

“Growth Pattern of Chickpea Pulse Crops in Madhya Pradesh”

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ABSTRACT

*Madhya Pradesh is the leading state in India in terms of cultivated area and productivity. The share of pulses to total food grain produced in India is around 9-10 percent. The total sown area of pulse crops in the M.P. stands at 5225 thousand hectare which is 6.89% more than the previous year. M.P. produced 6210 thousand metric tons of pulses which is 29.81% more than the last year production. chickpea (*Cicerarietinum*) has always been the most important pulse crops of India and its globally importance has increased considerably during the past three decades. Madhya Pradesh emerged as the state with the highest growth rate in agriculture. Madhya Pradesh was the second largest producer of pulse, with an annual production of 4304.74 tons in financial year 2020-21. gram, tur and urad tons the pulses list and are highly cultivated and grown in M.P. chickpea pulse crops in Madhya Pradesh data was reported at 3.030 mt in 2022. It's a declining from the previous year production of 3.210 Mt for 2021. Average of chickpea production in M.P. was 2.875 MT from March 2021 to 2022. Chickpea Pulse area growth rate 0.008 in the year 2010-11, -0.09 in 2014-15 and 0.12 in 2020-21. production growth rate of chickpea pulse crops -0.18 in the year 2010-11, 0.29 in the year 2017-18 and 0.177 in the year 2020-21. In order to productivity growth rate -0.19 in the year of 2010-11, 0.25 in the year of 2010-11, 0.16 in the year of 2017-18 and 0.05 in the year of 2020-21*

Keywords- chickpea, area, production , yield, growth rate.

Introduction- Pulse Crops is one of the most important groups of crops in our country. More than dozen pulse crops are grow in different parts in India among them chickpea (gram or Channa), Pigeon Pea (Tur), Moongbean (green Gram or moong), Urdbean 9blackgram or mash), lentil (Masoor) and field pea (Matar) are, most common ones which are widely cultivated major

pulse in the state of Madhya Pradesh, Maharashtra, Rajasthan, U.P. and Andhra Pradesh. Pulses Production in India is characterized by a very high degree of diversity as indicated by the number of crops and their spatial contribution into varied Agro-Climatic condition.

Pulses occupy a very important place in Indian Agriculture. A production target of 26.30 MT for pulse was set by the union government for the year 2019-20. The average yield of pulses in India is around 735 kilogram per hectare. In the rainy season pulses like gram, black gram, pigeon pea and cowpea is the leading pulse crop of India. Chickpea, lentil, lathyrus, field pea and kidney bean are vital pulse crops grown through out the winter season (Mukherjee et al, 2019). There are generally grown under irrigated and rainfed condition.

Global Scenario of pulse production- The pulse crop, an important source of nutrition and income for millions around the world, was cultivated over 81 million hectares along with 73.21 million tones production and 904 kg. ha⁻¹ productivity in 2013 (FAO). Global area of total pulses has been increasing since 2010-13. Among all the major pulses cultivated globally, lentil has been performing well at productivity level (1150 kg. ha⁻¹) but chick pea production has made it a leading crop amid other pulse crops in the world. Globally around 19 percent of pulses are used as feed, 6 percent as seed, 5 percent get wasted and the remaining is being as food. Asian countries, India secured top position in chickpea and pigeon pea respectively in 2012-13

Madhya Pradesh is the leading state in India in terms of cultivated area and productivity. The share of pulses to total food grain produced in India is around 9-10 percent. The total sown area of pulse crops in the M.P. stands at 5225 thousand hectare which is 6.89% more than the previous year. M.P. produced 6210 thousand metric tons of pulses which is 29.81% more than the last year production. Pulses are an expensive source of plant-based protein, Vitamin and minerals. It plays a vital role in sustaining the economy of the rainfed dry farming community in several ways, besides improving the fertility of the soil and physical structure. Pulses fit well in mixed /inter cropping pattern, crop rotation and dry farming and provide green vegetables (pods/bean) and without fodder for cattle as well thus contributing to a more sustainable food system. The cultivation of pulses under irrigation is only 20% of their cropped area with the remaining 80% area being grown under rainfed condition in India among pulses, the irrigated area under gram (35%) was observed to be the maximum followed by other pulse crops with less than 10%

irrigated are. The net availability of pulse has come down from 60gm/per day/ person in 1951 to 53 gm / day / person (Indian council of medical research recommends 65 gm/ day/capita in 2011). Therefore, there is a need to identifying the gaps in the present strategy to increase the area under pulses and also to developed the location- specific suitable new varieties to minimize the gap of requirement and availability of pulses in the country.

Chickpea- chickpea (*Cicerarietinum*) has always been the most important pulse crops of India and its globally importance has increased considerably during the past three decades. The number of chickpeas growing countries has increased from 30 to 52 and importing countries from 30 to 152 during 1981 to 2011. Chickpea reached a record high global area of 13.3 million hectare (Mha) and production of 11.75 million tons (mt) during 2011. In 2013 the area of chickpea cultivation increased to 13.5 Mha but production remained at 13.1 mt (FAO STAT 2015). Chickpea is currently the second most important food legumes in the world after common bean. during 2013 89.20% of the chickpea area and 84.47% of production was in Asia 3.57% and 4.05% in Africa and 4.24% and 6.22 % in Oceania, 2.44 and 4.55 % in America. And 0.55 and 0.71% in Europe (FAO STAT 2015). The major chickpea producing countries which contributed to about 9% of the global chickpea production during 2013. Include India (67.4%), Australia (6.21%) Pakistan (5.73%) turkey (3.85) Myanmar (3.74%), Iran (2.25%).

