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A COMPREHENSIVE ANALYSIS OF INDIA'S AGRICULTURE SECTOR WITH SPECIAL REFERENCE TO OUTPUT, YIELD PER ACRE & CREDIT TO AGRICULTURE SECTOR

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ABSTRACT:
Agriculture becomes always a challenging sector for socio - economic development of an India. Many initiatives have been proposed by the central government since independence for agricultural growth and development. The major challenges beside the crop output and yields are the financing to agriculture sector (direct institutional or advances by commercial banks). Outputs of major crops have increased steadily over a period, while the yield per hectare has not deviated much for all the crops. Financing by direct institutional (for long term) and advances by commercial banks (short term) has shown a certain impact on the output of agriculture sector. The output is the function of direct institutional credit and advances by commercial banks. The dependency is significant as observed for the period.

AGRICULTURE SECTOR OF INDIA:

Agriculture is still a base for India's economic developments, despite after 70 years of Independence. India is being an agriculturist country and having huge dependence on agricultural sector in respect to rural development, growth as well as employment. Many crops are produced in India based on regional demand and atmospheric conditions. Agricultural crops in India are classified as Cereals includes primarily Rice, Wheat & coarse cereals and Pulses. Still dominance of Rice has been found in southern and eastern part of a country, while northern and western parts are more wheat producing zones in India. Though there is no geographical demarcation as such for wheat and rice, but the mention areas are more producer of said crops. Coarse Cereals & Pulses are produced throughout the

countries. Being the basic food of Indian Meals, these crops are always in heavy demand. Possibly the law of demand theory may be exception for these products though in many economics books and researches published with respect to Indian context at large are not favoring this argument. There are some consumption patterns have been observed in consumptions of wheat and rice in context to production. More rice consuming states are lying in southern and eastern part of a country while northern and western parts of a country are having more wheat consuming states. There is no perfect patterns have been observed with respect to consumption of other crops. Given patterns are also not a demarcated as fixed patters of consumption.

Agriculture being the thrust area of all governments formed in India till now, every government has given more focus on agriculture and allied activities. It prominently includes agriculture production of various crops, area under cultivation, financial support to the agriculture and allied sectors, minimum support price as well as yield per hectare. These areas are always in consideration for government while formulating the policies for agriculture sector. The output of agriculture is affected by many environmental factors like in-sufficient rain fall, sudden climatic changes and many more. All these environmental factors are beyond human control. But certain factors which may affect agriculture production are how much land is allocated for the specific crop, financial support through banks or other credit suppliers and Minimum support price for the crop. The efficiency of the product mostly measured based on yield per hectare.

Even though these are the critical variables which are affecting the agriculture sector or agricultural output; the sector is always finds many concerns for its sustainability. Agriculture is part of concurrent list (both state and central government have a say on it). In India almost every Union Budget or Assembly Budget of a State has special focus on Agriculture development and betterment of farmers. The major thrust area for every government was the how to make agriculture in Indian Independent, Self-sufficient and self-sustainable. Unfortunately till data still the farmer in India and his land is not a sustainable business equation in all parts of the country. Agriculture in India is still the huge concern for the government post 70 years of Independence. Agriculture Output has increased over a period but still an agriculture output in terms of quality is not improved a lot. Currently in 2018 – 19, share agriculture is 15.87% of Gross Value Added to India's GDP (at current price). While share of Agriculture in Primary Sector Gross Value added is around 85% (at current price). Agriculture sector predominantly includes agriculture, forestry & fishing. Thus in agriculture sector at standalone crops share is around 65%.

The share of Agriculture sector has reduced over a period of time. India had huge share from agriculture sector during the decade 70's to 90's. Share of Agriculture was reported on an average above 50%. Many strong majors and initiatives have been taken by Government over past many decades. One of the strong major was "Green Revolution", the success of this was quite well recognized by the world. But after few years latter whenever the "Green Revolution" took place, the position was not properly handled by the authorities, resulted today still there are working papers written on India's Agriculture's Road Map, challenges and issues. Many conferences and workshops are taken to deal and discuss the issues of India Agriculture.

