JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

TRENDS AND PATTERNS OF OILSEED PRODUCTION IN INDIA: A GEOGRAPHICAL ANLYSIS

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Abstract

India is the 4th largest oilseeds producer in the world. The self-sufficiency in the oilseeds attained through 'Yellow Revolution' in the early nineties. It has 20.8% of the total area under cultivation globally and accounting for 10% of global production. The major oilseeds produced in India are soybeans, mustard, groundnut and sunflower. As agricultural produce, oilseeds are having the second most share of agricultural economy, next only to cereals within the category of field crops. Despite commendable performance of domestic oilseed production, it could not match with the galloping rate of per capita demand driven by increase in population and enhanced per capita income. In this research paper an attempt has been made to bring out the facts and the ground reality of oilseed production in India.

Key Words

Geographical, Data Base, Methodology, Oilseeds, Yellow Revolution, vegetable oil, Edible oil, Oilcake, Employment, Fertilizer, Oil Industry, Production, Productivity, Concentration, Principal Crop, Yield, Area, Coefficient, Weighted Ranking Coefficient, Infrastructure, Map, Percentage.

Introduction

India is an agricultural country, which includes raising of crops, animal husbandry, agro-forestry and pisciculture. Agriculture plays a vital role in the economy of India. More than 70% population of India lives in rural areas and still depended directly or indirectly on agriculture. As agricultural produce, oilseeds are having the second most share of agricultural economy, next only to cereals within the category of field crops. Oilseeds provide vegetable oils which are being preferred to animal fats, as peoples are becoming more and more health conscious. Edible oils form a necessary part of our diet and provide energy. Extraction of edible oil from oilseeds in mills and ghana's, gives employment to people. Oilcake (Residue remained after extraction of oil) is used as cattle feed and also as fertilizer for various cash crops. Vegetable oils especially linseed oil is in demand in the manufacturing of paints, varnishes and lubricants. The oil industry in India provides employment to more than ten million people.

The self-sufficiency in the oilseeds attained through 'Yellow Revolution' in the early nineties, as a result India becomes the fourth largest oilseed producing country in the world. Among the oilseeds, groundnuts are produced in Gujarat, Andhra Pradesh, Karnataka and Tamil Nadu. Soybean is largely cultivated in the states like Madhya Pradesh and Maharashtra. While, the states namely Rajasthan, Haryana, Uttar Pradesh and West Bengal are known for the cultivation of mustard. The above-mentioned states

produce more than 95% of total oilseed production in the country. Despite commendable performance of domestic oilseed production, it could not match with the galloping rate of per capita demand driven by increase in population and enhanced per capita income. The thing to worry is that, the area under oilseeds has experienced continuous decline due to their relative lower profitability against the competing crops like sugarcane, cotton, maize, chickpea etc. So, it becomes essential to assess the various parameters, which are related to the oilseed production in India. In this research paper an attempt has been made to bring out the facts and the ground reality of oilseed production in India.

Objective

The major objective of this research paper is to assess the facts related to oilseed production and to delineate the regions of oilseed production, productivity and concentration along with some important remedial measures for the overall development of the study region i.e., India.

Data Base and Methodology

1) The agricultural statistical data used for this research paper is secondary in nature and taken from, Normal Estimates of Area, Production and Yield of selected principal crops, of May, 2021, which is published by Government of India, Ministry of Agriculture and Farmers Welfare, Directorate of Economics and Statistics, Agricultural Statistics Division, New Delhi.

2) In this research paper Weighted Ranking Coefficient technique of Sapre and Deshpande is used to calculate the agricultural productivity of India. The weighted ranking coefficient is determined by the following formula.

$$wrc=(r_1c_1)+(r_2c_2)+(r_3c_3)+---+(r_nc_n)c_1+c_2+c_3+---+c_n$$

Where,

wrc- Weighted Ranking Coefficient.

r- Productivity rank of individual crop of particular state.

c- Percentage of cropland of individual crop of particular state.