There has been an impressive growth in area, production and productivity of chickpea in India during the past decade. The year 2011 was particularly rewarding as the chickpea production exceeded 8 mt for the first time and the area reached 9.2 Mha which was 0.4 Mha less than the highest chickpea area recorded in 1962(9.57Mha).overall India's contribution towards global chickpea area and production in about 7% so the global trend follows the Indian trend in chickpea area and production. Chickpea is the cool season crop and general perception is that it requires cooler and longer winter season and more suited to northern India. It was probably true for the earlier varieties which were bred for cooler, long season environments, confining the chickpea production to northern and central India. However, the scenario of chickpea cultivation has drastically changed in India during the past five decades. India is the largest pulses producer globally according for 27-28% of the world's total production. Moreover, India's import 14% of pulses globally. Pulses account for 7-10%of India's total foodgrain production. Rabi crop are

widely grown contributed to 60% of total production. moreover, chickpea is the most dominant crop that account for 40% of total pulses while Arhar account for 15-20% of the total production Urad and Moong at 8-10% each in total production.

Madhya Pradesh emerged as the state with the highest growth rate in agriculture. Madhya Pradesh was the second largest producer of pulse, with an annual production of 4304.74 tons in financial year 2020-21. gram, tur and urad tons the pulses list and are highly cultivated and grown in M.P. chickpea pulse crops in Madhya Pradesh data was reported at 3.030 mt in 2022. It's a declining from the previous year production of 3.210 Mt for 2021. Average of chickpea production in M.P. was 2.875 MT from March 2021 to 2022. The data reached and all time high of 4.600 Mt in 2018 and a record low of 1.620 Mt in 2001. In terms of area, chickpea secured the third rank in the state after soyabean and wheat. Gram was sown on 216 thousand hectares of land in M.P., which is 12.35 % more than last year M.P. highest gram producing district are Chhindwara, Rajgarh and Ujjain major gram producing regions are the central region of the state such as the eastern Malwa plateau, Bundelkhand plateau, and upper- central Narmada valley. Gram or chickpea (*Cicer arietinum* Linn) is a major winter pulse crop grow in India, Among the pulse's chickpea, occupies 30% of area with 38% of annual production in India. Chickpea is the price dominant pulse crop in Madhya Pradesh.

Review of literature-

Mathur and Henry (2004) analyzed the production of different pulses in India for two periods: period 1- from 1971 to 1990, producing chickpea, pigeon pea, lentil and total pulses; and period 2- from 1991 to 2002, producing black gram, mung bean, pea/bean and other pulses. It was found that the total production of pulses increased significantly during period 1. However, in period 2, the production of pulses revealed low negative compound growth rate (CGR). The mean import of pulses during the period 1992-2002 was 9.0 lakh tonnes with value of Rs. 1164.58 crores. The value of import of pulses showed a significant increase. During the same period, India exported pulses of worth Rs. 254.85 crores and CGR revealed that both quantities of pulses exported and value earned significantly increased. The mean import Review of Literature ~31~ of pulses (1991-99) was 5.73 lakh tonnes of which the major share was that of

peas, chickpeas, other pulses and pigeon peas. Countries like Myanmar, Australia and the UK were important for import of pulses.

Reddy and Mishra (2009) analyzed the pattern of growth, variability and the sources of growth and instability in production of chickpea at state level. The time series data for the period 1971-2000 regarding production, area and yield of chickpea had been used to compute compound growth rates, Coefficient of variation, Coppock's Instability Index (CII) and for performing decomposition analysis to attain the objectives. The average production of chickpea increased by 7 per cent from 4.8 mt in 1970/85 to 5.2 mt in 1986/2000, while coefficient of variation increased from 14 per cent to 17 per cent during the same period. As a result, most of the states fall in low growth-high-risk category in chickpea production. Only Madhya Pradesh, Andhra Pradesh and Orissa fall under high growth-low risk category. Yield Review of Literature ~23~ contributed positively and area contributed negatively to increase in chickpea production between the periods. Madhya Pradesh, Maharashtra and Karnataka contributed to increase in production, while Uttar Pradesh, Punjab and Haryana contributed negatively. Rajasthan and Madhya Pradesh along with change in interstate covariance contributed large chunk of increase in variability in countries chickpea production.

Gajbhiyet al. (2010) evaluated the growth and instability of important crop i.e. chickpea. For this study Vidarbha region of Maharashtra state was chosen. The study was based on secondary data pertained to the year 1980-81 to 2007-08. The results revealed that the growth rates for area and production of chickpea were found significant. Instability studied in chickpea indicated that productivity under chickpea exhibited less variation. It means that production of chickpea over the period had been almost constant.