TRENDS OF AGRICULTURAL OUTPUT AND ASSOCIATED FACTORS:

Agriculture output comprises of Cereals and Pulses. Following table is indicating the descriptive statistics with reference to agriculture production of the crops from 1961 – 62 till 2017 – 18. The data is expressed in Million tonnes output. (Source: official website of Reserve Bank of India)

The statistics (source table 1) reveals that average output of rice is proportionately higher as compared to other crops produced in a country. Rice output is average 67.97 MT almost account to more than 40% of total crops produced in a country, whereas the wheat output is approximately 30% of total crops produced in a country. Considering the fluctuation in output, output of wheat is more fluctuating compared to rice, coarse cereals and pulses. The co-efficient of variation (CV) of Wheat output is accounted to 53% (Standard Deviation / Mean), while rice is 37%, pulses 23% and coarse cereals are 20% (CV). On relative measures of dispersion also, Wheat has highest coefficient of range of 82%, while other crops are again in same sequence of CV while showing the relative dispersion. Total food grains are also deviating on 36% of CV and 59% of coefficient of variations.

All the crops output is associated with each at larger extent as shown by the correlation matrix (source table 2). Wheat and rice are almost perfectly correlated. Thus, outputs are fairly link with each other of the said crops.

Analysis of Area under Cultivation and Corresponding Yield: output of a crop is relatively depends upon the area allocated to it for cultivation. Higher the area allocated for cultivation may not necessarily results in to higher yield from that. By going with basic economic assumption, land is scarce resource and shall be utilize at its fullest. Agriculture land in India has not increase so significantly, during the period of 58 years of comparison aggregate land under allocation has been increased by less than 10%. Where land for crops are increase indifferently. The data shows the trends of area under cultivation and yield per hectare;

(Source table 3) Being highest producing crop the land allocation for cultivation of rice is highest than the other crops, while coarse cereals are allocated highest land after the rice, which has relatively less average production than wheat. Wheat and pulse are allocated with same quantum of land. The range of area under cultivation for coarse cereals is higher among the rest of the crops.

(Source table 4) Though allocated almost lesser land for cultivation and having more variations in production, wheat is giving highest yield per hectare of 2071 kg. While from other crops Rice is having 1642 kg. Yield per hectare. Coarse cereals have lower Yield per Hectare compared to allocation of land for cultivation, as well as it has highest variation in Yield per Acre for the period of 57 years ranging from 1961 – 62 till 2017 – 18. Lower variation is observed in Pulses. While average fluctuation in Yield per Hectare of Total food grains in India is around 36%.

***Emergence of Minimum Support Price (MSP)*:** With a view to support agriculture sector and to make farm product affordable to produce for farmer, government has begun the MSP for agricultural products. Main intention of this was to stop exploitation of farmers by middleman, who are the immediate

procurer of agricultural crops. Another intention behind this is to increase the agricultural output. The analysis of Minimum support price from 1985 – 86 to 2017 – 18 is given in following table;

Pulses have highest average MSP over a period of 33 years (source table 5), due to lower in production, area under cultivation and yield per hectare the prices offered to pulses are very high. The Wheat with higher yield per hectare in comparison with the other crops gets lesser MSP. The coarse cereals are also getting higher MSP over rice during the given period. The deviation in MSP is very high in almost every crop. Price of pulses is having highest fluctuations; the coefficient of variation of price of pulses is around 85 per cent, while coarse cereals CV are around 72 per cent. Range in price of pulses is very high Rs.4, 916 per quintal during the given period.

