

Trends in Area, Production and Yield in major Agricultural Crops

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Abstract : Agriculture sector for every country is the basic catalyst and accelerator of economic growth. The change in technology in agricultural sector has been sparked off by introduction of new yielding varieties of seeds, high fertilizers absorbing varieties, photo insensitive varieties of wheat, rice, maize, jowar and bajra. This came to be known as Green Revolution. The need for diversification arises from the fact that there is greater risk in depending exclusively on farming for livelihood. Diversification in agricultural to allied activities is necessary not only to reduce the risk from agriculture sector but also to provide productive sustainable livelihood options to farmers. The present study will highlight the production of different crops, area under crops which in turn will indicate whether farmers of Jammu and Kashmir have diversified or not. The study also highlighted the trend of major food grains and non-food grain crops in 15 major states . The study is based on secondary data published by Department of Economics and Statistics, J&K. this study highlighted farmers have diversified to some extent.

Keywords: Behavioral change, DDDE methodology, MOOCs, digitech space, digital equality.

Introduction

Agriculture in India is the pivotal sector for ensuring food and nutritional security, sustainable development and for alleviation of poverty (Swaminathan 1993). Agricultural situation in India has been changed a lot after introduction of Green revolution. Monsoon is quite erratic over large parts of the country and every year widespread droughts tend to occur. Severe droughts of 1965-67 are the best examples of monsoonal fluctuations. Unfortunately when the ground was prepared for a new step in the direction of modernizing Indian agriculture, there came severe droughts of 1965-66 and 1966-67. Droughts were so disastrous that all were shaken including Government authorities and farmers. As an impact of disaster all were ready to try out new varieties of seeds and practices which became available to them at that time. High Yield Varieties seeds for five grain crops namely wheat, paddy, maize, jowar and bajra were available to them whereas success was spectacular in wheat and paddy only. The change in technology has been sparked off by introduction of new yielding varieties of seeds, high fertilizers absorbing varieties, photo insensitive varieties of wheat, rice, maize, jowar and bajra. This came to be known as Green Revolution. But some harmful distributional impacts were attached with this revolution also. It led to the widening of disparities both at regional and personal level. The interests of big land lords were served whereas the class of marginal and small farmers was not benefited. The revolution led to the adoption of new labour saving machines which in turn led to unemployment, loss in productivity and efficiency of farmers and distortions in the life of farmers. Use of new technology was mainly predominant in the areas of Punjab, Haryana and U.P. Globalization wave in India has enormously affected all sectors of the economy including agriculture. Since the beginning of economic reforms in 1991, growth in agricultural GDP has shown high volatility. Since the launching of economic reforms in 1990's Indian agriculture has been passing through a serious crisis. Crisis of 1990's was not merely a crisis of deceleration of agricultural production growth and agricultural productivity but also the increasing distress experienced by a large growing proportion of farming community. Indebtedness is also increasing among the farmers. According to Royal Commission on Agriculture, ancestral debt is like "farmers born in debt, lives in debt and dies in debt". Over the years there have been a number of interventions made by the government to uplift the situation of marginal and small farmers but the results were not fruitful. Many small and marginal farmers lose their land due to unavailability of their holdings and are forced to seek employment as landless laborers, leading to increased casualization of labour in Indian agriculture (Chandershekar and Ghosh 2003). Low level of absolute income as well as large disparity between income of a farmer and non-agricultural worker constitutes an important reason for emergence of distress. The small and marginal farmers are still facing the problems of indebtedness, lack of access to credit, low income, distress, adoption of new technology, committing suicides etc. Agriculture is highly unsustainable in nature for small and marginal farmers. In case of Jammu and Kashmir, 81.5% of the farmers have operational holdings less than one hectare that is land holdings are marginalized. In Jammu and Kashmir 31.8% farmers were indebted. The low and highly fluctuating farm income is causing detrimental effect on the interest in farming and farm investments and is also forcing more and more cultivators, particularly those of younger age group, to leave farming. This can cause adverse effect on the future of agriculture in the country. There is an urgent need to take steps in the direction of making the livelihoods of farmers sustainable and also in maintaining the sustainability of agriculture. According to NITI Policy Paper No.1 (2017), "Doubling Farmer's income-Rationale, Strategy, Plan and Prospects" emphasized on doubling the farmers' income by 2022-23, central to promote farmers' welfare, reduce agrarian distress and bring parity between income of farmers' and those working in non-agricultural profession. Major sources of growth operating with agriculture are improvements in productivity, resource use efficiency, increase in cropping intensity and diversification towards high value crops. An essential component of rural transformation can be diversification of production pattern of agriculture to allied activities in J&K. Before stating what