Ardeshna and Shiyani (2011) explored the growth of area, production and yield of arhar, gram and total pulses in different districts of Gujarat. The data were collected and analyzed for the period from 1960-61 to 2007-08. The acreage under Arhar significantly increased in Gujarat at the rate of 1.38 per cent per annum during 1960-61 to 2007-08. Similarly, the area under pulses also significantly increased in Gujarat but at a lower rate during 1960-61 to 2007-08. The production of arhar significantly increased at the rate of 5.35 per cent per annum while the production of pulses significantly increased at the rate of 2.95 per cent per annum in the state

during 1960-61 to 2007-08. The compound growth rates of productivity of Arhar and gram were negative and that of total pulses were positive but nonsignificant in Gujarat during 1990-91 to 2007-08. The study suggested the needs for development of pulses through technological breakthrough.

Bodade and borkar(2011) evaluated the growth and instability of chickpea. For the present study, Buldana district from Vidharbha region was chosen purposively as area under Chickpea was highest in this district Buldana. The study was based on the secondary data pertained to the year 1990-91 to 2008-09. The growth rates for area of Chickpea were found significant. Instability studied in Buldana indicated that production of chickpea witnessed high instability.

Gajbhiye and Kakde (2011) evaluated the growth and instability of chickpea. For this study, Akola district from Maharashtra state was chosen purposively as area under chickpea reported highest in this district. The study was based on secondary data pertained to the year 1985-86 to 2005-06. The results revealed that chickpea is a most important crop in Akola district; the growth rate for area and production of chickpea were found significant. Instability studied in chickpea indicates that productivity under chickpea exhibited less variation. It means that production of chickpea over the period has been almost constant.

Objectives-

1. To analyze the trend and growth rate of Chickpea Pulse Crops in Madhya Pradesh.
2. To suggest the way and policy implication for sustainable growth of Chickpea Pulse production in M.P.

Limitation of the study-The study doesn't claim for free from limitation. Major limitation of the present study is based on data collected from different published records and reports and therefore validity of data cannot be questioned.

Sources of Data- The data for the period of 2009-10 to 2019-20 on area, production, and yield of Chickpea Pulse crops in India and Madhya Pradesh both were compiled from the Indian Agricultural statistics, Agriculture statistics at a glance and Indian institute of pulses research. State wise area, production and productivity data for the period of 2015-16 to 2020-21 compiled

from directorate of economic & statistics, DA&FW as per fourth advance estimates&E- pulses data book from ICAR- Indian institute of pulses research (<https://iipr.icar.gov.in/>).

Research Methodology-

1 Linear trend- To study the growth rate of Chickpea Pulse crop in Madhya Pradesh, the trend analysis was carried out using linear trend method.

Linear trend, $Y = a + b x$

Where,

Y= dependent variables (area, production and yield)

a= intercept

b= Regression coefficient

x= period

2. Simple Growth Rate (SGR)-

Current year value - previous year value

$$\text{Growth rate} = \frac{\text{Current year value} - \text{previous year value}}{\text{Previous year value of indicator}} \times 100$$

