

A Study on Pattern of Inputs Use in Major Commercial Crops Cultivation in India**Dr.L.Ganesan * and Mrs.K.Pushpavalli ******Abstract**

Agriculture has been a way of life and continues to be the single most important livelihood of the masses in India. Green Revolution in India resulted in increased productivity of agriculture crops in India. The main instruments behind this increment were the use of high yielding variety seeds, chemical fertilizers and new technology of production which led to a sharp rise in agricultural productivity. In following years there has been application of this modern technology of high yielding seed varieties, chemical fertilizers and pesticides in major commercial crops like Cotton, Sugarcane, Oilseeds etc., In recent years in India there has been fall in the growth of area under cultivation of crops but the country has managed to maintain the growth of production of crops. In this context this study aims to analyze the growth trend of area, production and productivity of major commercial crops in India during last two decades. It also aims to analyze the reason for increase in productivity of crops by means of growth in consumption of agriculture inputs like fertilizer and pesticides. The result says that while the area under cultivation of commercial crops has increased at a decreasing rate during study period, the production of those crops has increased at a increasing rate and this is because of the increase in productivity of the crops caused by consumption of agriculture inputs like fertilizers and pesticides.

Keywords: Commercial Crops – Area – Production – Productivity – Agriculture Inputs – Fertilizer – Pesticide

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Introduction

The performance of agricultural sector influences the growth of Indian economy. Agriculture has been a way of life and continues to be the single most important livelihood of the masses in India. Agriculture, which is the primary occupation for around 60 per cent of the population accounts for 14 per cent of the nation's GDP and about 11 per cent of its exports. India has the second largest arable land base (159.7 million hectares) after US and largest Gross Irrigated Area (88 million hectares) in the world. Rice, wheat, jute, tea, cotton, oilseeds, sugarcane, milk and potatoes are the major agricultural commodities produced in the country. As far as the commercial crops are concerned, oilseeds (Groundnut, Mustard, Soyabean), sugarcane, tea, coffee, cotton, jute and tobacco production are estimated to be a record (oilseeds 31.31), (coffee 316.00), (cotton 34.89), (raw jute 10.14), (sugarcane 376.91),

(Tea 1,325.05), (tobacco 0.66) million tonnes respectively in 2017-18 crop year. Green Revolution in India resulted in increased productivity of mainly rice and wheat during the middle 1960s. The main instruments behind this increment were the use of high yielding variety seeds, chemical fertilizers and new technology of production which led to a sharp rise in agricultural productivity (Jagran Josh 2015). In following years there has been application of this modern technology of high yielding seed varieties, chemical fertilizers and pesticides in major commercial crops like Cotton, Sugarcane, Oilseeds etc., In recent years there has been fall in the growth of area under cultivation of crops but the country has managed to maintain the growth of production of crops. In this context this study aims to analyze the growth trend of area, production and productivity of major commercial crops in India during last two decades and the reason the growth in production of the crops.

Commercial Crops

Commercial crops are those which are grown not primarily as a source of food, such as grains but mainly as raw materials for industries. The main commercial crops cultivated in India are sugarcane, cotton, jute, oilseeds, tea, coffee, tobacco and rubber. These commercial crops are very important because they play a significant role in the economy of the country. These crops not only provide raw material for several industries, but also are valuable foreign exchange earners. So, in this study the growth trend of major commercial crops such as sugarcane, oilseeds, cotton, jute, tea and coffee has been analyzed.

Sugarcane

Sugarcane is the main sugar producing crop that contributes nearly 78.2 per cent to the total sugar pool at global level. It holds the prominent position as the commercial cash crop in India. It occupies 3.5 per cent of the total cropped area in the country. Sugarcane can be grown in wide range of climates from warm tropical southern part of India to foot hills of Himalayas. Heavy soils with good drainage are preferred for sugarcane cultivation, though it grows well on medium and light textured soils with assured irrigation.

