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RESEARCH ARTICLE

AN APPRAISAL OF AGRICULTURAL TRANSFORMATION: A CASE STUDY OF HOOGHLY DISTRICT OF WEST BENGAL

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ABSTRACT

Agriculture is the pivot of economic growth and development of any nation. Like other developing countries in India also agriculture plays a dominant role for the economic development. During the first (1951-1956), second (1956-1961) and third (1961-1966) five year plans foodgrains production was the concerned of development strategy. This was the periods, when large junk of Indian population were suffered from food insecurity and malnutrition. The policymakers searched for something new to enhance the agricultural production. In mid 1960s the introduction of green revolution showed spectacular results and the production of food grains increased significantly. Later agricultural scientists put emphasis on the restructuration of Indian farming system. As a result in the beginning of the 21st century Indian farming has been shifting from traditional farming to modern commercial agriculture due to availability and growth of infrastructural facilities like improved seed varieties, fertilizers, pesticides, supplies and services, market facilities, literacy, mass media, research, teaching and extension. Besides, Indian economy has been undergoing structural transformation from an agro-based to knowledge-based services and industrial economy but the agricultural sector is still the mainstay as about half of India's population is wholly or significantly dependent on agriculture and allied activities for their livelihood. Hooghly is one of the most important agricultural based industrial districts of West Bengal, about 70% of its population depend on agriculture and represents an important and remarkable place in the field of agriculture in West Bengal. In Hooghly, with the invention of science, technology and its application in agricultural field gives more growth and developed agricultural products. In this paper a detailed retrospective of agricultural development for the past few years i.e. from 2008 to 2013 in terms of agricultural production of principal crops, vegetables, fruits, flowers; yield capacity of these crops; net sown area; gross sown area; cropping intensity; irrigation facilities; consumption of fertilizers; availability of warehouses and cold storages are analyzed.

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INTRODUCTION

The physical, social and economic environment of the country is changing fast after globalization. In India, agriculture and agro-based industries play an important role in improvement of rural economy. Small and marginal farmers constitute a major portion of rural agricultural sector. So transformation of agriculture through modernization is positively related to sustainable livelihood of rural population.

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Agricultural transformation is the process by which individual farms shift from highly diversified, subsistence-oriented production towards more specialized production oriented towards the market or other systems of exchange (Staatz, 1998). The process involves a greater reliance on input and output delivery systems and increased integration of agriculture with other sectors of the domestic and international economies. Agricultural transformation is a necessary part of the broader process of structural transformation. Agrarian change refers to change in the total system of relationship concerned in agrarian economics and societies. The system includes technological and environmental factors and relationships as well as social and cultural ones; a wide range

of processes affect such systems and may contribute in bringing about changes within them. The idea of 'agrarian system' is broader than 'farming system', which denotes a more restricted set of technical factors and relationship (Ruthenberg, 1980). Harris (1986:37) discusses three paths of agrarian transformation : (a) through development of capitalist farming, involving the establishment of relatively large scale units of production and absorbing most of the peasant sector, (b) through the establishment under state initiative of large scale cooperative, collective or state farms, and (c) through capital intensive, small scale farming. Timmer (1988) also defined four stages of the agricultural transformation and the necessary difference in policy emphasis for each stage. In general we can say agricultural transformation involves a change from one structural stage to another. This is typically manifested by increasing specialization in production, greater use of purchased inputs, greater resource inflows to farming and substantial cuts in unit costs of production from technological change.

In past, agricultural activities were very poorly related with industrialization and corporatization. But with the increasing demand and implementation of modern facilities such as cold storage, better transportation and goods movement in nation and international market influenced more and more industrialization and corporatization. So, the exploitation of farmers by the middle men is being reduced. Corporate houses are providing more modern support system such as high yielding seeds, soil testing facilities to the farmers for better production as well as they are providing funds without mortgage at a reasonable terms and conditions. As a result, farmers are getting more benefits against their hard work. In effect of modernization; farmers are also getting up-to-date information relating to climate and market price through Kiosk and other facilities. As the economy has been shifting away from agriculture and a major process of structural change is on, the questions of security in terms of livelihood turns up. Agriculture is still a pre-dominant activity and the main source of livelihood to the rural people of Hooghly district. Agriculture contributes a significant proportion of district income. Almost one third of the district income comes from agriculture. The land use pattern of the district demonstrates that out of the total reported area about 70% area is under agriculture in 2005-06.However, there is a decline in the net sown area and a steady rise of area under non- agricultural use. Though due to the innovation and implementation of technologies agricultural development and diversification have been taken place in this district. This paper provides a detailed picture about the agricultural development and transformation of Hooghly district for last few years.