3. Compound growth rate (CGR)

$$\text{CGR (\%)} = (\text{Antilog } b - 1) \times 100$$

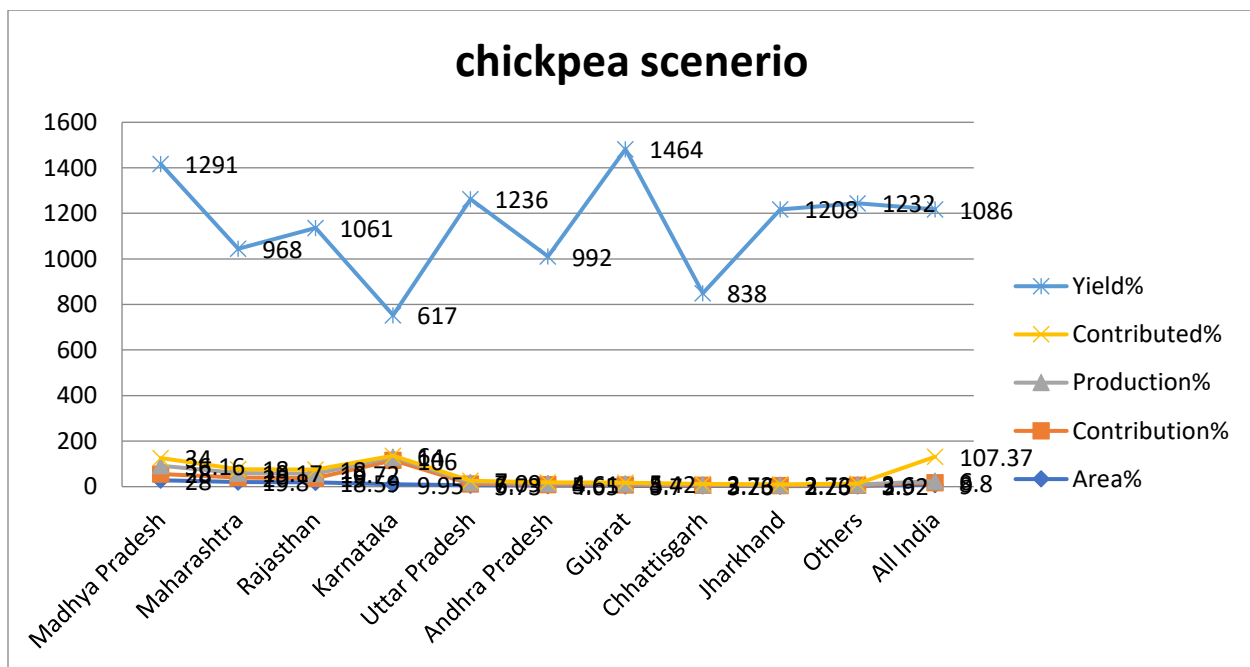
Result and Discussion-

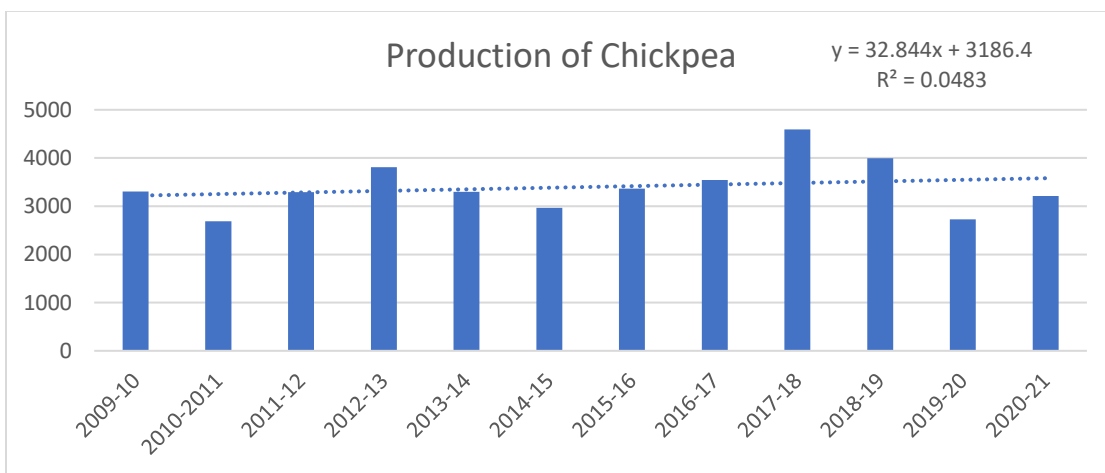
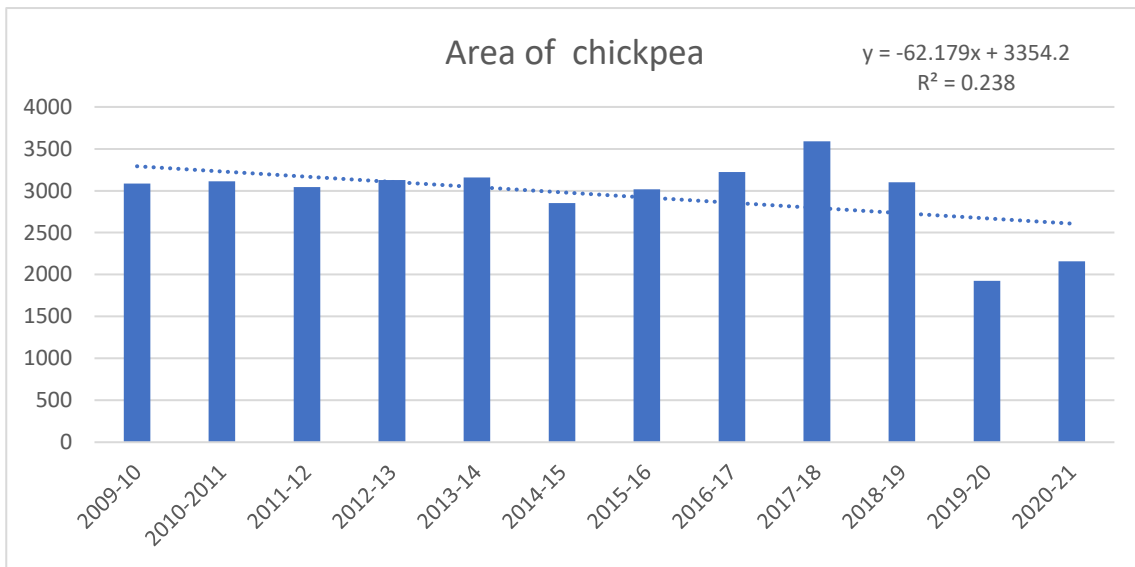
Chickpea Scenario- the crop was cultivated in about 99Lha. The country harvested a record production of 107 Lt at a highest productivity level of 1086kg/ha. As usual M.P. has contributed a significant 28% of total gram area and 345 of total gram production in the country, thereby ranking first both in area and production followed by Maharashtra (20% and 18%), Rajasthan (19% and 18%) and Karnataka(10% and 6%). About 97 percent of gram production of the