Oilseeds

Oilseeds constitute a very important group of commercial crops in India. Currently, oil seeds share around 14 per cent of the area under major crops (Agriculture Statistics at a Glance 2017). A large variety of oil seeds are produced in India such as groundnut, castor

seed, sesame, mustard, linseed, Soybean and sunflower. The oil extracted from oilseeds form an important item of our diet and are used as raw materials for manufacturing large number of items like paints, varnishes, hydrogenated oil, soaps, perfumery, lubricants, etc. Oil-cake which is the residue after the oil is extracted from the oilseeds, forms an important cattle-feed and manure. As awareness of the health benefits of vegetable oils is growing, the demand for oilseeds (groundnut, mustard, sesame, linseed, castor, etc) is also growing in India.

Cotton and Jute

The natural fibres i.e., cotton and jute has formed the basis of the textile industry for centuries. Cotton as king of fibres usually referred as white gold and one of the important commercial crops, plays a vital role in economic, political and social affairs of the world. Its natural fibres are the most important raw materials for “comfort Clothing” production. Cotton is the major cash crop of India that accounts for 65 per cent of the fibre used in the textile industries. The organized sector of Indian textile industry constitutes the largest single industrial segment in the country in terms of annual value of output and labour employed both directly and indirectly which depicts the importance of cotton production in India.

Jute is believed to have been cultivated in India as early as 800 B.C. It is a tropical fibre plant and grows well in the delta region of the Ganga-Brahmaputra valley. India is the second largest producer of jute after Bangladesh. Jute is the “golden fibre” of India since its products are an important foreign exchange earner.

Tea

After water, tea is the most widely consumed beverage in the world. Tea is an evergreen plant that mainly grows in tropical and subtropical climates. India is world’s second largest tea producer after China. In 2013, India’s estimated tea production was 900 million kilograms. Tea is grown in 16 states in India. Assam, West Bengal, Tamil Nadu, and Kerala account for about 95 per cent of total tea production. Besides being one of the largest producer, India is also a leading exporter of tea in the world. Some of the most exquisite and globally acclaimed varieties of Indian tea hail from plantations in Darjeeling, Assam and Nilgiris.

Coffee

Coffee is next in popularity and is by far the largest tropical commodity in world trade. India produces about 2.5 per cent of world's coffee. Among the plantation crops, coffee has made significant contribution to the Indian economy during the last 50 years. Karnataka is the largest producer accounting for about 70 per cent of total coffee production and 60 per cent of the area under coffee in India. The restricted agro-climatic conditions have forced the coffee plantations to confine themselves to small area in south India. Almost the entire production is shared by three states namely Karnataka, Kerala and Tamil Nadu. Indian coffee is well known for its quality and is much in demand in the international market. Therefore, India exports coffee to a large number of countries including U.K., the U.S.A., Russia, Australia, Iraq and a large number of countries of continental Europe.

Agricultural Inputs

Agriculture is mainly made up of cultivation practices by using the following inputs viz., Seeds, Irrigation, Fertilizers, Pesticides, Mechanization, electricity etc. Among them, fertilizers and pesticides are to be considered as main input in terms of increasing yields which helps the farmers to boost up their cultivation. So, this study has taken these major inputs i.e., fertilizer and pesticides as inputs for study.

Fertilizers

Fertilizer is an essential component of modern agriculture. Chemical fertilizers have played an important role in making the country self-reliant in agriculture production (Indian Fertilizers Scenario, 2013). Agriculture productivity is dependent upon various factors like soil properties, climate conditions, irrigation facilities, seed quality and variety, cropping pattern, techniques of farming, prevention from pests etc., but more importantly usage of optimum primary, secondary and micro nutrients i.e., fertilizers which boost up the production.

Pesticides

Pesticides are substances that are meant to control pests including weeds. Pest control is an important activity intended to reduce or eliminate yield losses, maintain high quality of products and prevent economic losses. The major applications of pesticides in India are found in rice and cotton. Without pesticides, more than half of our crops would be lost to pests and diseases. **Between 26 and 40 percent of the world's potential crop production is lost**

annually because of weeds, pests and diseases. Without crop protection, these losses could easily double which shows the significance of pesticides.