diversification in Agriculture do, there is need to define first what is diversification in Agriculture? Agricultural diversification involves movement of resources from low value commodity mix to high value commodity mix. It focuses mainly focuses on horticulture, dairy, poultry and fisheries sector. British Department for Environment, Food and Rural Affairs (DERFRA) defines diversification as "the entrepreneurial use of farm resources for a non-agricultural purpose for commercial gain". Diversification of agriculture to allied activities leads to sustainable agricultural development through increase in production, income and employment opportunities. Diversification is widely understood as a form of self-insurance (Bartell et al., 2001). Agricultural and allied activities diversification is an important mechanism for economic growth. Diversification depends upon two things, one on there being opportunities for diversification and second on farmers' responsiveness to those opportunities. Diversification in agriculture to allied activities can be facilitated by technological breaks-through, by changes in consumer demand, in government policy or in trade arrangements, and by development of irrigation, roads, and other infrastructures. Diversification includes two aspects first one is diversification of crop production and second one relates to a shift of workforce from agriculture to other allied activities such as livestock, poultry, fisheries and Bee keeping etc. The need for diversification arises from the fact that there is greater risk in depending exclusively on farming for livelihood. Diversification in agricultural to allied activities is necessary not only to reduce the risk from agriculture sector but also to provide productive sustainable livelihood options to farmers. Much of the agricultural employment activities are concentrated in the Kharif season. At the time of Rabi season, in areas where there are inadequate irrigation facilities it becomes very difficult to find productive employment as well as income generation sources. Therefore expansion into other sectors is very essential to provide them with supplementary gainful employment and in realizing higher levels of income for farmers' specially marginal and small farmers to overcome poverty and other tribulations. Agricultural sustainability demands that farmers continue to make a good living and that the population as a whole be supplied with an abundance of high quality food at reasonable cost.

Review of Literature

Rather et al. (2013) concluded that total production of the fruits under horticulture was increasing every year particularly the production of apple and walnut. Increasing trend of production shows that in absolute terms the production of fruits has increased and there exists a positive relation between total food production and number of years. Because of continuous increasing trend in production and export of fresh and dry fruits the agricultural land get diversified into horticultural land and increasing production of horticultural produces directly influences the income, employment and living standard in the rural area of Jammu and Kashmir. Bazaz and Haq (2013) in their study highlighted that along with area gain in oilseeds, area under other commercial crops viz. plantation crops, spices-condiments, fruits and vegetables witnessed a remarkable increase in both absolute as well as relative terms. Oilseeds, condiments, fruits and vegetables as well as plantation crops were major beneficiaries in terms of increased area under cultivation. It was also found that there is increase in crop diversification at the aggregate level. Gill and Singh (2005) in their working paper found that proportion of the cultivators who committed suicide are bigger than agricultural labourers and it is class of marginal and small farmers which reported maximum number of suicide. It was also highlighted that the causes of suicide were Indebtedness, economic distress, crop failure, alcoholism, marital status and domestic discord. Most of loans were taken from non-institutional sources and taken for unproductive purposes. Mellor (2003) analyzed that the growth in livestock production has a bigger effect on poverty reduction than similar growth in crop production. Also, observed that nearly 70% of the labor demand in livestock production is met by women leading to faster growth in livestock production thus contributing to female empowerment. Kristjanson et al. (2004) plotted the growth rates of the rural head –count poverty ratio against the growth rates in the value of output of livestock and of crops for the major Indian states for the period 1984-1997. It has been observed that both crops and livestock had a favorable effect on poverty reduction which was more responsive to the growth in livestock production. Asmah (2011) concluded that significant increase was found in household welfare as well as in percentage of farm households engaged in nonfarm diversification. There was an increase in access to motorable roads. Significant reduction was observed for the practice of share cropping and existence of local markets. It was found that farm households who participated in off farm employment have higher welfare than those who did not participate in non-farm work.

Objectives of the study

- To analyze the production pattern of major crops in 15 states.
- 2) To analyze the pattern of crop production and status of diversification in agriculture in Jammu and Kashmir.

