income and livelihood.

The government was target to landless, marginal, small farmers, unemployed youths, women, etc. for gaining normal life and bringing employment generation in the state. The reason behind it was to stabilize the growth of overall economy.

Taken the above facts and figures in account the present paper prepared with the prime aims to analyze the agriculture in the state with a view to understand the performance of agriculture, promoting agriculture as per the people needs, value addition and processing level enhancement and its sustainability as major objective. The study was mainly based on secondary data collected from various

published sources. The collected data arranged in tabular form and presented for discussions.

Agro- climatic situation of Bihar

The state has four distinct important agro-climatic zones i.e. North Alluvial plain popularly known as Zone-1 includes 13 districts and have 3.26 million hectares geographical area. Out of total geographical area, around 65.95 percent (2.15 M.Ha) under net sown area (6,7). In the zone rain fall found varied between 1040 mm to 1450 mm with an average annual rain fall of 1245 mm. The minimum- maximum temperature varies between7.7to36.60degree Celsius. The important crops of the zone are rice, wheat, Maize, Arhar, Moong, Potato, Sugarcane, etc. and the soil is mostly sandy loam to loam. North – East Alluvial plain also known as zone- 2 comprises eight districts of the state. The geographical area is (2.08 M.Ha) and out of it 1.21 M Ha under net sown area around 58.17percent. In the zone about 19.83 percent area is under irrigation. In the zone rainfall ranges between 1200 mm to 1700 mm and average is 1450 mm.

The temperature ranges between 8.8 to 33.80 degree Celsius as minimum and maximum. Important crops in the zone are Jute, Rice, Wheat, Potato, Maize, Mustard, Moong, etc. South zone Alluvial plain Zone- III comprising 17 district. The geographical area is divided into two part i.e. East South Alluvial plain comprises 6 district and having (1.11 M.Ha) of geographical area and out of it only 44.14 percent is under cultivation. The rainfall range between 990 mm to 1240 mm with an average annual of 1115 mm.

The main crops grown under the area is Rice, Wheat, Moong, Gram, Potato, Onion etc. The second sub-zones in the zone are West South Alluvial Plain. It comprises 11 districts and its geographical area is (2.92 M.Ha) in the total geographical area 57.53 percent area under net sown and 81.15 percent area under irrigation. The average rain fall of the zone is ranges between 990 mm to 1300 mm and temp. Ranges between 37.10 to 7.80 degree Celsius. The main crop of the zone is Rice, Gram, Moong, Wheat etc. The State as a whole is affected by two sets of stresses i.e. Floods and droughts occurred in every year as a rule. In the entire zone area under food grains decreased namely cereals, coarse cereals and pulses. And the area under fruits, sugarcane increased. It is important to highlight that the area under food grains till occupies more than 85 percent of the total cropped area due to traditional cropping pattern and traditional food habits.

Rainfall Scenario of Bihar

As per table cited above it is observed that S W monsoon is the main rain period and across the year it was found to varied between 665.80 mm to 1048.09 mm followed by N W monsoon and in this period rain found varies between 39.35 mm to 118.30 mm, Hot weather rain found varied between 53.33 mm to 160.2 mm and winter rain found varied between 02.66 mm to 29.66 mm. The annual average rainfall in the state is 1013 mm and only in three triennium found crossed the average i.e. triennium 2001-03, 2007-09 and 2019-20 and in rest triennium total rainfall was below the average rainfall.

Cropping Pattern of Bihar

In the state of Bihar variety of crops were found grown due to favorable agro climatic conditions. Cropping pattern constituted by different crops like food grains including cereals and pulses, some other crops also grown. The details of cropping pattern are presented under here under. It may be observed from above table no 2 stated above that the cropping pattern of various crops for

the period from triennium ending 2001-03 to 2019-2020, it reveal that the cropping pattern is very much oriented towards subsistence after the passing of 25 years of this twenty first century i.e. digital industrial revolution period.

The food grain occupied largest per cent age under gross cropped area and is found varies between92.77 per cent in 2013-15 to 95.65 percent in 2001-03. The other crops like oilseeds, fiber, sugarcane, etc. occupied only 4.35 per cent in 2001-03 to 6.91 per cent during 2016-18.As per the statistical data the net sown area is almost stagnant about 5252 thousand hectares but total cropped area was found slightly increased from 7194 thousand hectares in 2001 to 7590 thousand hectares in 2019-20. The cropping pattern of the state is 144 per cent below to the national level. The variation in cropping pattern was due to variation in rainfall.

