Social Science Journal for Advanced Research
ISSN (Online): 2583-0074
Volume-1 Issue-2 || September 2021 || PP. 41-46 DOI: 10.54741/ssjar.1.2.7

Area, Output and Productivity of Pulses in India

Jasraj Singh[1] and Prof. (Dr.) Veer Virendra Singh[2]
[1]*Research Scholar, Department of Economics, J. S. Hindu PG Collage, Amroha, Uttar Pradesh, India*
[2]*Principal, J.S. Hindu (PG) College, Amroha, Uttar Pradesh, India*

[1]*Corresponding Author: jasrajsingh032@gmail.com*

Received: 08-08-2021	Revised: 09-09-2021	Accepted: 22-09-2021

ABSTRACT
India's produce of cereal has been growing year by year and its one of the top manufacturers of different crops like rice, wheat, pulses, sugarcane and cotton. In 2019 India's pulses production is 23.15 million tonnes which contribute about 24 percent of world pulses output. In the present paper area, output and productivity of pulses in India are investigated. The study is descriptive in nature and used secondary data from different government publications. The paper concludes that the increase in output is much higher than the area of pulses, whereas total pulses production is always affected by the size of holding.

Keywords: *pulses, area, output, productivity, and yield*

I. INTRODUCTION

Pulses are rich sources of high-quality protein for vegetarian humans and fulfil the requirement of supplementing grain proteins. Pulse cultivation provides a system for determining atmospheric nitrogen in their nutritional nodules, which fulfils nitrogen needs to a great degree. As compare to wheat and rice, pulses supply about 20 to 25% of protein by mass. Pulses increase in size.

Pulses production need least resources and its affordable than animal protein. Pulses are rich in protein, which is cheaper and can be grown both as an intercrop and mixed crop in assessment to other vegetables.

Pulses are grown in areas remaining after cereal/cash crop demand has been satisfied, and they are mainly rainfed and do not need heavy irrigation. Even under these circumstances, pulses provide higher returns. On the other hand, are high level of protein. They improve soil fertility and physical structure, work well in mixed and intercropping systems, dry farming, and crop cycle, and produce vegetables, nutritious feed for animals, and green tops.
India is the world's sizeable manufacture of pulses, account for (30%) of world production and consumption.

Western Uttar Pradesh, Punjab, Haryana, Tamil Nadu, West Bengal Delta, Kerala, and West Karnataka and certain parts of Maharashtra form the main regions with higher productivity.

From 1960-61 to 2009-10, there has been no significant rise in production and area. Nevertheless, there has been considerable growth in area and production over the 5year (2011-2012 to 2017-2018). As infrastructure, irrigation facilities and income of people increased. They are ostracized, and pushed to another poor and marginal land plot. Pulse productivity increased by around 78%to 780 kg/ha in 2017-2018, up from 454 kg/ha in 1960-1961. In the mid 1961s after adopting New Agriculture Technology (NAT) there is rise in food grain production from 60.85 million to 70.85 million tons in 1960-1961 to 278.70 million tons with a growth in area from 98.42 million/ha to 130 million/ha, from 278.70 million tons in 1960-61 to 278.70 million tons in 2017-2018. Food grain productivity has also increased dramatically, rising to 2155 kilogram/ha in 2017-2018 from only 525 kilogram/ha in 1960-1961. According to the UN announcement of the 2017 year of pulses International pulses can contribute to world food security, environmental sustainability and nutritional need of future. Pulses are good foods because they are essential for the food basket (dal-chawal and dal-roti), its rich source of plant-based protein, and help in curing many diseases like diabetes, obesity, and so on. Despite pulses are highly water efficient, can be produce in drought prone areas, and improve soil health.

II. REVIEW OF LITERATURE

Singh at, al. (1989), in the period 1965 / 66-1983 / 84, the researchers looked at the changes in cropping patterns and production in India and calculated the compound growth rate production, area, and pulses of production at the state level. Comparative economics of key crops, as well as changes in district-level production and cultivation patterns, are provided for the state of Punjab. In the cost of pulses, both kinds of cereals and the surface production, and area at the national level, fiber crops and oilseeds, have increased.