Research Methodology

The present study is based on secondary data. The secondary data collected from digest of statistics 2015-16, government published reports, handbook of Statistics on Indian Economy etc. For the analysis of data simply the graphical analysis is employed like as columns and line charts etc. Compound annual growth rate is calculated by using the given formula:-

$$\log(y) = \beta_0 + \beta_2 t$$

Where $\beta_2 = \ln(1+r)$

$$1+r = e^{\beta_2}$$

$$r = e^{\beta_2} - 1$$

Growth rate = $r * 100$.

Analysis of the study

Status of agriculture in J&K

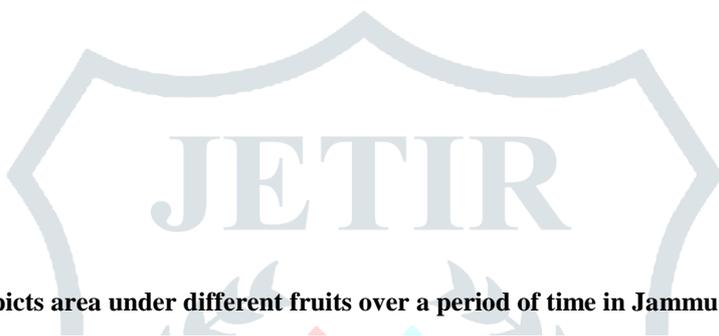


Chart 1st depicts area under different fruits over a period of time in Jammu and Kashmir.

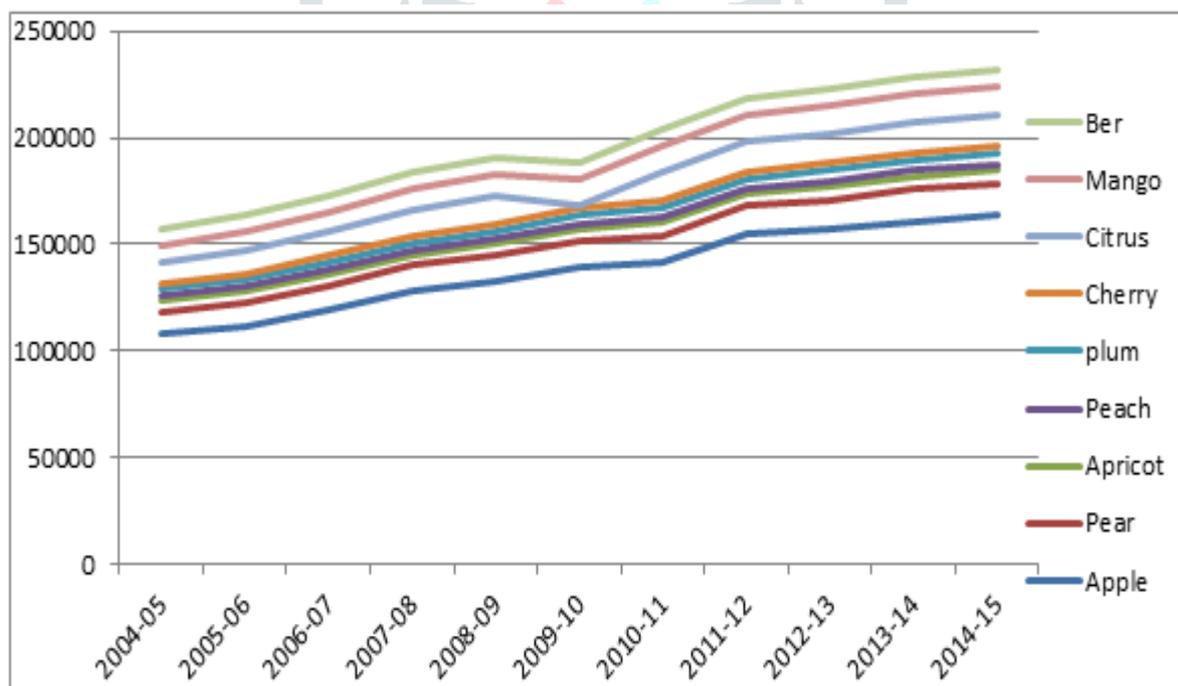


Chart 2nd shows the production of food grains in J&K.