DIRECT INSTITUTIONAL CREDIT FOR AGRICULTURE AND ALLIED ACTIVITIES – LONG TERM:

To give support to the farmers in producing food crops long term direct institutional credit is offered to Agriculture and allied activities mainly by cooperative banks, schedule commercial banks and regional rural banks. Given below the analysis of direct institutional credit by the entities mentioned from 1980 – 81 till 2017 – 18

From the given statistics (source table 7), it has been found that average credit for long term is issued by the SCBs. Co-operatives have issued average credit of Rs.54.90 billion over a period of 37 years. Least among three is RRB. But funding by SCB though higher as compared to Co-operatives and RRB but there was huge deviation in funding by SCBs as well as by RRBs. Co-operatives are least deviating in funding agriculture and allied services. Thus, still today cooperatives are the priority for getting long term credit for agriculture.

ADVANCES BY COMMERCIAL BANKS DIRECTLY OR INDIRECTLY:

Advances given by banks are mainly for operation level financing to agriculture. These primarily include two types: direct finances and indirect finances. Indirect finances are predominantly for distribution of fertilizer and other inputs, loans to electricity board, loans to farmer through PACS/FSS/LAMPS and other types of indirect finances. Given below the analysis of advance by commercial banks directly and indirectly to agriculture sector from 1980 – 81 till 2017 – 18

(Source table 8) Ratio of direct advances to indirect advances is almost 3 : 1. Average direct advances given by commercial banks to agriculture sector are Rs.1993 billion over a period of 38 years, while indirect finances are Rs.592 billion.

Designing of Econometric Model of Agricultural output with direct institutional credit and advances by commercial banks: it has been assumed that the agriculture output/yield and income of farmers form agriculture has certainly dependent of the finances provided by commercial banks and institutional credit. To find out the relationship among these parameters the correlation matrix of Agricultural output with direct institutional credit and advances by commercial banks has been obtained.

	Agriculture Output	Direct Institutional Credit	Commercial Bank Advances
Agriculture Output	1		
Direct Institutional Credit	0.887409	1	
Commercial Bank advances	0.831556	0.935629	1

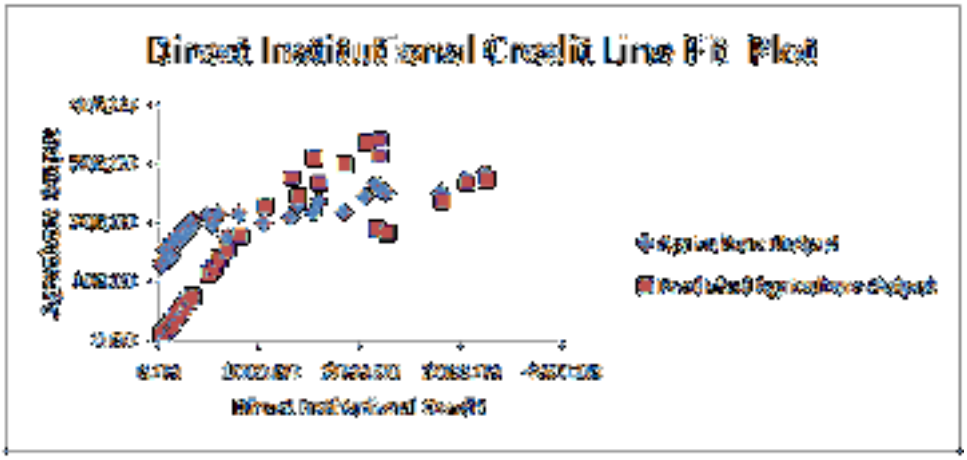
Agriculture output has positively correlated with both direct institutional credit as well as commercial bank advances. The degree of correlation is high. Apart from this the correlation between in the direct institutional credit and commercial Bank advances has high degree positive correlation. To check the dependency of agricultural output on direct institutional credit and commercial bank advances, a linear regression equation has been plotted and output is treated as dependent variable.