Pal (1990), the comparative percentage of yield and area of differences in agricultural output in India were investigated. Records from 1950/51 to 1983/84 showed that, in the face of a change in area away from pulses and oilseeds, output progress in these crops remained dependent on area.

Kumar (1995) in India, the land of cultivation, cultivation, and crops have remained unchanged over the past three decades. The causes of this were investigated for pigeon pea, chickpea, moong-beans, urd-bean, and cowpea sorghum programs in both slices and two. Reproductive management, additional irrigation, pest control, and disease control techniques were all discussed as part of the production process. To improve the production of regions under pulse production, insecticides and fertilizers are suggested.

In Kaur at, al. (2002), in India, researchers looked at the historical and current performance of grain legumes in various states. During the years 1970/71-1997/98, state-by-state statistics on area, output, and productivity were examined. There was a regional difference in grain legume production. The findings also revealed that irrigation had a beneficial effect on production.

Tuteja (2006) study of the state-by-state major pulses performance growth in India among (1980-81) and (2001-02) assess in order to the nature of pulse production stagnation in the context agricultural changing scenario in the country, and the factors impelling major pulse acreage in India's states core.

Objectives of the Study

- To find out growth of area of total pulses at national level,
- To examine the pulses productivity in India, and
- To calculate total output growth of pulses at nationwide.

III. METHODLOGY

3.1 Study time

The aim is to estimate total pulses area, productivity, and production at national level. The time trend data were used from 1971 to 2019.

3.2 Data source

Secondary data were gathered from newspapers, magazines, journals, government websites, krishikosh, bulletins, shodhganga, research publications, SSRN, and other chosen websites to complement primary data and provide a solid foundation for the study.

3.3 Procedure

3.3.1 The Estimate of the Growth Rates - The rate of multifarious growth was developed to investigate productivity of the variable to raise, decline, or remain constant over time. This is also showing the magnitude of variables under consideration's rate of fluctuation each unit of time.

(The compound growth rate (CGR) is the rate of change in 'Yt' per unit time. ‘t' represents, for example, the percentage of size of "Yt" itself. It may be stated mathematically as:

$$\text{CGR} = [(\frac{1}{Y_t})(\frac{dY_t}{dt})] = [(\frac{Y_{t+1}-Y_t}{Y_t})] \quad \dots (1)$$

The CGR of ‘Yt' in percentage terms is represented by multiplying equation 1) by a hundred. Researchers have created and utilized many different types of growth functions, such as linear, exponential, and modified exponential, and Cobb-Douglas, among others.

The exponential function (known as the log linear function) has the following mathematical form:

$$Y_t = Ae^{bt} \quad \dots (2)$$

This function's log transformation is like follows:

$$Log_e Y_t = Log_e A + bt$$

Distinguishing it based on the letter ‘t'

$$[(\frac{1}{Y_t})(\frac{dY_t}{dt})] = b$$

Or,

$$\frac{dY_t}{dt} = b * Y_t$$

The following is a calculation method (CGR) that uses the same equation:
Let ‘Y0' be the value of the study variable in the baseline period.
Let ‘YT ‘Variable values’’ T represent time or
Let ‘R’ be the value of CGR (growth rate of compound).
The compound used formulation that We've discovered,

$$Y_T = Y_0 (1+R)^T$$

The overhead is converted into a logs format.

$$\log Y_T = \log Y_0 + T \log(1+R)$$

Assuming to

$$\log Y_0 = \log A,$$

$$\log(1+R) = b,$$

Alternatively, you might say:

$$\log YT = \log A + bT$$

CGR may be calculated from the log-linear form by distinguishing with regard to ‘t'.

$$\frac{d(logY_{t)}}{dt} = b$$

However, with expontial function, the estimate of ‘b' is in semi-log terms. As a result, the following transformation is performed to return it to its original form of Yt:
Since-

$$B = \log (1+R)$$

$$Antilog (b) = 1+R$$

$$R = (Antilog\ b) -1$$

$$CGR\ in\ \% = [(Antilog\ b) -1] *100$$

3.3.1 Calculation of pulses production land and yield

The goal of this section is to use a decomposition approach to evaluate the effect of surface area, yield, and their interaction on the total production of main pulses at nationwide.
Data on the order of the period for studying the decay of significant and overall pulses at the level of micro-main state of production are collected on a decadal basis from 2005 to 2019.

