Research Paper

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Spatial Analysis of Land-Use Under Edible Oilseeds in Karnataka During 2012-13

GEOGRAPHY

KEYWORDS : Land use, Edible Oilseeds, Net sown area, Production, Productivity, cultivable wasteland, correlation.

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ABSTRACT

Edible oilseeds cultivation in India is an integral part of agricultural system, as edible oilseeds are part of food item for the human population. The per capita annual consumption of edible oil in India has increased from 4.0kg in 1980-81 to 6.4 kg in 1996-97. The production of vegetable oils has been rising annually at the rate of 5.96 % for consumption; even then it does not suffice the need. This has made India to import edible oils to the extent of 1.30 million tons during 1985-86. During the year 1992-93 India had 25560.36 thousand hectares of land under cultivation of several oilseeds together. Amongst the Indian states Karnataka shared 1.56 % of sown area under major oilseeds, which being 5th largest state to share an area of 2699.70 thousand hectares of land, out of 25560.36 thousand hectares of land under oilseeds in India. During 2002-03 Karnataka had 1311445 hectares of land under all major oilseeds together, which is 11.80 % of the total net sown area of all crops (10393336 hectares) of Karnataka. In 2012-13 the total area under all types of oilseeds (including major and minor oilseeds) is 1406352 hectares, which is being 14.14 % of the total net sown area (9941399 hectares) of Karnataka. The groundnut, sunflower and soybean are important oilseeds in Karnataka, while their productivity is reliant upon red soil, light black soil and laterite soil in association with rain fall (75 cm) or irrigation.

STUDY AREA

The state of Karnataka is confined within 11.35^0 to 18.30^0 north latitude and 74.51^0 to 78.35^0 east longitudes. The Karnataka state extends about 750 km from north to south and about 400 km from east to west. The total geographical area of Karnataka is 119791 sq km. It accounts for 5.83% of the total area of India (32.88 lakhs sq km) and ranks 8th among Indian states in terms of geographical area. As per 2011 census, the state's total population is 61130704, sharing 5.05% of India's population of 1,21,01,93,422. Karnataka state has 30 districts consisting of 175 taluks and 27481 inhabited villages. Karnataka has 66.02% of rural population. The chief soil types found in the Karnataka state can be grouped under rich black soils, red soils, laterite and mixed coastal soils. **In Karnataka state net sown area is 9941399 hectares which is 52.18 % of total geographical area** (19049836 hectares). About 14.66% land is used for forest, about 10.04% land is not available for cultivation, about 8.22% land is uncultivated and 9.17% land is as a fallow.

Objectives:

1) To study district-wise spatial analysis of land use under edible oilseeds in Karnataka during 2012-13.
2) To know the district-wise production and productivity (per hectare yield) of edible oilseeds in Karnataka during 2012-13.
3) To know the correlation ship of four independent variables impacting on the production of oilseeds as dependent factor.

Methodology and data base:

The percentage analysis of sown area under all types of oilseeds and their respective production, and productivity (per hectare yield), in Karnataka is worked out and categorized with the help of mean and standard deviation method in the three classes. The secondary data of the year 2012-13, (published by the Directorate of Economics and Statistics, Government of Karnataka) is used.

Discussion:

In Karnataka state during the year 2012-13 the net sown area under all types of crops is 9941399 hectares, out of which the area sown under all types of oilseeds is 1406352 hectares, which is about 14.14 %. In 2002-03 the net sown area under all types of crops was 10393336 hectares, out of which the area sown under all types of oilseeds was 1311445 hectares, which was about 12.6 %.

In the present study, analysis is based on the percentage share of cultivated land under all types of oilseeds. The following oilseeds are grown as **major oilseed crops**: groundnut, sunflower, soybean, sesame and safflower which share in all 13.63 % (1355408 hectares) of net sown area in Karnataka. While linseed, and niger being **miner oilseeds** share less than two percent. The **major and minor oilseeds together share** 14.14 % of net sown area in Karnataka in 2012-13. Out of the **land under major oilseeds** (1355408 hectares) in Karnataka, groundnut with first rank shared 47.55 % (668854 hectares) during 2012-13. The second rank was shared by sunflower with 27.04 % of area under oilseeds i.e.380328 hectares, during same period, soybean ranked third with 13.57 % of area under oilseeds i.e. 190973 hectares. The fourth ranking oilseed was sesamum sharing 4.26 % of area under oilseeds i.e. 59965 hectares (2012-13).The safflower shared fifth rank with 3.93 % of area under oilseeds i.e. 55288 hectares. **(TABLE 1 & FIG 1).** Similarly the percentage wise **production share** of five major oilseeds is as follows: 54.91 % by groundnut, 20.03 by sunflower, 13.51 by soybean, 4.49 % by sesamum and 4.45 by safflower. For per hectare yield **refer table 1**

Out of the total area under oilseeds crop (1406352 hectares) in Karnataka, **16 districts together share 91.84%** viz 9.88 % was shared by Belagavi district, 8.22 % was shared by Bijapur district, 7.82 % was shared by Chitrdurga district, 7.35 % was shared by Bidar district, 7.22 % by Raichur district, 6.78 % by Tumkur district, 6.58 % by Gadag district, 6.39 % by Bellary district, 6.23 % by Koppal, 5.70 % by Bagalkot district,5.6 % by Dharwad district, 4.09 % by Gulburga district,3.05 % by Yadgir district, 2.31 % by Chikkaballapur district, 2.26 % by Chamarajanagar district,2.14 % by Haveri district **while remaining 14 districts together share 8.16% (TABLE 2 & FIG 2).**