Land holding size of Bihar

It may be observed from the table no3 that in between 2001 to 2020 marginal holdings were significantly increased from 40.80 per cent to 57.43 per cent it was mainly due to division of joint family and rapid growth of the population in the state during the period. The other categories small, semi medium, medium and large are found declined from the year 2001 onwards. This clearly shows the uneconomic size of land holdings in the state.

Status of Horticultural crops in the state of Bihar

In the state of Bihar a variety of fruits crops, vegetables crops**,** flowers, medicinal plants, ornamental plants grown throughout the year. The area and production is presented hereunder.

The table 4 cited above indicates that mango, guava, litchi, and banana are important fruits grown under the state both in terms of acreage and production. The drawbacks of this fruits are that during the peak period prices of the produce goes down and farmers were not getting remunerative price. No systematic markets, technical knowhow to plugging, handling, packaging, transporting, etc, also creating a lot of problems during heavy harvest. In the state very few fruit processing units are established mainly by the private level so farmers were unable to process their produce at local level and ultimately distress sale was made.

The table 5 reveals that a variety of vegetables grown in the state but most prominent is cauliflower, onion, potato, tomato, chilly, okra and cow pea across various seasons. In past two decades mainly fold production of vegetables are increased due to continuous demand throughout the year. In recent past so many good factors like increase in income, awareness of nutritional value, health benefits of the vegetables create high demand for the vegetables in the country in general and state in particular. The cultivation of vegetables proved it is a remunerative and high income generating activities. The same problem like fruits are also happened in the vegetables and during bumper production prices of the produce goes far below from the cost of production and farmers get losses from the cultivation. The per capita availability of vegetable is low with the recommended level due to higher prices during short supply and particularly poorer section of the society cannot afford it. Thus in the state facilities may be created for the produced vegetable production by creating processing, storage and marketing facilities.

The table 6 showed that flowers also grown n the state but the area and production are not encouraging. The urbanization level increase in the state and also people are demanded flowers in social, official, rituals, festivals,

marriage, death, etc. but due to low production people of the state depended on outside state flowers which is very costly.

Status and trends of Minimum Support Price

The cited below depict the Status of minimum support price of agricultural commodities. The support price recommended by the CACP and announced by the union agricultural ministry for notified crops in *kharif* and *rabi* seasons every year. The aim behind this was provide at least costs of cultivation price to the farmers and farmers were not shift to their crops in other remunerative price crops for protection of cropping pattern. In past two decades the announced price collected and presented in table 7.

The table showed that during the past decades a significant increase in all commodities minimum support price the table is self explanatory. The increase in MSP was due to increase in the costs of inputs. Amongst the crop pulses are showed an increase in price at the faster level it was due to mismatched of demand supply gap and decline in area and production of pulses in past two decades. However the government has implemented several programme for its development but results are not encouraging due to several social, economical and financial factors.

Production of food grains in Bihar

The table 8 cited above indicates that after the year 2009 an onward a significant increase in production of food grains was observed due to state government initiatives and central government support price, programme, etc. The data indicates that in past one decade around 56 per cent increase in quantity and above 45 per cent overall increase or addition in total production in the state. The table further indicates that the production level varied across the referred years due to climatic and other production related factors.

Status of Roads infrastructure in Bihar

Roads are an important means of conveyance not for only man it is equally important for commodities, materials, etc. In the state since the year 2009 onward roads are started construct in a faster rate and up to 2020 with the help of state and central sponsored scheme on road a significant increase in the length of roads in Bihar. The table 9 is self explanatory.

The table showed that since 2009 to 2020 about 54641 kms roads are constructed it indicates the rate of increase which was more than double due to the efforts and vision of the government. This infrastructure invite to adopt new methods of agricultural production and marketing for getting remunerative price.

Status of digitalization of agriculture in Bihar

We all know that this century is treated as digital revolution era of industrialization**.** In all field more or less digital technology started to use. In agriculture government started to provide support, incentives, subsidies and other benefits through electronic medium for maintain transparency and reducing corruption as main objective. Digitalizing the agriculture is not the primary focus, whether using technology will it benefit the farmers or not is the main question in this era. In the recent years incomes of farmers go up, but it can be sustained or not will be the main focus. Therefore, all the stakeholders of agriculture try to ensure long term high economic growth and state government also try to achieve the targets through preparation of plans like agricultural road maps for better returns to farmers.