STUDY AREA

Hooghly district is one of the agricultural prosperous districts of the state of West Bengal in India. The Headquarter of the district is at Chinsura (Chuchura). There are four sub divisions in the district namely Chinsura Sadar, Chandannagar, Srerampore and Arambagh. The great river Ganga flows through this district and enhances its importance. The district is a rich Zone both in agriculture and industry in West Bengal. The district is a completely flat land with no place having more than an elevation of 200 meters. Most of the lands of the district are alluvial type of soil due to well distribution of river system.

The district lies from 22° 39′ 32′′ N to 23° 01′ 20′′ N and from 87° 30′ 20′′ E to 88° 30′ 15′′ E. The boundary of the Hooghly district is covered by the Hooghly river (sharing with Nadia in the East & North 24 Parganas in the South – East) in the East, Bardhaman in the North. Howrah in the South, Paschim Medinipore in the West, Bankura in the North-West. Total area of the district covers 3149 square km. Population is 5520389 (as per census 2011), Population Density is 1753/ sq. Km (1540/ sq. mile) and Population Growth is 9.49 % (2001 – 2011). Literacy Rate of Hooghly district is 82.55% and Sex Ratio of the district is 958 (958 females per 1000 males).

Objective of the study

- To determine the aspects of agricultural transformation in Hooghly district.
- To identify the trend and dynamics of agrarian change.

MATERIALS AND METHODS

The study is mainly based on secondary data. Various types of data like area under principal crops in Hooghly; production and yield rates of principal crops in Hooghly; area and production of fruits, vegetables and flowers; gross cropped area, net cropped area, cropping intensity; sources of irrigation; fertilizer consumption; availability of warehouses and cold storage facilities during different period of time mainly from 2008-09 to 2012-13 in Hooghly district are collected and compiled from various published sources like District Census Handbook, District Statistical Handbook, Directorate of Food Processing Industries and Horticulture of Govt. of West Bengal, Directorate of Agriculture of Govt. of west Bengal, Director of Agriculture of Hooghly etc. The major analytical tool employed for the study is tabular analysis to facilitate easy comparison. Map of the study area is prepared by QGIS software.

RESULTS AND DISCUSSION

Like other districts of west Bengal Hooghly district is also very prosperous in terms of agriculture. Various important reasons behind this are like – even topography, favorable climate, fertile soil, availability of water for irrigation etc. Besides, availability of modern farm technologies like chemical and organic fertilizers, pesticides, tractors etc. are also provided to the farmers of this district. Large farmers of this district use HYV seeds, drills, harvesters and some other modern technologies. As a result, agricultural development has been taken place in different parts of this district. For the last five to six years agrarian change has occurred here very rapidly in terms of production, yield capacity, net cropped area, gross cropped area, cropping intensity, use of fertilizers, irrigation etc. So to understand the different kinds of changes or to get deep knowledge about agricultural transformation various aspects related to agriculture in Hooghly district have been discussed in detail below. Table 1 indicates a steady decrease in area under food grains like rice, wheat, maize etc. In case of rice it has declined from 305.6 thousand hectares in 2008-09 to 273.5 thousand hectares in 2012-13. Similarly, the area under wheat has also fallen from 1.6 thousand hectares to 0.1 thousand hectares in the similar period. But area under maize has remained almost stable during that time span. While the area under total oil seeds shows wide fluctuation.