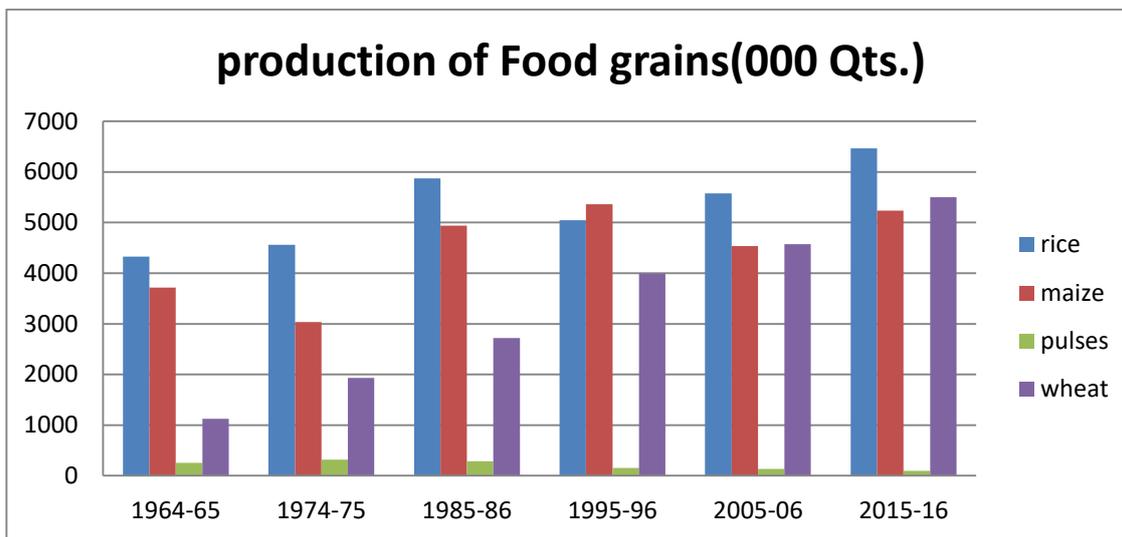


Chart 3rd shows the production of non-food grains in J&K.

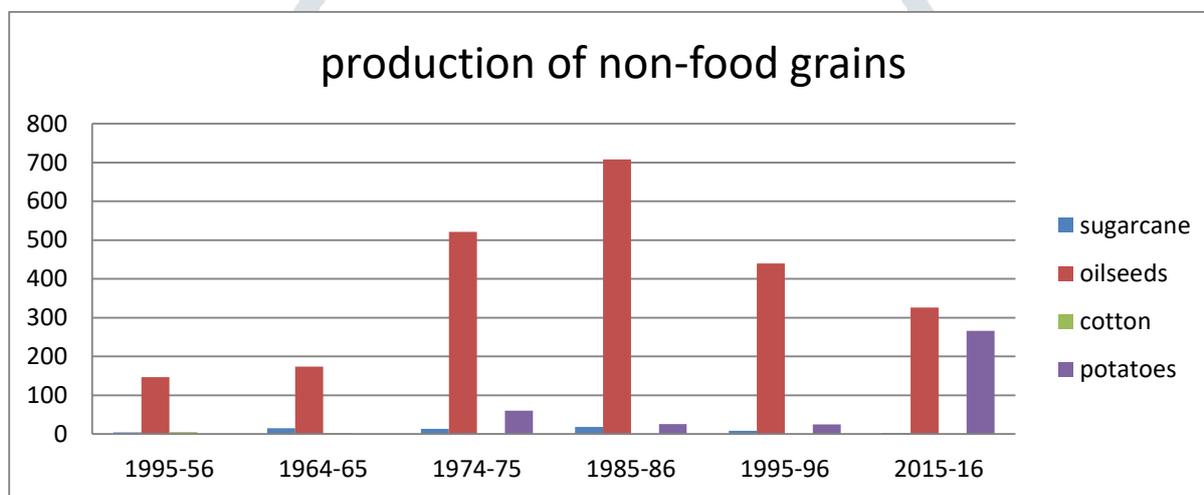
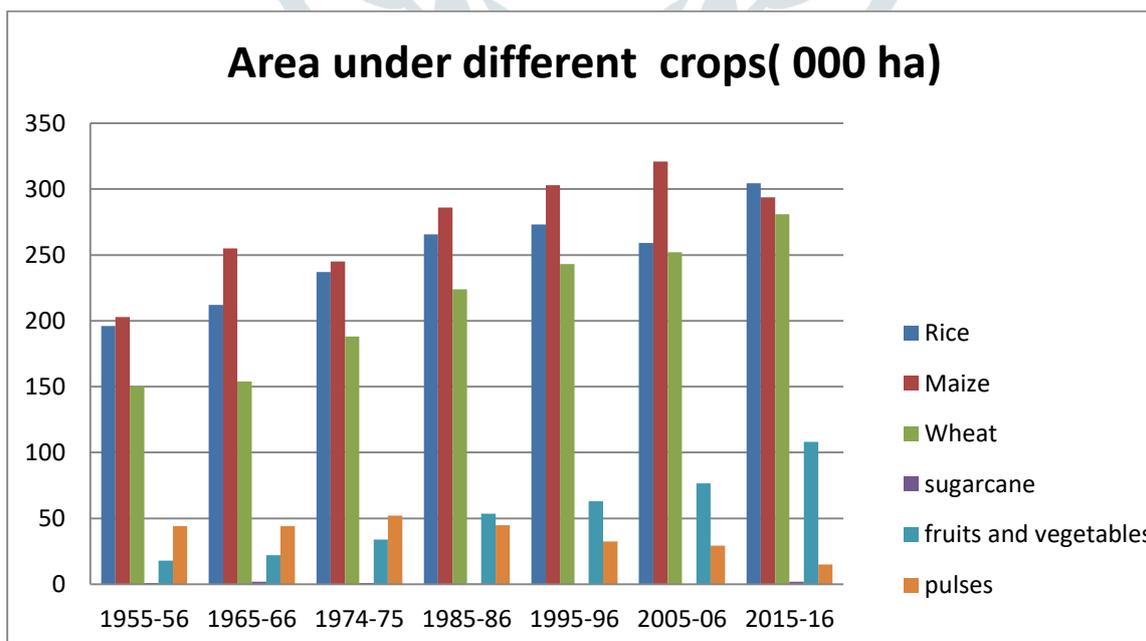