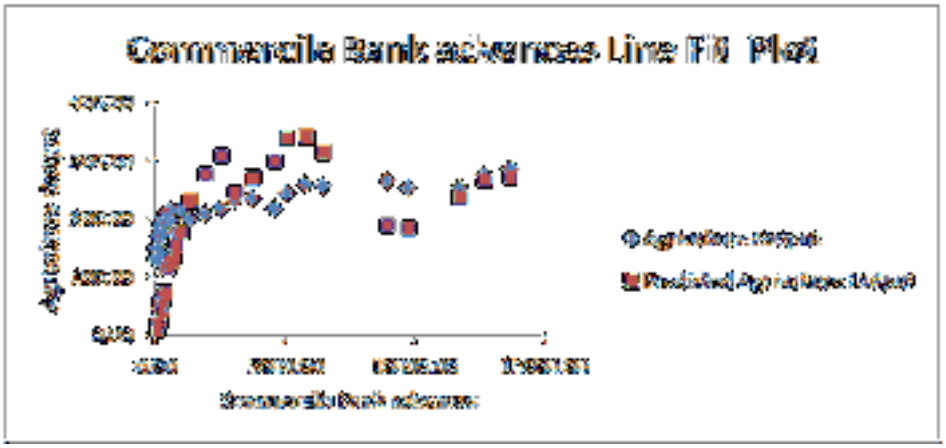
Summery Output

Regression Statistics	
Multiple R	0.875246
R Square	0.766056
Adjusted R Square	0.731779
Standard Error	100.9131
Observations	38

	Df	SS	MS	F	Significance F
Regression	2	1200453	600226.7	58.94135	6.24E-12
Residual	36	366604.5	10183.46		
Total	38	1567058			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	0	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A	#N/A
Direct Institutional Credit	0.277832	0.041432	6.705772	8.01E-08	0.193804	0.361859	0.193804	0.361859
Commercial Bank Advances	-0.04581	0.011853	-3.86535	0.000446	-0.06985	-0.02178	-0.06985	-0.02178





The regression equation is:

Agriculture Output = 0.277832 (Direct Institutional Credit) – 0.05 (Commercial Bank Advances)

Coefficient of both direct institutional credit and commercial bank advances are significant (p value is less that 0.05 & at 95% level of confidence). So, we can comment that the agriculture output is not independent of direct institutional credit and commercial banks advances.

GOVERNMENT INITIATIVES FOR AGRICULTURAL SECTOR:

The government of India has played a major role in the development of agriculture sector in the country. Various initiatives have been taken by the government since independence; few to recall are green revolution taken place immediately post – independence. Despite over a period of time furthermore initiatives have taken to benefit agriculture directly or indirectly.

(a) Gramin Bhandaran Yojana (Construction of Rural Go-downs) was launched in 2001 by Government of India. The main objective of this scheme is construction, renovation of rural go-down to meet the requirements of farmers for storing farm produce.

(b) Kisan Credit Card (KCC) scheme was introduced in 1998-99 by Government of India with an objective to provide free and timely credit to farmers for their agricultural activity. The basic objective is to provide a short term credit requirement of farmers for cultivation of crops, post-harvest expenses etc., and any other activities allied to agriculture like dairy animals, inland fishery etc.

(c) Pradhan Mantri Krishi Sinchayee Yojana: The government of India has introduced a scheme to provide relief to Indian farmers due to poor monsoon. The scheme focuses on giving water to each and every farm in the form of irrigation facilities and enhancement of farmer's water conservation skills.

(d) Paramparagat Krishi Vikas Yoaja**:** The government of India has launched an initiative named as Paramparagat Krishi Vikas Yoaja in the year 2015. With an primary objective to encourage bio farming in the country. To get the benefit of the schemes a cluster of minimum of 50 farmers is required with a land of 50 acres. Under this scheme farmer will get Rs.20,000 per acre in a span of 3 years. Farmers can utilizes this amount for harvesting, purchases of bio-seeds and to transport of agricultural products to the market. etc.