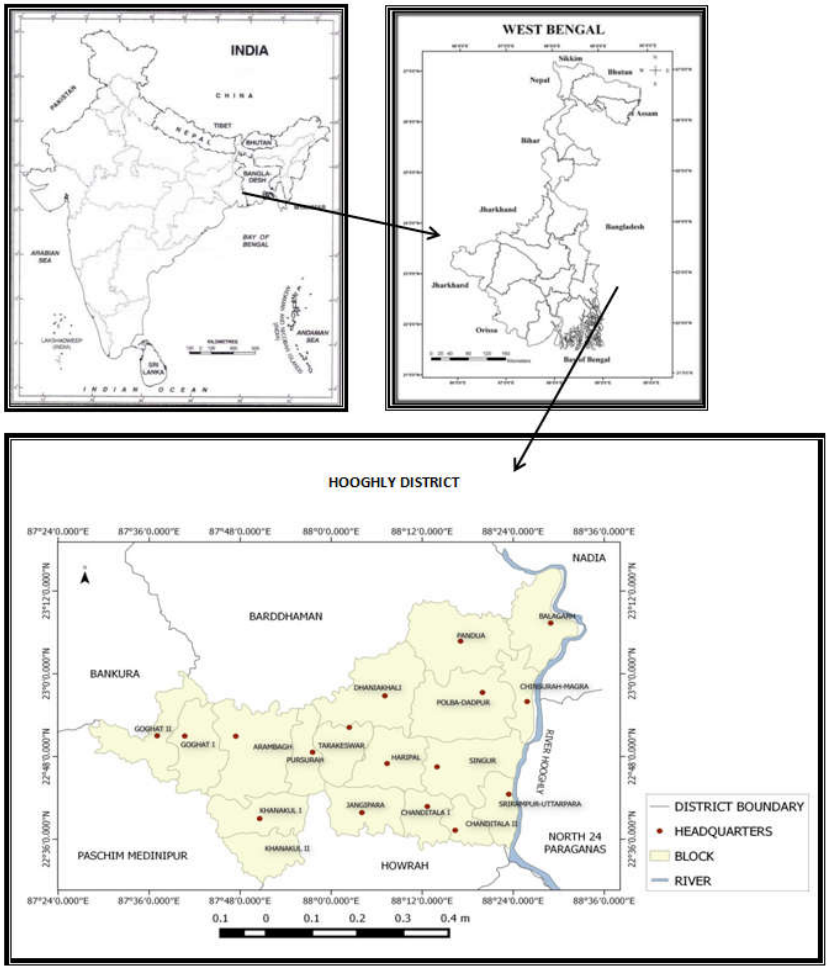

Table -1. Area under Principal Crops in the district of Hooghly

(Thousand hectares)

Crops	2008-09	2009-10	2010-11	2011-12	2012-13
1.Food Grains					
Rice	305.6	299.9	292.4	277.2	273.5
Aus	6.3	6.3	4.5	7.5	6.1
Aman	192.9	187.2	194.8	191.6	184.7
Boro	106.4	106.4	93.1	78.1	82.7
Wheat	1.6	0.4	0.3	0.2	0.1
Barley	-	-	-	-	-
Maize	0.2	0.2	0.3	0.2	0.2
Other Cereals	-	-	-	-	-
Total Cereals	307.4	300.5	293.0	277.6	273.8
Gram	0.2	-	-	-	-
Tur	(a)	-	-	-	-
Other Pulses	0.4	0.6	0.3	0.2	0.3
Total Pulses	0.6	0.6	0.3	0.2	0.3
Total Food Grains	308.0	301.1	293.3	277.8	274.1
2.Oil Seeds					
Rapeseed & Mustard	12.6	11.9	11.7	13.8	11.1
Linseed	-	-	-	-	-
Other Oil seeds	45.1	37.6	40.9	37.4	45.0
Total Oil seeds	57.7	49.5	52.6	51.2	56.1
3.Fibers					
Jute	24.6	29.0	26.9	26.9	26.7
Mesta	-	-	-	-	0.1
Other Fibers	(a)	(a)	(a)	(a)	(a)
Total Fibers	24.6	29.0	26.9	26.9	26.8
4.Miscellaneous crops					
Sugarcane	0.4	0.1	(a)	0.1	(a)
Potato	94.8	91.3	100.4	94.4	100.2
Tobacco	-	-	-	-	-
Tea	-	-	-	-	-
Chillies (dry)	0.9	0.9	0.9	0.9	0.9
Ginger	0.1	0.1	0.1	0.1	0.1
Total Miscellaneous crops	96.2	92.4	101.4	95.5	101.2

(a)Less than 50 hectares

Sources: 1) Directorate of Agriculture, Govt. of W. B.
2) B.A.E. &S., Govt. of W. B.
3) Tea Board of India

Table 2. Production of Principal Crops in the district of Hooghly

(Thousand tons)