$$^{\Delta}P = P_b - P_a = A_1*(Y_2-Y_1) + Y_1*(A_2-A_1) + {}^{\Delta}A*{}^{\Delta}Y$$

Social Science Journal for Advanced Research
ISSN (Online): 2583-0074
Volume-1 Issue-2 || September 2021 || PP. 41-46 DOI: 10.54741/ssjar.1.2.7

$$\text{Or } {}^{\Delta}P = P_b - P_a = A_1 * {}^{\Delta}Y + {}^{\Delta}A * Y_1 + {}^{\Delta}A * {}^{\Delta}Y$$

$$1 = [(A_1 * {}^{\Delta}Y/P] + [({}^{\Delta}A * Y_1/P] + [(\Delta A * {}^{\Delta}Y/P]$$

where

${}^{\Delta}P$ = For example, differences in average production over a three-year period from 2001 to 2003 and from 2008 to 2010.

A_1 = The area of the triennium'-based period is average (e.g., 2001 to 2003).

A_2 = The present triennium's average area (e.g., 2008 to 2010)

Y_1 = The base period's average yield (e.g., 2001 to 2003)

Y_2 = The current triennium's average yield (e.g., 2008 to 2010)

${}^{\Delta}A = (A_2 - A_1)$ = Between the two eras, the average area of the triennium has changed.

${}^{\Delta}Y = (Y_2 - Y_1)$ = Between the two eras, the average yield of the triennium has changed.

${}^{\Delta}A.\ Y_1$ = The impact of the surrounding area

$A_0.\ {}^{\Delta}Y$ = Effect of Yield

${}^{\Delta}A.{}^{\Delta}Y$ = Area and yield have an interaction impact.

As a result, the overall change in production is divided into three effects: the area effect (${}^{\Delta}A.\ Y_1$), the crop effect ($A_1.\ {}^{\Delta}Y$) effect and the area-yield interaction ${}^{\Delta}A.{}^{\Delta}Y$.

IV. RESULTS AND DISCUSSION

4.1 Area, Yield, and Output of Total Pulses at the National Level

The overall pulses area had improved from 22.78 m/ha to 26.21 m/ha. There was a positive and non-significant growth rate from 1971-2019, which indicate stagnation. The effect conforms to the findings of IshaTaneja 2008 the growth in area of whole pulses is nearly stagnant. Highest positive and important growth (0.95%) was registered in 1971-1980 followed by (3.6%) in 2011-2019.Table-1

The total pulse output rose from 10.42 million tons to 20.26 million tons between 1971 to 2019. The yield growth was the reason of total production increase of (1.8%) every year. As shown in Table-1, the highest increase in rate of output occurred at the same time as the highest rate of area expansion, i.e., 1971-1980 (0) and 2011-19 (10.64%).

Social Science Journal for Advanced Research
ISSN (Online): 2583-0074
Volume-1 Issue-2 || September 2021 || PP. 41-46 DOI: 10.54741/ssjar.1.2.7

Table 1: Yield, and area, output, total pulses at the national level

Total Pulses	Particulars	Study period (1971-2019)	Sub-period				
			(1971-80)	(1981-90)	(1991-2000)	(2001-10)	(2011-19)
Area	Beginning year area (million ha)	22.78	22.78	23.84	22.54	22.01	24.52
	End year area (million ha)	26.21	22.47	24.67	20.36	22.56	26.21
	No. of observation	(48)	(10)	(10)	(10)	(10)	(9)
	Coefficient	0.04	0.07	0.03	-0.07	0.11	0.13
	R^2 (%)	3	9.1	0.5	21.5	49	52
	Growth rate	0.2	0.95	0.23	-1.37	2.6	3.6
Production	Beginning year production (million tons)	10.42	10.42	11.51	12.02	13.37	15.40
	End year production (million tones')	20.26	10.63	14.26	11.08	19.25	20.26
	No. of observation	(48)	(10)	(10)	(10)	(10)	(9)
	Coefficient	0.007*	0	0.015	0	0.035*	0.046
	R^2 (%)	53.7	0	27.3	0	77	46
	Growth rate	1.8	0	3.5	0	8.4	10.64
Yield	Beginning year yield (Kg/ha)	495	495	521	533	607	685
	End year yield (Kg/ha)	765	473	578	544	750	765
	No. of observation	(48)	(10)	(10)	(10)	(10)	(9)
	Coefficient	0.05*	-0.5	0.011**	0.7	0.23*	0.27
	R^2 (%)	61.3	2.3	41.2	8.3	75	53
	Growth rate	1.4	-1.1	3.28	1.6	5.7	7.5