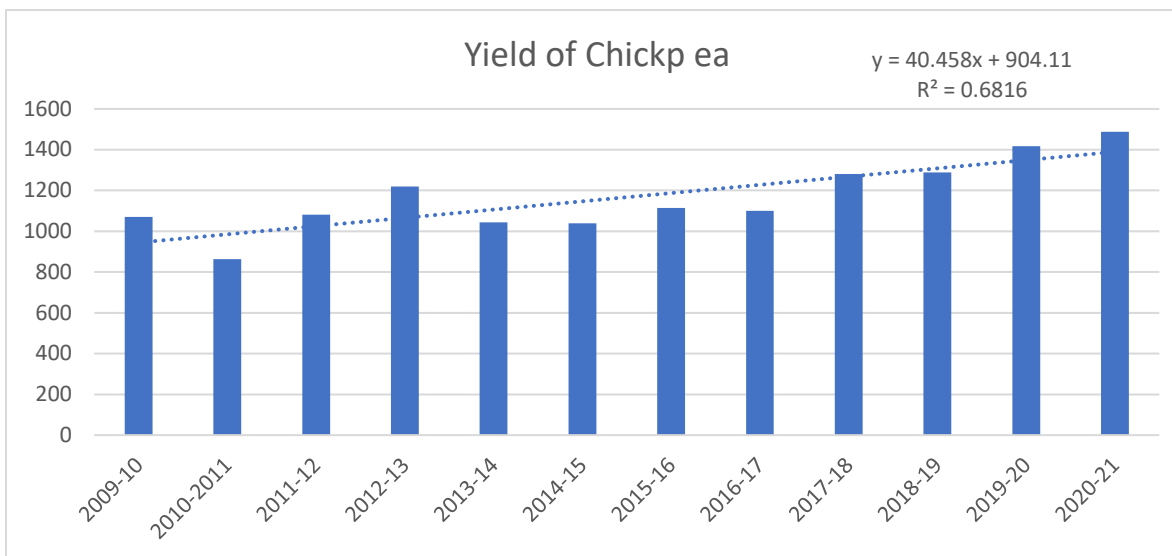
country during the period under report has been realized by 10 states of M.P., Maharashtra, Rajasthan, Karnataka, U.P. Andhra Pradesh Gujarat Chhattisgarh and Jharkhand.

S.NO.	States	Area%	Contribution%	Production%	Contributed%	Yield%
14	Madhya Pradesh	28	28	36.16	34	1291
2	Maharashtra	19.80	20	19.17	18	968
3	Rajasthan	18.59	19	19.72	18	1061
4	Karnataka	9.95	106	14	6	617
5	Uttar Pradesh	5.73	6	7.09	7	1236
6	Andhra Pradesh	4.65	5	4.61	4	992
7	Gujarat	3.70	4	5.42	5	1464
8	Chhattisgarh	3.26	3	2.73	3	838
9	Jharkhand	2.26	2	2.73	3	1208
10	Others	2.92	3	3.60	3	1232
11	All India	9	8.8	6	107.37	1086

Source: DES, Ministry of Agri. & FW (DA&FW), GoI. Normal Area & Prod. (2016-17 to 2020-21).







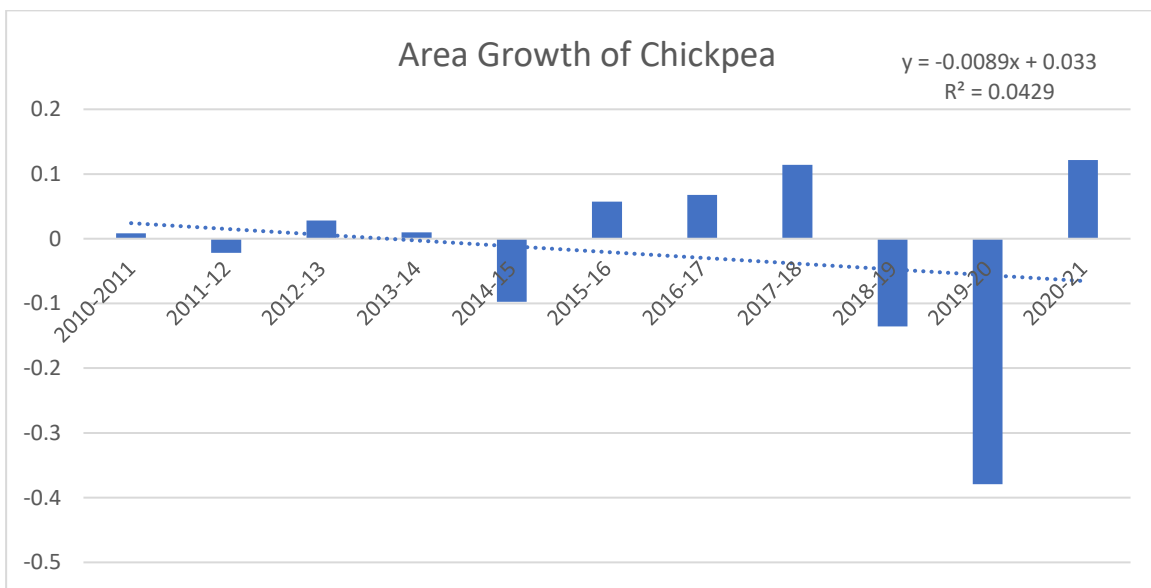
Area, production and yield of Chickpea Pulse in Madhya Pradesh- In the above chart depicts the area, production and yield of chickpea pulse crops in Madhya Pradesh during 2009-10 to 2020-21. In 2009-10 area of chickpea pulse crops in M.P. was reported 3085.5(000 ha), 2010-11 was 3112 (000ha) and the highest area covered in the year 2017-18 was 3590(000ha). Production of chickpea pulse crops in Madhya Pradesh was recorded 3304.1 (000tonnes) in 2009-10, 2686 in 2010-11 and the highest level of production touched in 2016-17 was 3544 (000tonnes) during the period of 2009-10 to 2020-21. yield data of chickpea pulse crops in Madhya Pradesh was reported 1071 (kg/ha) in 2009-10 863(kg/ha) in 2010-11 and the highest data reported 1488 (kg/ha) in 2020-21.