Research Problems

In addition to growth in total production, agriculture in India has shown an increase in the quantity of a crop produced per unit of land (agricultural yield) in last 60 years. India's accomplishments in crop yields while being impressive are still just 30 per cent to 60 per cent of the best crop yields achievable in the farms of developed and other developing countries. In India the agricultural yield is found to be lower in the case of most crops, as compared to other top producing countries such as China, Brazil and the United States. Despite the gains in agricultural yield in recent years agricultural growth has been fairly volatile and the agriculture sector's contribution has decreased from more than 50 per cent of GDP in the 1950s to 14 per cent recently. Key issues affecting agricultural productivity include the decreasing sizes of agricultural land holdings, inadequate access to irrigation, imbalanced use of soil nutrients resulting in loss of fertility of soil, uneven access to modern technology in different parts of the country among others. In this context this study aims to analyze the growth of area, production and productivity of major commercial crops in India and also the growth of agriculture input like fertilizer and pesticide.

Objectives of the study

This study focuses on growth trend of major commercial crops and agriculture inputs in India on the whole with the given objectives.

- To analyse the growth performance of major commercial crops in terms of area, production and productivity in India during 2000-01 to 2017-18.
- To examine the growth of selected inputs for agricultural production in India during 2000-01 to 2016-17.
- To identify the role of selected inputs in the growth of production of commercial crops in India.

Methodology

The present study is based on the secondary sources of information, mainly taken from the Handbook of Statistics on Indian States, Agricultural statistics at a glance, Reports of Reserve Bank of India. The period of study is eighteen years starting from 2000-01 to 2017-18. The researchers have planned to estimate the growth of major commercial crops (Oil seeds, Cotton, Jute, Sugarcane, Tea and Coffee) in terms of area, production and productivity and growth of selected inputs for agricultural production in India during study

period. The present study is confined with the analysis of agriculture inputs of pesticides and fertilizer use in commercial crops production. As far as the statistical tool for analysis is concerned, the researchers have used CAGR to find out the growth performance of major commercial crops and selected variables. The researcher has conducted linear regression analysis to identify the influence of fertilizer and pesticide in the growth of production of selected commercial crops in India.

Analysis

Table.1. Area under Cultivation- Major Commercial Crops in India (Million hectares) from 2000-01 to 2017-18

Year	Oilseeds	Sugarcane	Tea	Coffee	Cotton (Lint)	Raw Jute & Mesta
2000-01	22.77	4.32	0.5	0.31	8.53	1.02
2001-02	22.64	4.41	0.51	0.32	9.13	1.05
2002-03	21.49	4.52	0.52	0.33	7.67	1.04
2003-04	23.66	3.93	0.52	0.33	7.6	1.00
2004-05	27.52	3.66	0.52	0.33	8.79	0.92
2005-06	27.86	4.20	0.56	0.38	8.68	0.90
2006-07	26.51	5.15	0.57	0.38	9.14	0.94
2007-08	26.69	5.06	0.58	0.39	9.41	0.96
2008-09	27.56	4.42	0.58	0.39	9.41	0.90
2009-10	25.96	4.18	0.58	0.40	10.13	0.91
2010-11	27.22	4.88	0.56	0.40	11.24	0.87
2011-12	26.31	5.04	0.56	0.41	12.18	0.90
2012-13	26.48	5.00	0.56	0.41	11.98	0.87
2013-14	28.53	5.01	0.57	0.42	11.69	0.85
2014-15	25.73	5.14	0.57	0.42	13.08	0.81
2015-16	21.93	4.93	0.57	0.43	12.29	0.78
2016-17	26.18	4.44	0.58	0.45	10.83	0.76
2017-18	24.65	4.73	0.58	0.45	12.43	0.74
CAGR	0.47	0.53	0.88	2.22	2.24	-1.87

Source: Handbook of Statistics on Indian States, Reserve Bank of India 2018-19.