In this technique, the component areal units are ranked according to the per hectare yield of selected crops and the arithmetical average rank is obtained for each component areal unit. Then percentage of cropland under each crop for each component areal unit is calculated with the help of total cropped area of the study region. These percentages are taken as weights and are multiplied by average rank values for each crop and for each component areal unit, the obtained values are called as weighted average ranks. These weighted average ranks are divided by the sum of weights or percentage area of cropland, to obtain Weighted Ranking Coefficient for each component areal unit. Thus, weighted ranking coefficient for all component areal units is calculated and then arranged in an ascending or descending order or an array. Then the array is divided in to three or five equal parts to obtain high, moderate and low levels of agricultural productivity. Then, this gradation of each component areal unit is ascertained and plotted with the help of cartographic map.

3) For the demarcation of crop concentration regions, number of statistical techniques has been used in a period of time. Florence (1948) compared the enumeration region with the entire nation, Chisholm

(1962) calculated the difference in between the local and national enterprises, while, Bhatia (1965) used Location Quotient method for the delineation of crop concentration regions. For measuring the crop concentration in India, Jasbir Singh (1976) developed an equation, which is used in this research paper, is as follows.

$$Ci = Pae/Par$$

Where,

Ci is the crop concentration index,

Pae is the percentage of crop 'a' to the total harvested area in an enumeration unit,

Par is the percentage of crop 'a' to the total harvested area in the nation.

The values, thus derived for each enumeration unit are arranged in descending order and divided in to three equal parts to obtain High, Medium and Low crop concentration regions, which are presented with the maps for further analysis. The agricultural statistical data used for this research paper is secondary in nature and is taken from, Normal Estimates of Area, Production and Yield of selected principal crops, of May, 2021, which is published by Government of India, Ministry of Agriculture and Farmers Welfare, Directorate of Economics and Statistics, Agricultural Statistics Division, New Delhi.

4) To measure the linear relationship in between two variables i.e., productivity of oilseeds along with the concentration of oilseeds and agricultural facilities, Karl Pearson's Coefficient of Correlation is used. The value of coefficient always lies in between -1 and +1. When two variables change in the same proportion, it is a case of perfect correlation and it can be either-1 or +1. When there is no correlation in between two variables, the value of coefficient is zero. And coefficient value ranges in between zero to -1 and +1, is called limited correlation. To calculate the coefficient of correlation following formula is used.

$$r = \sum xy \sum x2 * \sum y2$$

Where,

r- Coefficient of correlation.

x- First variable i.e., agricultural productivity.

y- Second variable i.e., agricultural facilities.

Weighted ranking coefficient and concentration index is corelated with the agricultural facilities or the inputs like percentage of net sown area, percentage of net irrigated area, percentage of crop intensity and use of fertilizers in kg per hectare.

Location and Geographical Profile of the Study Region

India lies in the southern and eastern hemisphere and extends in between $8^0 4^1$N to $37^0 6^1$N latitudes and $68^0 7^1$E to $97^0 25^1$ E longitudes. The tropic of Cancer passes through eight central states bisecting India in to two parts i.e., North and South. The north-south extent of India is 3214 kms, while, its east-west width is 2933 kms. Indies total land frontier is 15200 kms, along with a maritime boundary of 6100 (7516 kms with

Islands). With an area of 32,87,263 sq kms India is a seventh largest country in the world. Census 2011 covered 35 states and union territories along with 640 districts, 5924 tahsils, 7936 towns and 6.41 lakh villages. India is having a population of 1,21,01,93,422, out of which 62,37,24,248 are males and 58,64,69,174 are females along with the growth rate of 17.64 percentage. India is second largest country in the world with 1210 million of population as per 2011 census.

India is a country of great geographical diversity, which forms a major part of South Asia, which encompasses vast areas of diverse landmasses. In the north, there are lofty ice capped Himalayas along with the great Indo-Gangetic plains at its foothill zone, which is known for its alluvial fertile soils. Thar, the sandy desert is also a part of this Great Plains. The northern India is surrounded by the nations like Pakistan, Afghanistan, Chin Nepal, Bhutan, Bangladesh and Myanmar. The southern peninsular India comprising of uneven plateau along with the Eastern and Western Coastal Plains surrounded by Arabian Sea, Sea of Bengal and Indian Ocean. Due to its vastness and diversities India is also known as Indian Sub-Continent.