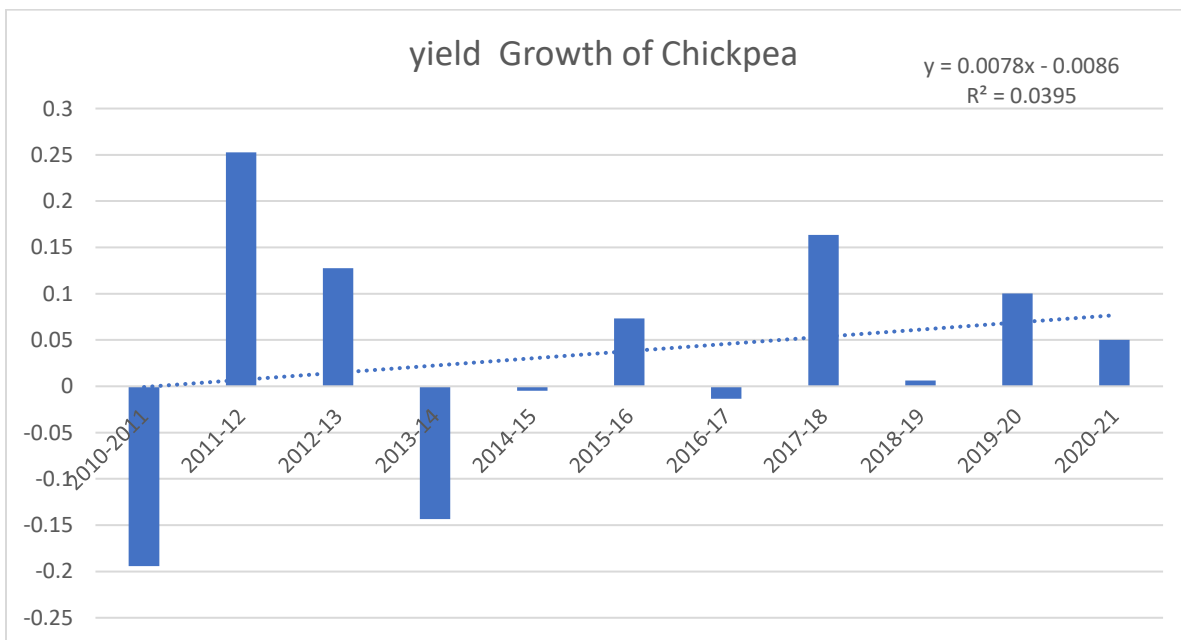
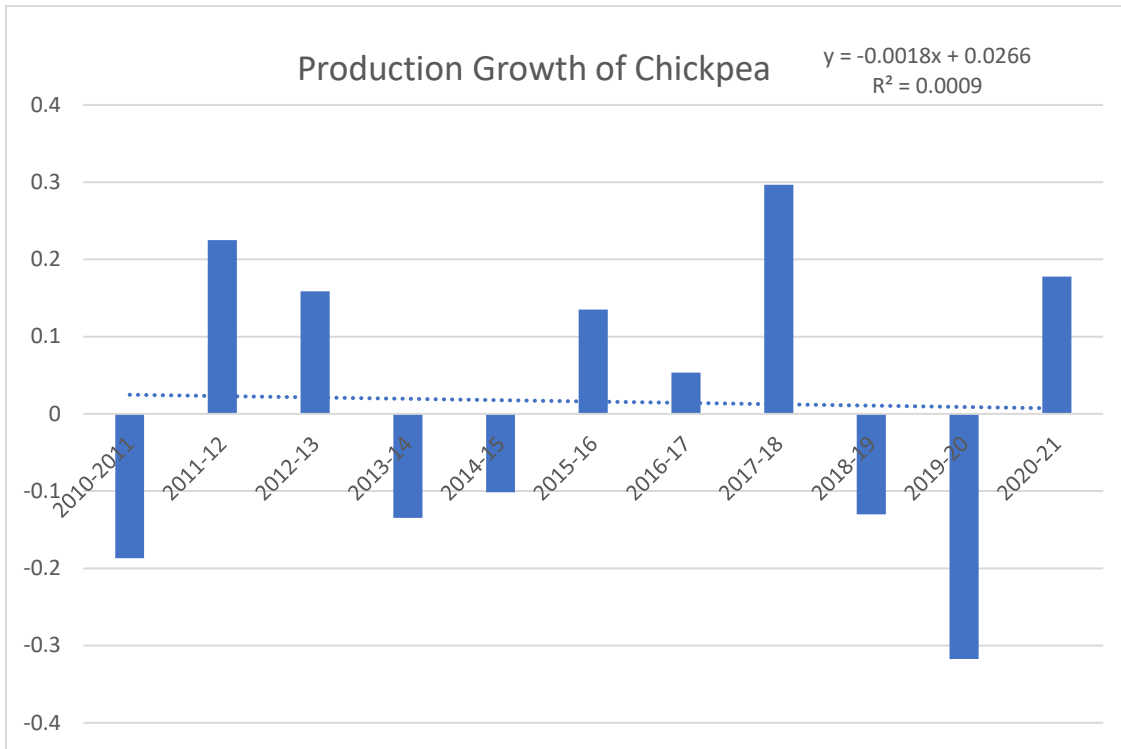
In the above chart depicts area, production and yield trend of chickpea pulse crops in India and especially Madhya Pradesh. After analyzing the chart, we find that yield and production of pulses showing regular increasing trend over the period of time but area of pulses decrease with regular trend except some years over the period of time. The equation for trend line of production and productivity is given below:

$$Y = a + bx$$

Where, y is the dependent variable showing area, production and yield separately. X is the independent variable showing period of time. B is the rate of change and a is the intercept of y. Chart showing the positive slope of the trend line of production and productivity in M.P. but area

reported with negatively sloped over the period of time. In the view of trend line equation, the trend line of upward slopping with the slope magnitude of 32.84(production) 7.904(Yield) and area reported with negatively slopping with slope magnitude -62.17(area). Especially increasing pattern of productivity reflects increased area under irrigation, enhancing cropping pattern method, marketing of pulses, increases minimum support price and govt. intervention such as dissemination of high yielding varieties and integrated pest and nutrient management practices under NFSM. But the area lost of chickpea gradually. It may be the reason of Pulses area was substituted by oilseed and cotton respectively. These findings indicate that oilseed compete with pulses in Madhya Pradesh. The observed substitution between pulses and oilseeds/cotton might be promising because of the similarities in the production requirement, including climate conditions and inputs as the entire crop group are mostly grown in marginal land rather than on productive area under rain fed condition as compared to cereals crop.





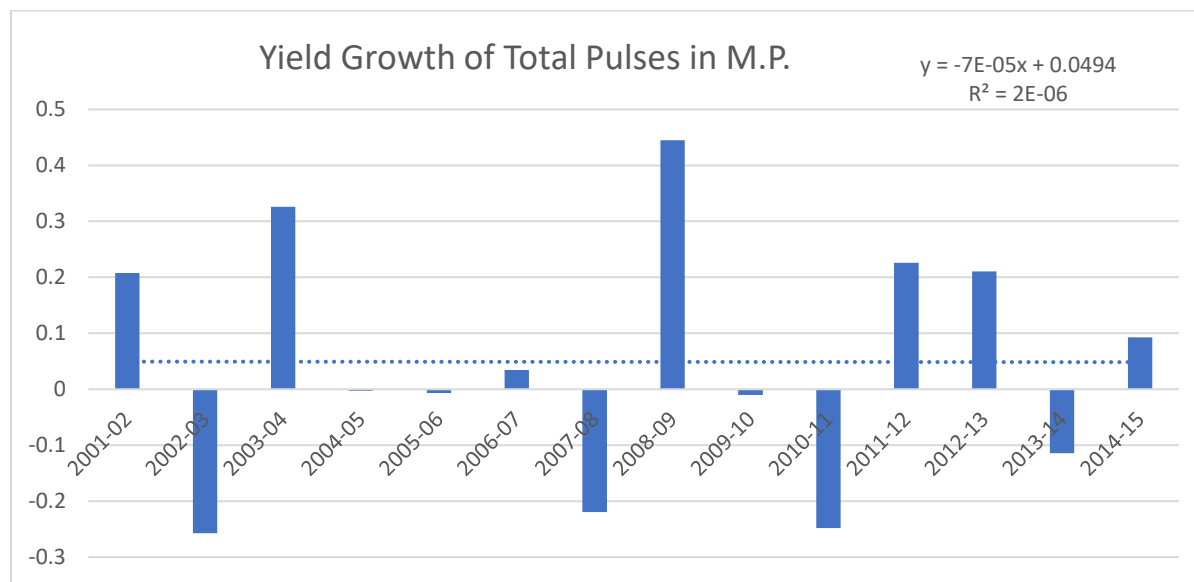
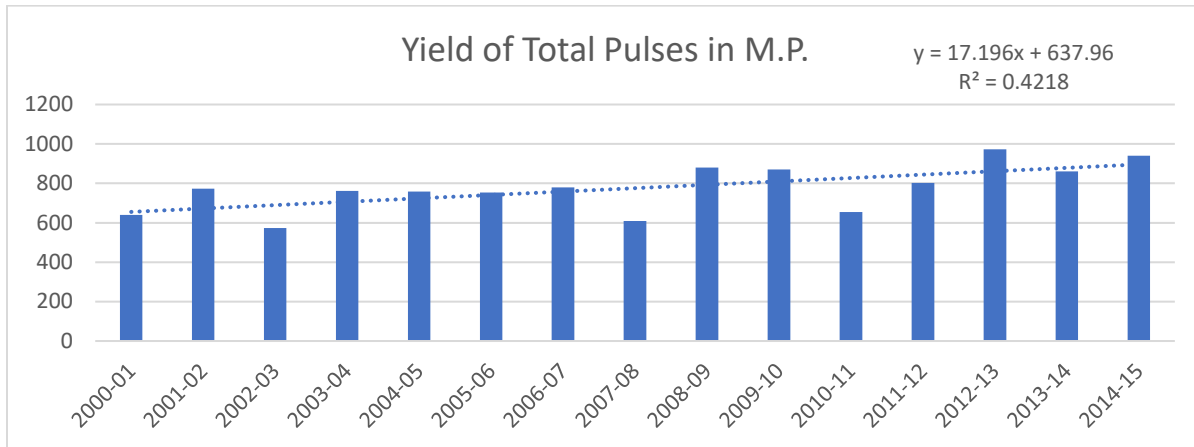
Growth rate of pulses Area, production and yield of chickpea pulse crops in Madhya Pradesh: in the chart shows growth rate of area, production and productivity of pulses in