The above table 1 shows the trend in growth of area under cultivation of major commercial crops like Oil seeds, Cotton, Jute, Sugarcane, Tea and Coffee during 2000-01 to 2017-18. In the year 2000-01 the area under cultivation of oilseeds was 22.77 Mh and it increased to 24.65 mh in 2017-18. Then the area under cultivation of sugarcane was 4.32 mh in 2000-01 and it increased to 4.73 mh in 2017-18. The CAGR of oilseeds and sugarcane during this period is 0.47 and 0.53 respectively. While the area under cultivation of Tea was 0.50 mh in 2000-01 increased to 0.58 mh in 2017-18 with a CAGR of 0.88 per cent, the area under cultivation of coffee increased from 0.31 mh to 0.45 mh in the same period with a higher CAGR of 2.22 per cent. Similarly the area under cultivation of cotton increased from 8.53mh to 12.43 mh during 2000-01 to 2017-18 with a CAGR of 2.24. whereas the area under cultivation of Jute & Mesta which was 1.02 mh in 2000-01 fell to 0.74mh during the same period with a negative CAGR of -1.87 per cent. This shows that there has been higher increase in area under cultivation of coffee and cotton than other crops and decline in area under cultivation of Jute and Mesta during the last two decades.

Table.2. Agricultural Production- Major Commercial Crops in India (Million Tonnes) from 2000-01 to 2017-18

Year	Oilseeds (Groundnut, Rapeseed & Mustard, Soyabean)	Sugarcane	Tea	Coffee	Cotton (Lint)	Raw Jute & Mesta
2000-01	18.44	295.96	848.43	301.2	9.52	10.56
2001-02	20.66	297.21	851.41	300.6	10	11.68
2002-03	14.84	287.38	845.97	275.3	8.62	11.28
2003-04	25.19	233.86	878.65	270.5	13.73	11.17
2004-05	24.35	237.09	906.84	275.5	16.43	10.27
2005-06	27.98	281.17	948.94	274	18.5	10.84
2006-07	24.29	355.52	973.07	288	22.63	11.27
2007-08	29.76	348.19	987.02	262	25.88	11.21
2008-09	27.72	285.03	972.77	262.3	22.28	10.37
2009-10	24.88	292.3	991.18	289.6	24.02	11.82
2010-11	32.48	342.38	966.73	302	33	10.62

2011-12	29.8	361.04	1,095.46	314	35.2	11.4
2012-13	30.94	341.2	1,135.07	318.5	34.22	10.93
2013-14	32.75	352.14	1,208.78	304.5	35.9	11.69
2014-15	27.51	362.33	1,197.18	327	34.81	11.13
2015-16	22.09	348.44	1,233.14	348	30	10.52
2016-17	31.28	306.07	1,250.49	312	32.58	10.96
2017-18	31.31	376.91	1,325.05	316	34.89	10.14
CAGR	3.16	1.43	2.66	0.28	7.94	-0.24

Source: Handbook of Statistics on Indian States, Reserve Bank of India 2018-19.

The above Table 2 shows the trend in growth of production of selected major commercial crops in India during 2000-01 to 2017-18. The production of oilseeds was 18.44 MT in 2000-01 increased to 31.31 mt in 2017-18 with a CAGR of 3.16. Then the production of sugarcane was 295.96 mt in 2000-01 increased to 376.91 mt in 2017-18. Then the production of tea was 848.43 mt in 2000-01 and it increased to 1325.05 in 2017-18 with a CAGR of 2.66. At the same time the production of coffee was 301.2 mt in 2000-01 increased to 316 mt in 2017-18 with a CAGR of 0.28, then the production of cotton was 9.52 mt in 2000-01 increased to 34.89 mt in 2017-18 with a whopping 7.94 per cent of CAGR. However the production of jute & mesta which was 10.56 mt in 2000-01 reduced to 10.14 mt in 2017-18 with a negative CAGR of -0.24 per cent. From this Table 2, it can be seen that the increase in CAGR of production of all selected commercial crops except coffee and Jute Mesta has been higher than the CAGR of area under cultivation of respective crops. Only for coffee, the production CAGR was less than area under cultivation CAGR. Whereas for jute & mesta which shows a negative growth rate, the fall in area under cultivation was more than fall in production of jute & mesta. The reason for this condition is the difference in the level of productivity (yield per hectare) of each crop which will be analyzed as follows.