Crops	2008-09	2009-10	2010-11	2011-12	2012-13
1.Food Grains					
Rice	876.3	861.3	904.2	806.8	793.0
Aus	15.5	19.3	11.6	14.4	15.1
Aman	556.2	528.4	592.7	543.6	522.1
Boro	304.6	313.6	299.9	248.8	255.8
Wheat	3.6	1.0	0.9	0.4	0.3
Barley	-	-	-	-	-
Maize	0.5	0.6	0.5	0.5	0.4
Other Cereals	-	-	-	-	-
Total Cereals	880.4	862.9	905.6	807.7	793.7
Gram	0.2	-	-	-	-
Tur	(b)	-	-	-	-
Other Pulses	0.3	0.4	0.2	0.2	0.3
Total Pulses	0.5	0.4	0.2	0.2	0.3
Total Food grains	880.9	863.3	905.8	807.9	794.0
2.Oil Seeds					
Rapeseed & Mustard	10.5	11.5	11.4	11.3	10.1
Linseed	-	-	-	-	-
Other Oil seeds	46.4	39.6	48.0	48.7	61.0
Total Oil seeds	56.9	51.1	59.4	60.0	71.1
3.Fibers					
Jute	444.8	510.4	573.2	444.5	526.4
Mesta	-	-	-	-	1.7
Other Fibers	(b)	(b)	(b)	(b)	(b)
Total Fibers	444.8	510.4	573.2	444.5	528.1
4.Miscellaneous crops					
Sugarcane	52.5	5.2	1.0	8.4	0.1
Potato	881.6	3434.5	3530.6	2439.9	3246.4
Tobacco	-	-	-	-	-
Tea	-	-	-	-	-
Chilies (dry)	1.2	1.2	1.3	1.4	1.4
Ginger	0.1	0.1	0.1	0.1	0.1
Total Miscellaneous crops	935.4	3441.0	3533.0	2449.8	3248.0

* In 1000 bales of 180 kg each, less than 50 tons

Source: 1) Directorate of Agriculture, Govt. of W. B.
2) B.A.E. &S., Govt. of W. B.
3) Tea Board of India

Table 3. Yield rates of Principal Crops in the district of Hooghly

(Kilogram Per Hectare)

Crops	2008-09	2009-10	2010-11	2011-12	2012-13
1.Food Grains					
Rice	2866	2872	3093	2911	2900
Aus	2446	3079	2583	1920	2487
Aman	2883	2823	3043	2838	2828
Boro	2862	2946	3220	3185	3093
Wheat	2320	2528	2656	2411	2545
Barley	-	-	-	-	-
Maize	2012	2408	2012	2020	2014
Other Cereals	-	-	-	-	-
Total Cereals	2863	2872	3091	2910	2899
Gram	1231	-	-	-	-
Tur	490	-	-	-	-
Other Pulses	632	689	570	974	1010
Total Pulses	773	689	570	974	1010
Total Food grains	2859	2868	3088	2908	2897
2.Oil Seeds					
Rapeseed & Mustard	834	964	973	825	908
Linseed	-	-	-	-	-
Other Oil seeds	1028	1056	1176	1298	1354
Total Oil seeds	985	1034	1130	1171	1266
3. Fibers					
Jute	18.1	17.6	21.3	16.5	19.7
Mesta	-	-	-	-	12.5
Other Fibers	3.9	3.7	9.0	4.5	4.5
Total Fibers	18.1	17.6	21.3	16.5	19.7
4.Miscellaneous crops					
Sugarcane	121882	83097	38089	146509	140524
Potato	9303	37621	35162	25837	32414
Tobacco	-	-	-	-	-
Tea	-	-	-	-	-
Chilies (dry)	1419	1429	1432	1531	1543
Ginger	914	919	919	977	991
Total Miscellaneous crops	9723	37240	34842	25652	32415
Sugarcane	121882	83097	38089	146509	140524

In bales / hectare

Source: 1) Directorate of Agriculture, Govt. of W. B.
2) B.A.E. &S., Govt. of W. B.
3) Tea Board of India

In fact area under total fibers has increased significantly from 24.6 thousand hectares from 2008-09 to 29.0 thousand hectares in 2009-10, though in later period it has fallen. Only the area under potato in Hooghly district has remained a positive trend. Potato is one of the major crops produced in Hooghly. Huge amount of potatoes are exported in different parts of west Bengal as well as other neighbor states of our country like Bihar, Jharkhand, Orissa. Thus though agriculture has still remained a major source of livelihood, the area under agricultural crops has been gradually decreased. Table 2 clearly reveals the production trend of some major crops in Hooghly district. It is observed from the table that the production of total food grains has decreased from 880.9 thousand tons in 2008-09 to 794.0 thousand tons in 2012-13. Among the food grains the production of rice and wheat has shown deceleration trend.