Chart 4th shows the area under different crops in J&K



Findings of the above charts

This chart shows that over a period of time area under maize crop has been increased followed by wheat and fruits and vegetables in the study area. This chart shows that in case of non-food grains production of oilseeds have been increased over a period of time

followed by potatoes in the state of Jammu and Kashmir. This chart shows that area under different types of fruits has increased in Jammu and Kashmir. Rate of increase of area under Ber and Mango is more as compare to other fruits in J&K. This chart shows that over a period of time production of rice has increased in J&K followed by wheat and maize whereas production of pulses have decreased. The above analysis shows that area as well as production of food crops has been increased over a period of time in J&K specially wheat and Maize. Study also highlighted that area in hectares under different fruits has also been increased with the change in time period especially Ber and Mango. Production of potato and oilseeds also showed a positive trend in J&K. This reveals that to some extent have diversified i.e., shifted towards high value crops in Jammu and Kashmir. Very few cases of suicide due to stress found among farmers. Diversification can be a best next alternative to cope with the sustainability and viability issue of Farmers. With the movement towards diversification the status of farmers can be improved as it was highlighted in budget speech referring “Doubling Farmers Income by 2020”.

Table 1st Trends in area under cultivation, production and yield per hectare of major commercial crops for 15 major states.

States	Rice			Wheat		
	Area	Production	Yield	Area	Production	Yield
AP	-0.18	1.11	1.21	-3.05	-1.32	-4.40
Assam	-0.11	1.97	1.90	-4.11	-4.61	-0.25
Bihar	-2.37	-0.18	2.33	0.19	0.64	0.28
Gujarat	N.A	4.51	N.A	4.81	7.47	1.52
Haryana	2.53	3.87	0.93	1.31	2.53	1.06
Karnataka	0.27	1.10	0.75	0.03	N.A	N.A
Kerala	-4.65	-3.48	1.11	NA	NA	NA
MP	-6.20	-4.91	1.05	1.01	3.61	1.80
Maharashtra	0.07	1.16	0.86	1.92	3.30	1.21
Odisha	-0.30	1.32	1.62	9.43	-9.09	0.66
Punjab	1.45	2.57	-0.20	0.40	1.25	0.85
Rajasthan	-0.58	3.72	5.34	1.21	3.37	1.44
TN	-1.09	-1.32	0.59	5.55	8.87	3.89
UP	0.24	1.38	0.90	0.40	1.56	1.05
WB	-0.36	1.14	1.41	N.A	1.58	N.A
All India	0.08	1.63	1.39	0.95	2.3	1.04

Table: 2nd Annual Compound Growth Rate of Area, Production and Yield of Pulses and Cereals for the Period 1990-91 to 2014-15.