(e) Soil Health Card Scheme:- Launched on 19 February 2015, under Soil Health Card Scheme the government has to issue a soil card which contain the information about the soil and the farmers will know the fertility of their land. With the help of soil report of their land, farmers will be able to obtain more products on their farms. The expert will sort out the problem related with soil.

(f) The Pradhan Mantri Fasal Bima Yojna (PMFBY) was introduced on 14th January 2016. This new Crop Insurance Scheme is in line with One Nation – One Scheme theme. The main aim of scheme is to provide relief to the farmers affected by the loss of crop damage. Under this schemes the farmers are provided the assessment of local calamities along with unpredicted or unseasonal rain fall, land slide etc., Under Pradhan Mantri Fasal Bima Yojna (PMFBY) the farmers are required to pay 2% for Kharif and 1.5% for Rabi.as a premium Rest of the premium will be deposited by the Government.

(g) National Agriculture Market (e-NAM): On14 April 2016, the government of India has launched National Agriculture Market (NAM) as a pan-India electronic trading portal for farm crops which makes a unified national market for agricultural produces by integrating the existing Agriculture Produce Market Committee (APMC) market. The main objective of this scheme is to form a combined national market for agricultural products by making a network for the markets related to the existing Agricultural Product Marketing Committee.

(h) My Village My Pride: For the development of scientific farming and to provide advanced technology to every village government of India has launched my village my pride scheme. Under the Scheme of My Village My Pride, 20,000 agriculture scientists are providing important information and sophisticated benefits to the farmers within prescribed time limit.

(i) National Mission for Sustainable Agriculture (NMSA): This scheme is operational from the year 2014-15. The main objective of the scheme is to make agriculture more productive, sustainable, and remunerative. The schemes mainly focuses on integrated farming, efficient use of water, soil health management.

FUTURE PROSPECTIVE:

During the last 30 years India has made remarkable growth in agricultural sector. The credit of this success goes various Government initiative and several small farmers who are the real backbone of Indian agricultural sector and Indian economy. The various government policies, investment in infrastructure development etc., helped to increased food production and development of this sector. The Government of India has set a target of doubling of farmers' income by the year 2022. To achieve the target of doubling the farmers income following are the major reforms

Increased Investment in Agriculture and Infrastructures: the public and private capital investment in agricultural sector in India is declining. The investment is agricultural sector must be stimulated through appropriates government policies and schemes. Still in India 65-70 percent population lives in rural India and agricultural is their main occupation. Agricultural growth will be the engine for economic development of the country.

Enhanced investments are needed to facilitate agricultural and rural development of the country. Research & Development is the key in future: the important barrier of low agricultural productivity in India is lack of new advanced technology. To overcome from this challenge India requires huge investment in research and development in agriculture sector.

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Table 1: Descriptive Statistics of India's Agriculture Production

	Rice	Wheat	Coarse Cereals	Pulses	Total Food grain
Mean	67.97	51.38	31.41	13.24	164.00
Standard Error	3.28	3.59	0.81	0.41	7.89
Median	71.16	51.98	30.43	12.76	169.15
Mode	#N/A	69.35	40.04	14.91	#N/A
Standard Deviation	25.01	27.33	6.15	3.10	60.07
Sample Variance	625.50	746.68	37.78	9.59	3608.38
Kurtosis	-1.34	-1.18	-0.19	4.33	-1.08
Skewness	0.12	0.06	0.71	1.73	0.21
Range	82.47	89.85	25.57	16.88	212.48
Minimum	30.44	9.85	21.42	8.35	72.35
Maximum	112.91	99.7	46.99	25.23	284.83

Table 2: Correlation Matrix between crops produced period (1961 – 62 to 2017 – 18)

	Rice	Wheat	Coarse Cereals	Pulses
Rice	1.00			
Wheat	0.99	1.00		
Coarse Cereals	0.86	0.85	1.00	
Pulses	0.80	0.79	0.86	1.00