Table.3. Major Commercial Crops in India (Yield Per Hectare) from 2000-01 to 2017-18

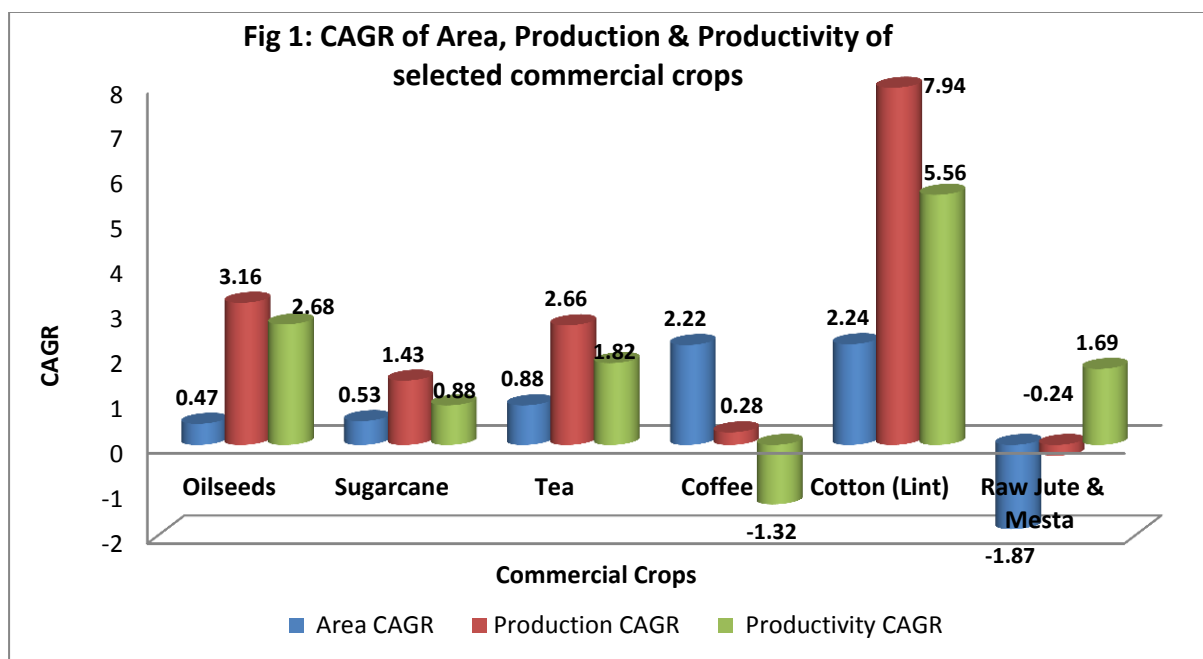
Year	Oilseeds	Sugarcane	Tea	Coffee	Cotton (Lint)	Raw Jute & Mesta
2000-01	810	68577	1682	959	190	1867
2001-02	913	67370	1670	937	186	2007
2002-03	691	63576	1640	839	191	1960
2003-04	1064	59380	1691	831	307	2008