India is drained by Ganga, Yamuna, Brahmaputra in the north and Mahanadi, Narmada, Godavari, Krishna, Kaveri in the south along with their number of tributaries. The effect of physiographic and climatic diversity is also seen in the soils and vegetation of the country. The country has variety of soils like alluvial soils, black cotton soils, red lateritic soils, saline marshy soils along with variety of vegetation like tropical wet evergreen forest to alpine Himalayan Forest with special character of monsoon deciduous forests.
Indian wildlife is comprised of variety animals, birds and insects living in forests, which offer wide range of habitat. India is having highest percentage of its geographical area under cultivation. Though half of India is having its location in temperate zone, the climate of India is strongly affected by the tropical monsoon winds. Indian landmass gets an abundance of sunshine from the tropical sun and splashing rain from the monsoons, the most important factors of Indian climate.

Two third of northern India is having mean temperature of 21°c to 27°c, on the other hand, the southern part of India experiences rather warm tropical climate with 30°c to 37°c temperature. The western disturbances and tropical cyclones with limited rain showers control the winter weather conditions of India, while, high temperature and low humidity characterizes the summer season. The hot wet monsoons or the rainy season is a unique characteristic of Indian climate with an average of 118 cms and 90% of total rainfall.

Trends in Area, Production and Yield of Oilseeds in India (2001-02 to 2020-21)

In India, annual oilseeds are cultivated over 27 million hectares of area producing more than 30 million tons annually (Fig No. 1). The area, production and yield of oilseeds has experienced uncertain and undulating trends, throughout the investigation period i.e. from 2001- 02 to 2020- 21. The trend of area, production and yield of oilseeds is increasing up to 2012-13 and is declining for more prominently after the year 2015- 16. In the years 2012-13 to 2015-16 it is quite steady for short period. This is because of the relative lower profitability against the competing crops like sugarcane, cotton, maize etc., under the prevailing crop growing and marketing situations. As far the overall period is concerned, the annual production of oilseeds is increasing continuously in the country and showed positive growth throughout the

investigation period. The years, especially from 2001- 02 to 2004- 05 experienced lowest values for area, production and yield of oilseeds because of the draught conditions over the whole nation. At the end of the investigation period, the year 2020- 21 again experienced the same situation for area, production and yield of oilseeds, but this time it because of the Pandemic conditions of COVID- 19. While considering the whole investigation period i.e., 2001- 02 to 2020- 21, the annual production of oilseeds is increasing continuously in the country, because of increase in area and increase in the productivity along with the impact of technology.

Status of Area, Production and Yield of Oilseeds in India

India has more than 20% of the total area under oilseed cultivation and accounts more than 10% of global production. The country produces oilseeds like, groundnut, soybean, sunflower, sesamum, mustard, safflower and niger seed, which are largely grown under rain fed conditions, over an area of about 26 million hectors. Among these, soybean (34%), groundnut (27%) and mustard (27%) contribute more than 85% of total oilseed production in the country. In 2020- 21 the total area under oilseed was 25741 thousand hectares, out of which 86.70 % area i.e. 22318 thousand hectares was occupied by soybean, mustard and groundnut. The same oilseed crops i.e. soybean, mustard and groundnut are having highest share of production (90.87%) with 27759 thousand tones out of total production of 30545 thousand tons. As far the per hectare yield of oilseeds is concerned, castor seed (1722 kg/Hector), groundnut (1646 kg/Hectare), mustard (1349 kg/Hectare) and soybean (1013 kg/Hectare) are on the top of the list. While, niger seed (310), sesamum (449) and linseed (555) are at the other end of the scale of oilseed yield per hectare.

Production of Oilseeds in India

The trend of production of oilseeds in India is showing positive growth in the last 20 years. In 2020-21, the production of oilseeds of the country was 25.23 thousand tonnes, which is at its lowest in the last 10 years. As far the total period is concerned, the highest production of oilseeds was recorded in the decades 2012- 13 and 2015- 16, while the lowest production was recorded in 2004- 05. With some exceptions, from 2001- 02 to 2011- 12, production of oilseeds was lower than the area of oilseeds, while, from 2012- 13 the oilseed production exceeds the area of oilseed. It is also seen that, the yield per hector and production of oilseeds goes hand in hand, throughout the investigation period. In spite of some ups and downs in the production in the last five years, above linear graph shows positive and uplifting trend in the investigation period. As far the spatial distribution of oilseed production is concerned in the year 2021, central and southwestern part of India is showing a character of high oilseed production. On the contrary, the states in the northern, north-eastern and eastern India shows a character of medium and low oilseed production. Madhya Pradesh with 7218 thousand tons production of oilseeds, is at top of the list, followed by Rajasthan ((6342), Gujarat (5043), Maharashtra (4363), Uttar Pradesh (1107), Haryana (1073), West Bengal (1029), Tamilnadan (918), Karnataka (869), Andhra Pradesh (807) and Telangana (623). At the other end of the scale, Kerala with 0.47 thousand tons production of oilseeds is at bottom of the list, followed by Goa (2.00), Mizoram (2.00) and Sikkim (5.00). The Union Territories namely, Andaman & Nicobar Islands, Chandigarh, Dadar Nagar & Haveli, Daman & Diu and Puducherry shows quite negligible