Table 3: Descriptive Statistics of Area under Cultivation (Million Hectares)

	Rice	Wheat	Coarse Cereals	Pulses	Total food grains
Mean	40.92	23.29	35.97	23.22	123.40
Standard Error	0.40	0.69	1.00	0.22	0.50
Median	41.73	24.11	36.55	23.03	123.6
Mode	#N/A	#N/A	46.24	22.54	126.7
Standard Deviation	3.00	5.18	7.51	1.70	3.81
Sample Variance	8.98	26.85	56.45	2.88	14.53
Kurtosis	-0.93	-0.50	-1.52	6.30	-0.10
Skewness	-0.49	-0.58	-0.08	1.94	-0.40
Range	10.85	18.62	23.19	9.64	17.29
Minimum	34.69	12.57	24.15	20.35	113.9
Maximum	45.54	31.19	47.34	29.99	131.2

Table 4: Descriptive Statistics of Yield per Hectare (Kilograms per Hectare)

	Rice	Wheat	Coarse Cereals	Pulses	Total Food Grains
Mean	1642.68	2079.09	946.35	566.02	1337.58
Standard Error	66.46	100.51	50.55	13.12	62.96
Median	1740	2244	814	547	1349
Mode	1308	2708	721	598	2129
Standard Deviation	501.78	758.85	381.66	99.07	475.36
Sample Variance	251787.33	575856.47	145665.34	9813.98	225971.68
Kurtosis	-1.25	-1.26	-0.14	0.55	-1.22
Skewness	0.14	-0.20	0.90	0.68	0.20
Range	1716	2641	1458	464	1604
Minimum	862	730	483	377	629
Maximum	2578	3371	1941	841	2233

Table 5: Descriptive Statistics of Minimum Support Price (per quintal)

	Paddy common	Coarse cereals	Wheat	Pulses
Mean	641.76	582.33	735.73	1761.37
Standard Error	76.65	72.67	83.77	259.44
Median	530	485	620	1290
Mode	530	485	620	#N/A
Standard Deviation	440.35	417.46	481.21	1490.38
Sample Variance	193907.44	174274.98	231567.83	2221219.76
Kurtosis	-0.71	-0.58	-0.87	-0.22
Skewness	0.77	0.85	0.62	1.06
Range	1408	1295	1573	4916
Minimum	142	130	162	290
Maximum	1550	1425	1735	5206

Table 6: Comparison of All crops in terms of percentage of total aggregate of each factor

Crops	Production	Area under Cultivation	Yield	MSP
Rice	41.45	33.16	31.38	17.25
Wheat	31.33	18.87	39.72	19.77
Coarse Cereals	19.15	29.15	18.08	15.65
Pulses	8.07	18.82	10.81	47.33
	100	100	100	100

Table 7: Descriptive statistics of direct institutional credit – Long term

	Co-operatives	SCBs	RRBs
Mean	54.90	164.33	26.03
Standard Error	7.01	44.61	7.31
Median	42.38	48.48	7.18
Mode	#N/A	#N/A	#N/A
Standard Deviation	42.06	252.34	42.65
Sample Variance	1768.71	63676.41	1818.60
Kurtosis	-1.34	2.564	9.25
Skewness	0.36	1.86	2.84
Range	125.8	943.20	202.60
Minimum	6.43	6.599	1.244
Maximum	132.23	949.8	203.84

Table 8: Descriptive statistics of direct institutional credit – Long term

	Total Direct Finance	Total Indirect Finance
Mean	1993.161	592.465
Standard Error	500.170	137.368
Median	347.800	105.425
Mode	#N/A	#N/A
Standard Deviation	3083.255	846.792
Sample Variance	9506458.883	717056.914
Kurtosis	1.973	1.281
Skewness	1.761	1.491
Range	10652.877	3003.973
Minimum	28.880	8.830
Maximum	10681.757	3012.803