States	Pulses			Cereals		
	Area	Production	Yield	Area	Production	Yield
AP	-1.88	1.12	3.22	-2.44	4.64	-6.47
Assam	-1.29	-0.13	1.11	-0.38	2.28	2.29
Bihar	-5.64	-4.64	0.96	-1.51	1.57	2.96
Gujarat	-2.08	0.17	1.91	-2.21	0.43	2.46
Haryana	-6.39	-6.70	-0.34	-1.23	2.94	3.80
Karnataka	0.41	2.24	1.99	-0.63	-2.60	3.02
Kerala	-12.72	-12.28	0.50	-12.42	-12.89	0.52
MP	-1.33	0.48	1.34	-3.63	-0.67	3.14
Maharashtra	-1.32	0.87	2.04	-2.11	-0.94	1.19
Odisha	-3.82	-27.75	0.45	-2.71	2.67	3.87
Punjab	-8.33	-7.80	0.62	-2.34	0.59	3.00
Rajasthan	-1.39	0.32	0.90	0.11	4.44	3.76
TN	-2.47	-1.68	0.85	-1.63	3.40	0.00
UP	-2.57	-3.01	-0.15	-2.29	-0.6	1.6
WB	-3.73	-2.37	0.13	2.75	7.3	3.1

All India	-1.28	-0.16	1.07	-1.23	1.78	2.9
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It is observed from the table that over a period of time, area under rice increased at all India level. States like Andhra Pradesh, Assam, Kerala and Madhya Pradesh registered negative Annual Compound Growth Rate (ACGR) whereas area under rice crop increased in states of Haryana, Punjab and Uttar Pradesh. Over a period of time, production of rice increased in states of Haryana, Gujarat, Karnataka, Rajasthan, Uttar Pradesh, West Bengal and negative growth has been registered by Kerala, Madhya Pradesh and Tamil Nadu. At all India level, production of rice over a period of time increases with positive Annual Compound Growth Rate (1.63). In majority of selected states, yield per hectare of rice increases over a period of time except Punjab. Again, at all India level, yield per hectare of rice increased over a period of time having ACGR=1.39. It can be concluded from the above table that area under wheat, production of wheat and yield per hectare of wheat increased over a period of time in majority of selected states except Andhra Pradesh and Assam. At all India level, production of wheat, yield per hectare and area under wheat also increased over a period of time with positive growth rates i.e. 2.3, 1.04 and .952 respectively. Similarly it would have been seen from the table that area under Pulses decreased in Andhra Pradesh, Assam, Punjab and Kerala whereas it has been increased in Karnataka with positive growth rate (.041) over a period of time. At all India level, area under pulses decreased over a period of time. Over a period of time, production of pulses decreased in majority of selected states except Gujarat, Madhya Pradesh and Maharashtra. Again, at all India level, production of pulses decreased with negative growth rate i.e. -0.16. Yield of pulses per hectare increased over a period of time in majority of states with positive rate of growth whereas Haryana and Uttar Pradesh registered negative growth rate. In India, at a glance yield per hectare of pulses over a period of time increased having ACGR=1.07. It can be concluded from the table that production of cereals over a period of time decreased in majority of selected states except Karnataka, Kerala and Madhya Pradesh. Yield per hectare of cereals increased over a period of time in all the states except Andhra Pradesh. At all India level, production and yield of cereals increased over a period of time and area under cereals decreased over a period of time with negative growth rate i.e.,-1.23. Area under cereals decreased over a period of time in all the states except West Bengal with negative rate of growth.

Table: 3 Annual Compound Growth Rate of Area, Production and Yield of Oilseeds and jute for the Period 1990-91 to 2014-15.