character i.e. fewer than one thousand tons of oilseed production. Majority of the Northern, North-Eastern and Eastern states of India recorded medium character of oilseed production. Jharkhand with 250 thousand tons production of oilseeds leads moderate group, which is followed by Assam (202), Chhattisgarh (149), Bihar (125), Odisha (105), Nagaland (96), Punjab (58), Jammu & Kashmir (39), Arunachal Pradesh (36), Manipur (21), Uttarakhand (28), Meghalaya (15) and Tripura (12). The states which are larger in size, better infrastructural facilities and favorable physical elements like physiography, climate and soil are ahead in the oilseed production.

Productivity of Oilseeds in India

Agricultural productivity is used as an effective measure for delimiting areas of agricultural development. Measurement of agricultural productivity of a nation or a region is an important step in maximization of agricultural output of that particular area and for particular crop. Agricultural productivity is an ultimate outcome of physical, social, cultural and economic conditions of the region. Productivity of oilseed in India is also not exception to it, and can be studied in the above-mentioned perspective. Higher productivity areas are confined to the Northwestern and Northeastern India, along with some exceptions in the south. While low productivity areas of oilseeds are seen in the North and in the South. Majority part of central India is occupied with moderate level of oilseed productivity. High productivity index ranges in between 1.24 to 8.16, and the states which are having high productivity are Haryana, Punjab, Gujarat, Goa, Bihar, Telangana, Tamilnadan, West Bengal, Nagaland, Mizoram, Meghalaya, Arunachal Pradesh, Rajasthan, Delhi and Puducherry. On the other hand, the low productivity index of oilseeds ranges in between 19.04 to 29.08, which is seen in the states namely Andhra Pradesh, Himachal Pradesh, Andaman & Nicobar Islands, Chandigarh and Daman Diu. Moderate productivity index ranges in between 9.71 to 17.88, which can be seen in the central peninsular part of India. The states fall in this category are Odisha, Madhya Pradesh, Uttarakhand, Maharashtra, Jharkhand, Karnataka, Tripura, Assam, Chhattisgarh, Sikkim, Dadra Nagar Haveli, Manipur, Jammu Kashmir, Uttar Pradesh and Kerala.

Concentration of Oilseeds in India

Majority of the oil seeds in India are cultivated under rain fed conditions. The cultivation of oilseeds has been lowering due to lower profitability against the higher profitability of cash crops like sugarcane and cotton. The crop concentration in any region largely depends on the physical determinants like terrain, climate, and soils along with the socio-economic determinants like irrigation, transport, market and technological facilities. Every crop has a tendency to have a high concentration in the areas which are having ideal physical, social and economic conditions. On the other hand, the concentration declines as the above-mentioned conditions declines gradually. With the exception of Andhra Pradesh and Nagaland the states located in the North, Northeast, East and Southern Part of India recorded moderate and low level of oil seed concentration. On the other hand, the Central and Western part of India is recorded high level of concentration index of oilseeds. With 2.00 crop concentration index Gujarat is at the top of the list, followed by Madhya Pradesh (1.93), Chandigarh (1.66), Rajasthan (1.60), Maharashtra (1.40), Andhra Pradesh (1.33) and Nagaland (1.06). At the other end of the scale, Punjab and Kerala jointly with 0.06 concentration index

are at the bottom of the list. The states which are having low concentration index are Odisha (0.13), Himachal Pradesh (0.13), Bihar (0.13), Uttarakhand (0.20), Goa (0.26), Uttar Pradesh (0.33), Tripura (0.33), Chhattisgarh (0.33), Mizoram (0.40) and Jammu Kashmir (0.46). Moderate concentration of oilseeds ranges in between 0.93 to 0.53, which is seen in the Northern, Northeastern, eastern and in the southern states of India. The states namely Uttar Pradesh, Uttarakhand, Haryana in the North, Jharkhand, West Bengal in the East, Arunachal Pradesh, Assam, Meghalaya, Manipur, Sikkim in the Northeast and Telangana, Karnatak, Tamilnadan in the South forms the moderate concentration zone of oilseeds.