In case of maize and pulses, the production has slightly declined. But the production of non- cereal foods clearly indicates an opposite picture during the same time period. The production of oilseeds, fibers, jutes, sugarcane, and potato has shown acceleration trend. For example, the production of total oilseeds has accelerated from 56.9 thousand tons in 2008-09 to 71.1 thousand tons in 2012-13. Similarly, the production of jute has also increased from 444.8 thousand tons to 526.4 thousand tons during the period. This type of transformation reveals that nowadays farmers are showing their interest to cultivate non-cereal crops and commercial crops instead of traditional crops. Huge change is found in terms of potato production. Table 2 shows a fourfold increase in potato production from 881.6 thousand tons to 3246.4 thousand tons over 5 years. This is due to the commercial needs and benefits to the farmers.

Table 4. Area and Production of Fruits in the district of Hooghly

Name of Fruits	Area (Thousand hectares)					Production (Thousand tons)				
	2008-09	2009-10	2010-11	2011-12	2012-13	2008-09	2009-10	20010-11	2011-12	20012-13
Mango	5.61	5.63	5.63	5.64	5.64	37.95	38.95	39.00	40.00	40.50
Banana	4.73	4.84	4.93	5.14	5.21	99.00	100.95	101.75	106.50	108.80
Pineapple	0.05	0.05	0.05	0.05	0.05	0.97	0.97	0.97	0.87	0.71
Papaya	0.73	0.73	0.73	0.74	0.74	18.06	18.06	18.38	18.59	18.65
Guava	0.22	0.22	0.22	0.22	0.22	4.13	4.13	4.13	4.14	4.15
Jackfruit	0.12	0.12	0.12	0.12	0.12	2.25	2.25	2.25	2.26	2.27
Litchi	0.20	0.20	0.21	0.21	0.21	2.06	1.86	1.86	1.87	1.88
Mandarin Orange	-	-	-	-	-	-	-	-	-	-
Other Citrus	0.21	0.20	0.21	0.21	0.21	2.00	2.00	2.20	2.21	2.21
Sapota	0.11	0.11	0.11	0.11	0.11	1.46	1.46	1.46	1.46	1.35
Others	0.11	0.11	0.12	0.08	0.11	1.24	1.24	1.46	1.05	1.00
Total	12.09	12.21	12.33	12.52	12.62	169.12	171.87	173.46	178.95	181.52

Sources: Directorate of Food Processing Industries and Horticulture, Govt. of W. B.

Table 5. Area and Production Vegetables in the district of Hooghly

Name of Vegetables	Area (Thousand hectares)					Production (Thousand tons)				
	2008-09	2009-10	2010-11	2011-12	2012-13	2008-09	2009-10	2010-11	2011-12	2012-13
Tomato	0.99	0.99	1.00	1.06	1.07	14.91	19.91	19.17	20.27	20.40
Cabbage	2.85	2.85	2.88	2.90	2.95	44.14	64.14	65.04	66.04	67.10
Cauliflower	3.59	3.59	3.64	3.68	3.73	90.35	90.35	91.54	92.84	96.82
Peas	0.68	0.68	0.69	0.70	0.71	6.73	6.73	6.93	6.93	7.05
Brinjal	7.64	7.64	6.16	7.79	7.83	126.59	126.59	102.43	135.68	136.19
Onion	2.59	2.59	2.62	2.67	2.67	55.68	55.68	57.21	58.40	58.50
Cucurbits	12.06	12.05	12.23	12.25	12.26	152.97	136.97	141.52	142.63	142.05
Ladies Finger	3.80	3.80	3.84	3.87	3.88	41.29	41.29	41.38	41.39	41.60
Radish	1.41	1.41	0.37	1.43	1.45	18.95	18.95	3.40	19.28	19.75
Others	17.08	17.19	24.52	17.42	17.49	78.44	78.45	126.41	90.92	94.33
Total	52.69	52.79	57.95	53.77	54.04	630.06	639.06	655.03	674.38	683.79
Tomato	0.99	0.99	1.00	1.06	1.07	14.91	19.91	19.17	20.27	20.40

Sources: Directorate of Food Processing Industries and Horticulture, Govt. of W. B.