Table.1 Season wise annual rainfall in Bihar (*Triennium ending 2001-03 to 2019-20*)

(In mm)

Year	Winter Rain	Hot weather rain	S.W Monsoon	N.W Monsoon	Total rainfall	Avg.Annual Rain
2001-03	29.66	82.16	857.57	118.30	1087.69	1013.00
2004-06	07.96	73.29	869.53	39.35	990.13	1013.00
2007-09	19.68	78.80	1048.09	43.64	1190.21	1013.00
2010-12	05.71	53.33	772.20	31.70	826.94	1013.00
2013-15	20.70	86.40	665.80	70.16	843.06	1013.00
2016-18	02.66	80.40	823.33	42.50	948.89	1013.00
2019-20	19.16	160.2	1029.60	88.77	1297.73	1013.00

Source : Directorate of Economics and Statistics, GOB

Table.2 Year-wise triennium ending cropping pattern in Bihar (2001-03 to 2019-21)

Year	Food Grains	Cereals	Pulses	Other crops
2001-03	95.65	87.25	8.40	4.35
2004-06	95.48	87.35	8.13	4.52
2007-09	94.80	86.74	8.06	5.20
2010-12	93.40	85.20	8.20	6.60
2013-15	92.77	84.90	7.87	7.23
2016-18	93.09	86.11	6.98	6.91
2019-20	93.45	86.70	6.75	6.55

Source: Economic survey of Bihar various issues & Bihar through figure

Table.3 Distribution of land holding size in Bihar

Categories of farm	% of No of holdings	% of operation holdings	% of No of holdings	% of operation holdings	% of No of holdings	% of operation holdings
	Year 2001		Year 2011		Year 2020	
Marginal below 1 hac	82.90	40.80	91.21	57.73	91.06	57.43
Small (1-2 hac)	9.60	19.00	5.75	18.24	5.85	18.56
Semi medium (2-4 hac)	5.70	23.10	2.52	16.66	2.56	16.79
Medium (4-10hac)	1.70	14.30	0.49	6.67	0.50	6.49
Large (10 & above hac)	0.10	2.80	0.018	0.69	0.018	0.70

Source : Agricultural census division, M o A, New Delhi 2019-20.

Table.4 Status of Fruits area and production in the state 2017-18**.**

Fruits	Area in hectares.	Production in tons.
Mango	150000.00	1541000.00
Guava	27700.00	331200.00
Litchi	24500.00	333100.00
Lemon	17000.00	135000.00
Banana	28000.00	450000.00
Coconut	15600.00	151500.00
Others	29000.00	486685.00
Total	291800.00	3428485.00

Source : Directorate of Horticulture, Government of Bihar 2018-19

Table.5 Status of Vegetables area and production in the state 2017-18

Vegetables	Area in hectares.	Production in tons.
Cauliflower	59900.00	960000.00
Cabbage	36600.00	590000.00
Onion	48500.00	920000.00
Tomato	45500.00	590000.00
Chilly	38500.00	460000.00
Brinjal	55600.00	1090000.00
Okra	59000.00	930000.00
Pumpkin	26000.00	410000.00
Nanua	34000.00	470000.00
Jingni	8000.00	48000.00
Karaila	3500.00	51000.00
Parwal	4600.00	47000.00
Bodi	12000.00	72000.00
Others	63000.00	990000.00
Total	494700.00	7628000.00

Table.6 Status of Flowers area and production in the state 2017-18

Flower	Area in hectares.	Production in tons.
Rose	25.30	32.00
Gladiolus	30.00	60.00
Marigold	150.00	2900.00
Jasmine	33.00	98.00
Tuberose	21.00	95.00
Others	52.00	471.00
Total	311.30	3656.00
Cutflower	33.00	-
Spike	59.00	-
Loose flower	3300.00	-

Table.7 Status of minimum support price of agricultural commodities (Rs. per quintal)

Commodity	2001-02	2010-11	2016-17	2019-20
Paddy	530	1030	1510.00	1835.00
Jowar	485	900	1625.00	2570.00
Bajra	485	880	1330.00	2000.00
Ragi	445	965	1725.00	3150.00
Maize	485	880	1365.00	1760.00
Arhar	1320	3000	5050.00	5800.00
Moong	1320	3170	5225.00	7050.00
Urad	1320	2900	5000.00	5700.00
Wheat	620	1120	1625.00	1925.00
Barley	500	780	1325.00	1525.00
Gram	1200	2100	4000.00	4875.00
Lentil	1200	2250	3950.00	4800.00
R&M	1300	1850	3700.00	4425.00