Infrastructural Facilities in India

There are number of key infrastructural facilities, which determine the progress and development of agriculture sector in India. It includes irrigation facilities, fertilizer consumption, transport network, market centers, storage facilities, processing units, farm machinery, power supply etc. Uneven spatial distribution of these facilities hampers the overall agriculture development of any region. In the present paper four infrastructural parameters are used, it includes net sown area (in '000' hectors), net irrigated area (in '000' hectors), use of fertilizers (kg per hectors), and cropping intensity (in %). The states and union territories of Rajasthan, Punjab, Haryana, West Bengal, Uttar Pradesh, Pondicherry, Bihar, Madhya Pradesh, Delhi and Gujarat are having high level infrastructural facilities. On the other hand, the regions which are having low level of infrastructural facilities are Goa, Chandigarh, Sikkim, Dadra & Nagar Haveli, Odisha, Jharkhand, Nagaland, Arunachal Pradesh, Daman Diu, Manipur, Meghalaya, Mizoram, and Andaman & Nicobar Islands. The states like Karnataka, Telangana, Maharashtra, Tamil Nadu, Andhra Pradesh, Tripura, Assam, Uttarakhand, Jammu Kashmir, Kerala, Chhattisgarh, and Himachal Pradesh are having moderate level of infrastructural facilities. The states which are located in the northern and northeastern mountainous regions along with some of the southern states are having lesser infrastructural facilities, compared to the other part of India.

CONCLUSIONS

India is the 4th largest oilseeds producer in the world. It has 20.8% of the total area under cultivation globally and accounting for 10% of global production. The country produces groundnut, soybean, sunflower, sesamum, niger seed, mustard and safflower oilseeds. However, a breakthrough was realized in oilseed production through introducing latest crop production technologies. The major oilseeds produced in India are soyabeans, mustard, groundnut and sunflower.

1) Considering the whole investigation period i.e., 2001- 02 to 2020- 21, the annual production of oilseeds is increasing continuously in the country, because of increase in area and productivity along with the impact of technology. India has more than 20% of the total area under oilseed cultivation and accounts more than 10% of global production.

2) Among these, soybean (34%), groundnut (27%) and mustard (27%) contribute more than 85% of total oilseed production in the country. The same oilseed crops i.e. soybean, mustard and groundnut are having highest share of production (90.87%) with 27759 thousand tones out of total production of 30545 thousand tons.

3) Central and southwestern part of India is showing a character of high oilseed production. On the contrary, the states in the northern, north-eastern, eastern and southern India shows a character of medium and low oilseed production.

4) The states which are larger in size, better infrastructural facilities and favorable physical elements like physiography, climate and soil are ahead in the oilseed production. In spite of some ups and downs in the production in the investigation period, linear graph shows positive and uplifting trend.

5) Higher productivity areas are confined to the Northwestern and Northeastern India, along with some exceptions in the south. While low productivity areas of oilseeds are seen in the North and in the South. Majority part of central India is occupied with moderate level of oilseed productivity.

6) With the exception of Andhra Pradesh and Nagaland the states located in the North, Northeast, East and Southern Part of India recorded moderate and low level of oil seed concentration. On the other hand, the Central and Western part of India is recorded high level of concentration index of oilseeds.

7) Uneven spatial distribution of infrastructural facilities hampers the overall agriculture development of any region. The states which are located in the northern and northeastern mountainous regions along with some of the southern states are having lesser infrastructural facilities, compared to the other part of India.

8) During the last five years, the Government of India has undertaken several initiatives like Targeted Rice fallow Area (TRFA), National Food Security Mission (NFSM), Directorate of Oilseed Development (DOD), Cluster Demonstration of Improved Technology (CDIT), Indian Oilseed Produce, Export and Promotion Council (IOPEPC) etc. to increase oilseed production. These initiatives resulted in high oilseed production in the country in the nearby years.

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