Table 6. Area and Production of Flowers in the district of Hooghly

Name of Flowers	Area (Thousand hectares)					Unit	Production				
	2008-09	2009-10	2010-11	2011-12	2012-13		2008-09	2009-10	2010-11	2011-12	2012-13
Rose	0.002	0.002	0.002	0.002	0.002	Crore Cut Flower	0.031	0.031	0.031	0.031	0.032
Chrysanthemum	0.011	0.011	0.011	0.011	0.013	"	0.216	0.216	0.216	0.216	0.265
Gladiolus	0.005	0.005	0.005	0.009	0.010	"	0.062	0.064	0.064	0.114	0.130
Tuberose	0.023	0.023	0.023	0.024	0.030	"	0.298	0.298	0.298	0.350	0.415
Marigold	0.002	0.002	0.003	0.005	0.008	' 000 MT	0.016	0.016	0.025	0.042	0.065
Jasmine	0.002	0.002	0.002	0.002	0.002	"	0.002	0.002	0.002	0.002	0.002
Seasonal Flower	0.037	0.037	0.038	0.040	0.040	"	0.037	0.037	0.039	0.042	0.035
Misc. Flower	0.035	0.035	0.035	0.035	0.036	"	0.040	0.040	0.040	0.040	0.042
TOTAL	0.117	0.117	0.119	0.128	0.141		0.702	0.704	0.715	0.837	0.986

Sources: Directorate of Food Processing Industries and Horticulture, Govt. of W. B.

The above table 3 shows the yield rates of some principal crops during 2008-09 to 2012-13. From the table, it is observed that the yield rate of rice has increased from 2866 kilogram per hectare in 2008-09 to 2900 kilogram per hectare in 2012-13. But it has decreased if we compare it with 2010-11. The yield rate of wheat has fluctuated immensely. In fact, the yield rate of maize has remained stable during this period. But in case of pulses the yield rate has improved sharply from 773 kg per hectare to 1010 kg per hectare during this period. Oil seeds and fibers also present a positive view in terms of yield rates. Rapid positive change is found in case of miscellaneous crops from 9723 kg per hectare in 2008-09 to 32415 kg per hectare in 2012-13. Table 4 shows the area and production of fruits in Hooghly district from 2008-09 to 2012-13. Both in terms of area and production there is acceleration. In 2008-09 12.09 thousand hectares area were under fruit production and it rises to 12.62 thousand hectares in 2012-13. Among the fruits maximum area is under mango and banana. It is generally argued that plantation is more remunerative than crop-cultivation. This positive trend clearly indicates that Hooghly district is one of the best places in terms of remunerative agrarian livelihood. Similarly, the production of fruits has also remained a positive trend from 169.12 thousand tons in 2008-09 to 181.52 thousand tons in 2012-13. In terms of production banana occupies first position followed by mango and papaya. The production of other crops is less significant in this district. Vegetables also maintain a similar trend of area and production like fruits in Hooghly district. From the table 5, it is found that the total area under vegetables was 52.69 thousand hectares in 2008-09 and it raised to 54.04 thousand hectares in 2012-13. Among the vegetables maximum areas are devoted to cucurbits followed by brinjal, ladies finger, cauliflower etc. The total production of vegetables has also steadily increased from 630.06 thousand tons to 683.79 thousand tons in 2012-13. Among the vegetables, the production is maximum for cucurbits followed by brinjal, cauliflower etc. From the table 6 we can determine that like fruits and vegetables the area under flower has also slightly increased from 0.117 thousand hectares in 2008-09 to 0.141 thousand hectares in 2012-13.

Table 7. Gross Cropped Area, Net Cropped Area and Cropping Intensity (Area in thousand hectares)

YEAR	GROSS CROPPED AREA	NET CROPPED AREA	CROPPING INTENSITY
2000-01	396.38	230.54	171
2009-10	540.04	214.25	252
2010-11	542.68	212.41	255
2011-12	520.74	211.27	246
2012-13	527.63	212.09	249
2013-14	539.37	212.58	254

*Cropping Intensity= (Gross Cropped Area/Net Cropped Area) *100 Source : Directorate of Agriculture, Evaluation Wing, Govt. of WB.

Table 8. Area Irrigated by different sources in the district of Hooghly

(Thousand hectares)

Year	Area irrigated by*									
	Govt.Canal	Tank	HDTW	MDTW	LDTW	STW	RLI	ODW	Others	Total
2008-09	106.09	34.45	12.43	1.12	0.40	51.15	16.29	-	-	221.93
2009-10	103.02	34.45	17.38	0.96	2.22	57.48	16.29	-	-	231.80
2010-11	80.71**	34.45	17.38	0.96	2.22	57.48	16.29	-	-	209.49
2011-12	106.00	34.45	18.03	0.96	2.22	68.81	16.29	-	0.20	246.96
2012-13	96.88	34.45	18.49	0.96	2.22	68.81	16.29	-	0.20	238.30

Note:
HDTW = High capacity Deep Tubewell
MDTW = Middle capacity Deep Tubewell
LDTW = Low capacity Deep Tubewell
STW = Shallow Tubewell
RLI = River Lift Irrigation
ODW =Open Dug Well
*Total Irrigated area by all crop season
** Irrigation is suffered due to severe drought situation
Source: Dy. Director of Agriculture, Hooghly; Exe. Engineer, Agri. Irrigation, Hooghly; Irrigation & Waterways Directorate, Govt. of W. B.