Madhya Pradesh. Chickpea Pulse area growth rate 0.008 in the year 2010-11, -0.09 in 2014-15 and 0.12 in 2020-21. production growth rate of chickpea pulse crops -0.18 in the year 2010-11, 0.29 in the year 2017-18 and 0.177 in the year 2020-21. In order to productivity growth rate -0.19 in the year of 2010-11, 0.25 in the year of 2010-11, 0.16 in the year of 2017-18 and 0.05 in the year of 2020-21. After analyzing the data of growth rate over the period of time we find that chickpea pulses area, production and yield growth rate in Madhya Pradesh can be negative in specific years but still it has performed well comparatively. Negative growth rate can be caused of lack of power supply, change the cropping pattern, lack of market information, lack of high yielding varieties seeds, lack of infrastructure and transportation. After analyzing the chart, we find that area, production and productivity growth rate of chickpea pulse crops trend lines are irregular increase trend over the period of time. The equation for trend line of production and productivity growth rate are given below-

$$Y=a+bx$$

Where, y is the dependent variable showing growth rate of area, production and productivity of chickpea pulse crops separately. X is the independent variable showing period of time. B is the rate of change and a is the intercept of y . chart shows the positive slope of the trend line of yield growth rate and area and production reported with negative sloped in Madhya Pradesh over the period of time. In the view of trend line equation, the trend line is downward slopping with the slope magnitude of -0.0008(productivity growth rate) and -0.001(production growth rate). But the yield growth rate trend line is upward slopping with the slope magnitude 0.007(yield). It reflects chickpea pulse crops in Madhya Pradesh slightly moved right direction during last decades by registering positive growth in productivity but area and production growth rate registering negative growth rate over the period of time .it reflects chickpea pulse crops area declined over the period of time but level of production and yield cant be declined sharply. Production of chickpea pulse crops slightly varied during the period and yield level of chickpea pulse crops moving on right direction. To increase the productivity of pulses the national food security mission (NFSM) pulse Programme is being implemented in 644 districts and 28 states with UTS JK and Ladakh.under NFSM Programme there Govt. provides support for breeder seed production of pulses and seed hubs have been created at ICAR, state agriculture universities

and KVK for increasing certified seeds production of pulses. New scheme intercropping of pulses with sugarcane was implemented in M.P. also. Apart from this, special action plan was implemented during 2019-20 for increasing pulses productivity under NFSM.



Conclusion and policy recommendation-The above study is tried to attempt almost every aspect of chickpea pulses production and growth rate in Madhya Pradesh. The study is done thoroughly and find that chickpea pulses production from 2009-10 with 3304 thousand tonnes to 2020-21 with 3214.08 thousand tones and in order to productivity from 1071 kg/ha in 2009-10 to 1488 kg/h in 2020-21. Annual Growth rate of chickpea pulses production in 2010-11 with -0.18% and 2020-21 with 0.17% and growth rate of area in chickpea pulse in 2010-11 was 0.008% and 0.12% in 2020-21. Growth rate of yield in chickpea pulse in 2010-11 was -0.1942% and

0.050% in 2020-21. Here we also analyzed the total pulses scenario in Madhya Pradesh also. Annual growth rate in 2001-02 was 0.20% and 0.92% in 2010-11. Yield data recorded in 2001-02 was 640 kg/ha and 2014-15 was 941.it depicts in Madhya Pradesh whole pulses productivity increased along with chickpea pulses also.

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