([1]significant at 1% level and [2]significant at 5% level)

The total pulse production rose by (1.4%) from 495 kg/ha to 765 kg/ha, over the period of 1991-2019. The yield showed highest growth rate of7.5% between 2011 t0 2018. Table-1.

Area and yield increased played a vital role in production growth in the period 1971-80 and 2011-19. Because agriculture and irrigation were prioritized in the first ten-year plan (1971-80), and large dam projects were prioritized in the second ten-year plan (1981-90), this good outcome happened between 1971 and 1980. It is concluded that between 1971 and 2000, and all over the post-green revolution the extension of pulse-producing regions was restrained by the diversification of cultivated lands apart from pulses and close to other crops. From 2011 to 2019 through the dynamic and intensive schemes (NFSM, A3P, and ISOPOM) linked to pulses and price escalation results a significant increase in productivity and area.

4.2 Output of Total Pulse Area, Yield, and Interaction at the National Level

That one of the major factors influencing the overall increase in total pulse output in 1971-2019 was the area below whole pulse production at the national level. The yield effect dominated for four years in a row (1971-80, 1981-90). From 1991 to 2000, and again from 2001 to 2010). Since post-independence, the area impact has been more prominent than the yield effect, which explains why India continues to trail behind in terms of total pulse yield. The table shows that overall pulse output rose between 1971 and 2019, owing to an increase in the area designated for pulse cultivation. Table-2

Table 2: Output of total pulse area, yield, and interaction at the national level

Year / Components	(1971-80)	(1981-90)	(1991-2000)	(2001-10)	(2011-19)	(1971-2019)
Area effect $\Delta A. Y_0$(%)	-148.05	12.52	35.06	42.12	52.65	45.25
Yield effect $\Delta Y. A_0$(%)	245.25	88.42	64.80	52.12	34.77	32.18
Interaction effect $\Delta A. \Delta Y$ (%)	2.84	1.29	2.18	4.56	14.55	29.51

V. CONCLUSION

The first ten annual plan (1961–70) was devoted to irrigation and agriculture projects, and the second ten annual plan (1971–80) was devoted to large dam projects. This beneficial result occurred between 1961 and 1970. As a result, under total pulses, area expansion happened with a maximum area increase of (0.95%). Pulse production increased from 2001 to 2010 as a result of the introduction of intense and dynamic pulse schemes. As a result, due to inelastic and diminishing land supply in 2011-19, the increase in yield is much higher than the increase in total pulses area, including main and minor pulses, at the national level. Therefore, to produce more total pulses in the future, it is necessary to combine yield and area efficiently.

Since independence, the area effect in total pulse decomposition studies has been larger than the yield effect, which is why India still lags behind in terms of total pulse yield. Total pulse production is always pretentious by the magnitude of field. By decay analysis, it was deduced that the land was one of the crucial factors in the total development of pulse production, with a substantial and collateral contribution to yield.

REFERENCES

1. Tuteja, U. (2006). Growth performance and acreage response of pulse crops: A state-level analysis. *Indian Journal of Agricultural Economics, 61*(2), 218-237.
2. Kaur, H., Kaur, J., & Rangi, P. S. (2000). Growth performance of pulses in India: an inter-state analysis. *Agricultural Marketing, 44*(4), 34-40.
3. Kumar, D. (1995). Problems, prospects and management strategies of pulse production under rainfed situations. *Sustainable Development of Dryland Agriculture in India,* 335-373.
4. Pal, S. (1990). Sources of growth in Indian crop production: A component analysis. *Annals of Agricultural Research, 11*(1), 73-79.
5. Singh, A. J., Sethi, K., Kaur, A., & Sekhon, S. (1989). A study into the production behavior of pulses in India with special reference to Punjab state. *Agricultural Situation in India, 44*(9), 707-713.