Table 9. Sources of Irrigation in the district of Hooghly

(Numbers)

Year	Tank	HDTW	MDTW	LDTW	STW	RLI	ODW	Others
2008-09	41448	395	46	74	18988	347	-	-
2009-10	41448	373	48	74	20836	347	-	-
2010-11	41448	373	48	74	20836	347	-	-
2011-12	41448	386	48	74	20836	347	-	2
2012-13	41448	394	48	74	20836	347	-	2

Note: HDTW =
High capacity Deep Tubewell
MDTW = Middle capacity Deep Tubewell
LDTW = Low capacity Deep Tubewell
STW = Shallow Tubewell
RLI = River Lift Irrigation
ODW =Open Dug Well
Source: Dy. Director of Agriculture, Hooghly; Exe. Engineer, Agri. Irrigation, Hooghly

Table 10. Fertilizer Consumed in the district of Hooghly

(Thousand tons)

Year	Nitrogen (N)	Phosphate (P)	Potash (K)	Total
2008-09	49.7	51.4	46.3	147.4
2009-10	54.6	54.4	45.6	154.6
2010-11	54.5	57.0	42.9	154.4
2011-12 (R)	66.3	36.7	33.4	136.4
2012-13	61.9	52.6	39.1	153.6

Source: Directorate of Agriculture, Govt. of W.B.

Table 11. Warehousing and Cold Storage Facilities available to Cultivators in the district of Hooghly

Year	Warehouses		Cold Storages		No. of Cultivators benefitted
	No.	Capacity (MT)	No.	Capacity (MT)	
2008-09	27	41835	131	1670000	780000
2009-10	27	41835	132	1658000	790000
2010-11	25	59562	132	1662900	815000
2011-12	36	70502	142	1768000	1000000
2012-13	29	71848	144	1751429	1015000

Source: Asset. Director of Agri. Marketing (Administrative), Hooghly

Among the flowers maximum area comes under seasonal flower. The production of flowers has also improved slightly during this time. Thus, we can say that with the improvement of science and technology and due to the impact of globalization now the people of Hooghly district are not only dependent upon the production of staple crops but also on seasonal fruits, vegetables and flowers. So this trend determines the diversification of agriculture in this district.

However, to get a clear picture we should concentrate on the quality of crop cultivation rather than simply consider the quantity of area allocated to it. This is because stable livelihood from agriculture does not merely depend on cultivating more area but cultivating them in a qualitatively improved manner through intensive use of modern technology, multiple cropping practice, high quality seeds, better feed management etc. The cropping pattern in the past few years in Hooghly district has shown remarkable changes. The gross cropped area (total area sown ones as well as more than ones in a particular year) has increased sharply from 396.38 thousand hectares in 2000-01 to 542.68 thousand hectares in 2010-11 but then it decreased to 539.37 thousand hectares in 2013-14. The net cropped area (area sown with crops but is counted only ones) has fallen to 212.58 thousand hectares from 230.54 thousand hectares during this time. Due to the promotion of land intensive technologies, the cropping intensity (a number of crops from the same field during one agricultural year) has increased from 171 to 255 in this period. Nowadays irrigation has become essential equipment for agriculture. Due to the global warming, climate change and uncertainty of monsoon, the importance of irrigation has been increasing day by day. In Hooghly district also irrigation plays an important role for crop cultivation. From the table 8 it is clearly identified that total irrigated area in this district was 221.93 thousand hectares in 2008-09 and it rose to 231.80 thousand hectares in the next year. In 2010-11 due to severe drought total area under irrigation has come down to 209.49 thousand hectares. After that it has increased sharply. In 2012-13 238.30 thousand hectares area is under irrigation. Among the major sources maximum areas are irrigated by Govt. canal. Besides, shallow tube well and tanks also play important role for irrigation. But this kind of dependency is not a positive thing for human being. It can lead to various major problems like ground water depletion, decrease in water level, environmental disbalances etc. The table 9 indicates the number of major sources of irrigation in Hooghly district from 2008-09 to 2012-13.