2004-05	885	64752	1739	826	318	2019
2005-06	1004	66919	1708	803	362	2173
2006-07	916	69022	1716	840	421	2170
2007-08	1115	68877	1706	761	467	2101
2008-09	1006	64553	1679	748	403	2071
2009-10	958	70020	1711	815	403	2349
2010-11	1193	70091	1726	838	499	2192
2011-12	1133	71668	1756	852	491	2283
2012-13	1169	68254	2027	846	486	2281
2013-14	1153	69839	2121	799	532	2249
2014-15	1037	69859	2113	847	461	2550
2015-16	968	70720	2176	876	415	2421
2016-17	1195	69001	2165	761	512	2585
2017-18	1270	79650	2285	765	477	2481
CAGR	2.68	0.88	1.82	-1.32	5.56	1.69

Source: Handbook of Statistics on Indian States, Reserve Bank of India: 2018-19

The above Table 3 shows the productivity of the selected commercial crops during 2000-01 to 2017-18. The yield was 810 kg/ ha in 2000-01 for oilseeds and it increased to 1270 kg/ ha in 2017-18 with a CAGR of 2.68 per cent. Then in 2000-01 the yield for sugarcane was 68577 kg/ ha which increased to 79650 kg/ ha in 2017-18 with a CAGR of 0.88 per cent. While the yield for Tea was 1682 kg/ ha in 2000-01 it increased to 2285 kg/ ha in 2017-18 with a CAGR of 1.82. The yield of coffee decreased from 959 kg/ ha, 2000-01 to 765 kg/ ha in 2017-18 with a negative CAGR of -1.32 per cent. Then for cotton the yield was 190 kg/ ha in 2000-01 and it increased to 477 kg/ ha in 2017-18 with a significant CAGR of 5.56 per cent. Similarly the yield of jute & mesta was 1867 kg/ ha in 2000-01 increased to 2481 in 2017-18 with a CAGR of 1.69 per cent. This Table 3 explains the reason for more increase in CAGR of production than the CAGR of area under cultivation of oilseeds, sugarcane, tea and cotton. This is because the productivity of these crops have witnessed higher growth rate as seen in Table 3. Similarly the reason for CAGR of production of coffee was less than the CAGR of area under cultivation of coffee was because of negative CAGR of productivity of coffee as seen in Table 3. Thus productivity of crops plays the crucial role in increasing the production of each crop.

Major Findings:



Source: computed by the author

The above Figure 1 is compiled from Table 1, Table 2 and Table 3. It shows the CAGR of area under cultivation, production and productivity for the period of 2000-01 to 2017-18 of the selected commercial crops i.e., oilseeds, sugarcane, tea, coffee, cotton and Raw Jute&Mesta. From the figure 1 it can be seen that the growth in production of all crops except coffee is more than the growth in CAGR of area under cultivation. Despite lesser growth in area under cultivation, the reason for more growth in production of crops is due to increase in productivity of the crops. This is further evident from coffee and Raw jute & mesta. In coffee the growth in production (0.28 CAGR) is less than growth in area under cultivation (2.22 CAGR). This is because the productivity of coffee has registered a negative CAGR of -1.32 per cent. Similarly, in Raw jute & Mesta there is negative CAGR in area under cultivation and production but the fall in production of jute& mesta (-0.24 CAGR) was less than the fall in area under cultivation (-1.87 CAGR) which is because of increase in productivity of jute & mesta with 1.69 CAGR during the same period. This shows the significance of productivity in determining the level of production of agricultural crops. The productivity of the crops depends on agricultural inputs like fertilizers, pesticides, seeds modern technology etc., In this study the researchers analyze the growth of consumption of fertilizers and pesticides in agriculture cultivation as follows.