Source: Directorate of Economics and Statistics, MoA&FW.GoI, New Delhi

Table.8 Production of food grains in Bihar (2001- 2020)

Triennium ending	Production lakh tonnes	% Change in Trends	
		Quantity	%
2001-03	122.70		
2004-06	118.73	-3.97	-3.23
2007-09	116.21	-6.49	-5.28
2010-12	153.74	+31.04	+25.29
2013-15	153.38	+30.68	+25.00
2016-18	181.43	+58.76	+47.86
2019-20	178.39	+55.69	+45.38

Source : Economic surveys of Bihar& Bihar through figure (various issue)

Table.9 Length of rural roads in Bihar

Triennium ending	Pakka Road	Kachha Road	Total Road (Kms.)
2001-03	NA	-	-
2003-06	836	-	836
2006-09	NA	-	-
2009-12	42883	-	42883
2012-15	57970	-	57970
2015-18	76256	-	76256
2018-20	97524	-	97524

Source: Department of Rural workers GOB, Patna

For marketing of agricultural produce and removing the vast numbers of middlemen in agricultural marketing so many electronic platform, Apps, created and also government has launched E- nam, E- commerce and is started working in Delhi, Bangalore, Maharashtra, etc, for benefiting the farmers in realizing better price to their produce. By using technology in the field of agriculture leading to increase in productivity, efficiency, and output more agrotech start-ups were created. Under the E- Commerce system the buying and selling of goods and services using online media through the internet leads broad marketing i.e. a firm interaction with other business, a firm interaction with its customers, customers interaction with customers. In this system of marketing, buying and selling of agricultural produce made through online and create links between the value chain or connect farmers to business through technology. This system by pass middlemen and receive fair price. At present this system is confined in vegetables and fruits crops in some metropolitan states of the country but in the state of Bihar it is not popular So many FPOs were trying to start it and consulting with flip cart, Amazon, etc. In the state of Bihar fruits and vegetables grown throughout the year farmers may adopt and use this technology and market their produce directly to consumers and realize better price. Also, it helps customers to source fresh vegetables at competitive prices directly from the farmers. In the system microfinance apps, mobile banking helpful to easy access to credit, insurance and investment

Issues in Agriculture of Bihar

The main challenges earlier faced by the farmers are in the production of crops are low productivity, continuous declining land holding, over and under use of various inputs, crop failure, low mechanization etc. In marketing of agricultural produce issue like high commission, many market intermediaries, less producers share, high marketing costs, lack of proper logistics and cold storage, poor and not proper and scientific packaging, huge post harvest losses, lack of marketing information and price fluctuation. This issues are also exists but the intensity is slightly low during the past decades due to government interest and investments. Due to lack of proper extension facilities farmers in the state was found using over and under use of recommended doses of the inputs and it creates so many problems to agriculture, human, animal, etc. The food habits of the people has changing, income level of people increases, buying behaviour of people is increasing in this situation continuous demand of processed products was also increasing. So it is the time for policy makers, planners, researchers, academicians', and administrative persons to take initiatives in this secondary agriculture and enhance the income of farmers and the state.

Suggestions

Above discussions reveal that the agriculture of the state is in progress but still there is vast scope for adoption and use of technology for reduction in over use of inputs and increase in overall production and remunerations for the farmers. The productivity gaps need to be fulfilled for increasing the production of agricultural commodities. The production of pulses may be enhanced by using additional area and advanced technologies. In case of horticultural crops there is need for special attention in the time of fruiting, flowering, harvesting, post harvest management and processing for increasing the crop area and productivity both in quantity and quality. The state agricultural department, agricultural universities and extension department with their joint efforts it may be achieved. Farmers may be trained in mobile applications and its use for faster growth of digitalization in

agriculture with suitable e- net infrastructure. The discussions of this paper will be certainly helpful to the policy makers for enhancing the agricultural practices in the state. The high value added operations can be made through construction of processing units and small scale industries. In the agriculture sector construction of cold storage, market infrastructure, financial assistance may be assured by the government for faster growth of this sector.

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