It is observed from the table that the number of tank, shallow tube well, river lift irrigation remains constant during these years. However the number of high capacity deep tube well has fluctuated during these periods. But the number of middle capacity deep tube well and shallow tube well has slightly increased. The table 10 describes the consumption of different fertilizers from 2008-09 to 2012-13. The consumption of fertilizer has increased from 147.4 thousand tons in 2008-09 to 153.6 thousand tons in 2012-13. Among the fertilizers, the amount of nitrogen has been increasing sharply. But the amount of phosphate and potash has been decreased during the period. But to maintain the environmental balance, soil stability and productivity, the farmers should be encouraged to apply organic fertilizers instead of these chemical fertilizers in future. Recently Warehouses and cold storages have become essential equipments in agriculture for storage of agricultural commodities. From the table 11 it is found that the storage capacity of warehouses has increased from 41835 MT in 2008-09 to 71848 MT in 2012-13. Not only the storage capacity of warehouses but also the capacity of cold storages has increased from 1670000 MT to 1751429 MT during the same period. As a result, the number of benefitted cultivators has also increased. But the major storage capacity of government agencies are occupied by wheat and rice which leads to acute shortage for storage capacity of other food grains and agricultural commodities. Over the years warehousing and cold storage business has been transformed to a great extent from merely storage infrastructure to stop shops for supply food management through the entry of private sector. Nowadays goods are stored as per the scientific methodology to protect them against the quantitative as well as qualitative losses occurring due to unavoidable circumstances such as floods, pest attacks etc. hence warehouse and cold storage performance indicators should be introduced to check the efficiency of the warehouses and cold storage.

CONCLUSION

Due to increasing space and pressure of globalization, agrarian economy in the study area has experienced many challenges and pressures for its traditional and subsistence agricultural practices. The decreasing trend of cereals like rice (from 876.3 thousand tons in 2008-09 to 793.0 thousand tons in 2012-13 i.e. -9.50%), wheat (from 3.6 thousand tons in 2008-09 to 0.3 thousand tons in 2012-13 i.e. -91.67%), maize (0.5 thousand tons in 2008-09 to 0.4 thousand tons in 2012-13 i.e. -20%) etc.

Now creates a background for deficit in food grains availability to the local people and its depending other population. The diversification in agriculture moves towards the process of commercialization of cash crops like jute, potato etc. The farmers those who have land holding are interested to earn more cash from its agricultural production that's why they ignored the local needs of the people and society. This process accelerated the shifting pattern of the cropping pattern and it almost favored the outside needs by minimizing the local needs of the people and society. The prevalence of multiple cropping patterns contributed in a positive way by providing various needful vitamins, minerals and other nutritional supplements to the local people. The replacement of multiple crops by mono crops has posed serious challenges to the nutritional needs of the local people. The crop analysis of the study area has shown this process in a more transparent and visible way that may create other serious challenges to the food and nutritional security of the Hooghly district. The expanding nature of the production of commercial crops like oil seeds (from 46.4 thousand tons in 2008-09 to 61.0 thousand tons in 2012-13 i.e. 31.47%), jute (from 444.8 thousand tons in 2008-09 to 526.4 thousand tons in 2012-13 i.e. 18.35%), potato (from 881.6 thousand tons in 2008-09 to 3246.4 thousand tons in 2012-13 i.e. 268.24%) can be categorized in a systematic way through multiple analysis and observations. The authors throw its detailed study and analysis have observed that the diversification of cash crops in study area only shifted its positive impact to its farmers those have substantial land holdings, however, the marginal farmers (12.06% in 2011 census) and agricultural laborers (27.10 % in 2011 census) may be vulnerable sections for food insecurity. Finally the impact of globalization on agricultural practices may open new patterns of Challenges and opportunities to the agrarian economy of the Hooghly district. Besides area and production of fruits, flowers and vegetables have also increased sharply from 2008-09 to 2012-13 which is visible in table 4, table 5 and table 6. It clearly reveals that the increasing demand of fruits and vegetables of the local people made huge influence on the farmers to cultivate these in Hooghly. The emerging scenario in agricultural transformation in Hooghly district needs proper attention by policymakers and researchers. The prevailing situation in agricultural practices of study area impacted largely on the population of the marginal and agricultural labourers i.e. almost 40% of the local populations. A small proportion of peasantry is interested to earn more cash from their agricultural products, while on the other hands more than 40% have been fallen under the trap of food insecurity. These ground level conflicting issues are serious crises that need attention from policy makers and development strategists. Lastly we may conclude our views in a way that focuses - a suitable strategy that considers the local social dynamics and people aspirations and needs.

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