States	Oilseeds			Jute		
	Area	Production	Yield	Area	Production	Yield
AP	-2.680	-2.63	0.051	-8.43	-7.77	0.73
Assam	-0.659	0.1	0.765	-1.82	-1.46	0.37
Bihar	-3.072	N.A	2.939	-0.81	0.91	1.74
Gujarat	-0.195	3.41	3.611	NA	NA	NA
Haryana	-0.680	0.9	1.595	NA	NA	NA
Karnataka	-2.732	-2.44	0.297	-11.40	-14.18	-11.50
Kerala	-14.234	-11.53	3.043	NA	NA	NA
MP	1.740	3.43	1.659	-0.79	-5.22	-4.49
Maharashtra	2.585	4.91	2.271	-6.12	-6.51	-5.45
Odisha	-4.115	-2.82	1.347	-5.75	-6.79	-5.45
Punjab	-7.342	-6.96	0.416	NA	NA	NA
Rajasthan	1.690	4.22	2.493	7.59	4.49	NA
TN	-5.538	-2.58	3.134	13.17	3.95	NA
UP	-2.272	-2	0.272	5.92	-0.44	NA
WB	1.908	3.79	1.844	0.33	1.77	-1.11
All India	0.259	2.07	1.810	-0.81	0.83	1.43

It would be seen from the study that the states like Kerala, Tamil Nadu, Uttar Pradesh and Odisha registered a decrease in the area under oilseeds over a period of time whereas West Bengal, Madhya Pradesh and Rajasthan recorded positive ACGR for area under oilseeds. At a glance area under oilseeds in India over a period of time increased with ACGR 0.259. Production of oilseeds increased over a time with positive ACGR except Kerala, Punjab, Tamil Nadu recorded negative growth rate. Over a period of time production of oilseeds increased in India. In case of yield of oilseeds per hectare of all the states registered increase over a period of time i.e. positive rate of growth. At all India level yields of oilseeds increased with positive ACGR 1.810 over a period of time. It would have been seen from study analysis that over a period of time area under jute decreased in states of Andhra Pradesh, Karnataka and Odisha whereas states like Rajasthan, Tamil Nadu and Uttar Pradesh recorded positive growth. In India at a glance area under jute decreased

over a period of time with negative growth rate -0.81. Production of jute increased in states of Rajasthan, Tamil Nadu and West Bengal whereas states like Andhra Pradesh, Assam and Maharashtra recorded negative growth of production of jute over a period of time. At all India level production of jute increased with the change in year having rate of growth 0.83. Yield of jute in India increased over a period of time. States as Andhra Pradesh, Assam and Bihar recorded a positive growth rate of yield per hectare of jute whereas it has been decreased in Karnataka, Madhya Pradesh, Odisha and Maharashtra.

Conclusion

Table 4: Compound Annual Growth Rate (CAGR) of major crops at all India level

Crop →	Rice	Wheat	Pulses	Cereals	Oilseeds	Jute
Indicators ↓						
Area	0.08	0.95	-1.28	-1.23	0.259	-0.81
Production	1.63	2.3	-0.16	1.78	2.07	0.83
Yield	1.39	1.04	1.07	2.9	1.81	1.43

Agriculture is one of the most important pillars of Indian economy. So it is quite necessary to study agriculture from each and every aspect. This paper is focused on the diversification in agriculture to its allied activities. The above study focused on different facets of agriculture like production of different crops, area under crop production highlighting whether the farmers of J&K state have diversified or not. The trends of major food as well as non-food crops in 15 states of India have been analyzed. These trends in turn highlight that whether the farmers have diversified or not. The present study was based on secondary data. The present study showed that in J&K state area under crop and the production of food crops, especially maize and wheat, have been increased. Also, the state of J&K shows diversification to some extent. At all India level, the study revealed that the production of wheat and area under its cultivation both have increased at higher growth rate as compared to rice. Per hectare yield of Pulses shows the positive growth rate, whereas, area under the cultivation of pulses as well as its production have shown negative growth rate over a period of time. On the other hand, the production of cereals and its per hectare yield have been increased but the area under cereal's production has declined. Same results have been found in case of Jute. Area under the cultivation of oilseeds, its per hectare yield as well as its production have registered a positive growth rate over a period of time.

At a glance, if we talk about area under cultivation, wheat has registered the maximum growth rate. In case of production, Oilseed has shown the maximum increase and in case of per hectare yield, Cereals have shown the highest growth rate.

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