Table. 4. Growth of Selected Inputs for Agricultural Production in India during 2000-01 to 2016-17

Year	Consumption of Fertilizers (lakh tonnes)	Consumption of Pesticides (lakh technical grade material 000 tonnes)
2000-01	180.7	46.2
2001-02	167.02	43.58
2002-03	173.6	47.02
2003-04	160.94	48.3
2004-05	167.99	41
2005-06	183.98	40.67
2006-07	203.4	39.77
2007-08	216.51	41.51
2008-09	225.7	44.77
2009-10	249.09	43.86
2010-11	264.86	41.82
2011-12	281.22	55.54
2012-13	277.9	52.98
2013-14	255.36	45.62
2014-15	244.82	60.28
2015-16	255.76	56.12
2016-17	267.52	50.41
CAGR	2.48	0.55

Source: Handbook of Statistics on Indian States, Reserve Bank of India 2018-19

The above Table 4 shows the growth of selected agriculture inputs i.e., fertilizers and pesticides in India during 2000-01 to 2016-17. The consumption of fertilizers was 180.7 lakh tonnes in 2000-01 and it increased to 267.52 in 2016-17 with a CAGR of 2.48 per cent. Then the consumption of pesticides was 46.2 lakh tonnes in 2000-01 which increased to 50.41 lakh tonnes in 2016-17 with a CAGR of 0.55 per cent. From this it can be seen that there is more growth in consumption of fertilizer than pesticide in India.

Influence of Agriculture Inputs on Production:**Fertilizer:**

In order to know the level of influence of fertilizer on the production of commercial crops in India, the linear regression analysis was conducted by keeping fertilizer as independent variable and all the selected commercial crops as dependent variable. The result of the regression analysis is given below in Table 5.

Table 5: Influence of Fertilizer on Production of Commercial Crops

Coefficients					
Dependent Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
OilSeed	2.326	.606	.704	3.839	.002
Sugarcane	52.319	13.038	.720	4.013	.001
Tea	2.920	.938	.627	3.115	.007
Coffee	-.361	.320	-.279	-1.127	.277
Cotton	2.274	.368	.847	6.171	.000
Jute&Mesta	3.611	.786	.765	4.594	.000
The independent variable is Fertilizer					

Source: Computed by the author

From the above Table 5, it can be seen that there is strong relationship between consumption of fertilizer and level of production of selected commercial crops. Except coffee all other crops shows significant relationship at 1 per cent level. Also the Beta coefficient value for all crops except coffee shows positive and high relationship. This shows the importance of fertilizer increasing the agriculture production.

Pesticide:

In the same way, to find out the influence of pesticide on the production of commercial crops in India, linear regression analysis was conducted by keeping pesticide as independent variable and all the selected commercial crops as dependent variable. The result of the regression analysis is given below in Table 6.

Table 6: Influence of Pesticide on Production of Commercial Crops

Coefficients					
Dependent Variable	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		

OilSeed	5.169	5.864	.222	.881	.392
Sugarcane	131.468	127.889	.257	1.028	.320
Tea	21.406	6.432	.652	3.328	.005
Coffee	1.606	2.314	.176	.694	.498
Cotton	4.868	4.720	.257	1.031	.319
Jute&Mesta	19.559	6.955	.588	2.812	.013
The independent variable is Pesticide					

Source: Computed by the author

From the above Table 6, it can be seen that except Tea, there has not been much influence of pesticide on the production of selected commercial crops in India. Only Tea has shown significant relationship at one per cent level with beta value of .652 and Jute&mesta has shown significant relationship at 5 per cent level of significance with beta value of .588. All other crops does not show significant relationship and their beta value is also very less. This shows that fertilizer plays more important role than pesticide in determining the production of crops.

Conclusion

To sum up, while the levels of crop production have increased over the recent years, there has been decline in the area under cultivation of agriculture crops. Increase in production of crops was mainly due to increase in productivity which occurred as a result of increased usage of agricultural inputs like fertilizers and pesticides. But this condition has led to issues such as an imbalance of nutrients in the soil, decline in the water table as well as the quality of water, decline in soil fertility and overall depletion of soil health. Agriculture inputs include not only fertiliser and crop protection product i.e., pesticides but also seed, machines and electricity which support crop and allied production. As found in this study, among fertilizers and pesticide, fertilizer plays a major role in influencing the productivity of the crops and at the same time other inputs like seed, machinery also plays important role in determining the productivity and production of the of the agriculture crops.

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