SOWN AREA, PRODUCTION AND PRODUCTIVITY (YIELD) OF MAJOR AND MINER OILSEEDS IN KARNATAKA DURING 2012-13

TABLE- 1

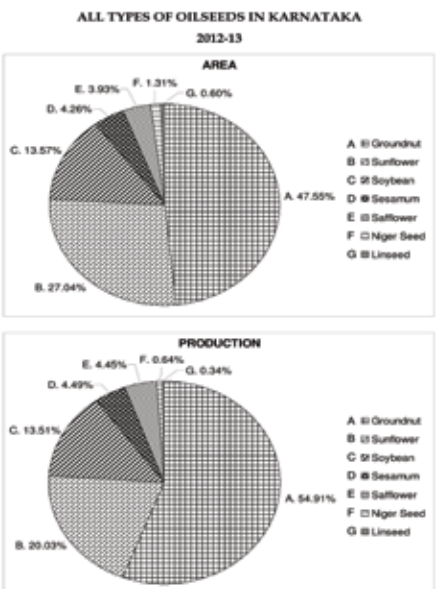
MAJOR OILSEEDS

S L NO	NAME OF OILSEEDS	AREA In Hectare	%	PRODUCTION In Tones	%	YIELD In Kg

1	Ground nut	668854	47.55	600339	54.91	898
2	Sunflower	380328	27.04	219057	20.03	576
3	Soybean	190973	13.57	147777	13.51	774
4	Sesamum	59965	4.26	49112	4.49	819
5	Safflower	55288	3.93	48719	4.45	881
MINER OILSEEDS						
1	Castor	16148	1.14	15991	1.46	990
2	Niger seed	18431	1.31	7041	0.64	382
3	Linseed	8523	0.60	3809	0.34	447
	TOTAL	1406352		1093129		777

In Karnataka state, during 2012-13 the district wise data analysis shows that, the district of Bidar shared 29.49% area (103456 hectares) under all oilseeds to its net sown area (350792 hectares), which ranks first in the land use of cultivation of edible oilseeds. The location of Bidar district being on high altitude receives nearly 75 cms rain which is higher than neighboring districts. Therefore red and lateritic soils being fertile are very well productive to grow oilseeds under rain fed condition. For district wise share of sown area under oilseeds when compared to their total net sown area please refer **TABLE NO 3**

The **groundnut, sunflower** and **soybean** are the most impartment edible oilseeds in the Karnataka. The total area shared by these three crops is 88% out of area under all types of oilseeds.



The **groundnut** is the dominant oilseed cultivated in Karnataka with an area of 668854 hectares in Kharif season during 2012-13, which shares 47.55% area out of all types of oilseeds together. The Chitradurga district is first ranking in area under groundnut (93086 hectares) with 13.92% when compared to the state total area under groundnut. It is also first ranking district in groundnut production with 82172 tones with a percentage share of 13.69%. This is mainly because of the farmers of Chitradurga district who are interested to cultivate oilseeds, more so the groundnut on large hectares, which speaks about bent upon mind of the farmers, adapting to the existing edaphic-climatic conditions prevailing in the district. **However the yield of groundnut is only 883 Kg per hectare which needs to be increased by providing irrigation when rains are inadequate.** The 15 districts known for groundnut cultivation with 13.92% to 2.78% area are Chitradurga, Tumukur, Ballary, Gadag, Koppal, Bijapur, Raichur, Belagavi, Bagalakot, Chikkaballapur, Yadagir, Dharawad, Havari, Davanagere, and Chamarajanagar, where red soils, less rainfall and needed irrigation facility are available.

The **sunflower** is the second dominant oilseed crop in Karnataka with 380328 hectares. This crop thrives well in red soil with seasonal rainfall and irrigation if needed. It needs 3 months during Kharif season. It is very well cultivated in 11 districts viz Bijapur, Raichur,Dharwad,Gadag, Koppal, Gulburga, Ballary, Belagavi, Yadagiri, Chitradurga and Chamarajanagar.The Bijapur district with 60151 hectares (15.8%) ranks first in area under sunflower cultivation. Whereas, in terms of production of sunflower, Raichur district ranks first with 12.77% (27980tones). The state average yield sunflower is **576 Kg per hectare while maximum yield is in Shivamogga district with 2578 Kg per hectare,** however this district being located in heavy rainfall zone shares only 0.26% area i.e. 1002 hectares.

Soybean is also a Kharief crop in Karnataka cultivated under red soils. The total area in Karnataka during 2012-13 was 192973 hectare. It is an important crop in 6 districts viz Bidar, Belagavi, Dharwad, Haveri, Bagalakot and Gulburga. **The district of Bidar is having first rank in soybean area with 81066 hectares. The Bidar district is also first ranking in soybean production** with 87640 tones and also in per hectare yield with 1081 Kg. In recent decades the research made by food technologist has emphasized to grow more soybean as it is good for heart with omega 3.

KARNATAKA
DISTRICT WISE RANKING OF AREA UNDER ALL TYPES OF OILSEEDS, NET SOWN AREA AND THEIR PERCENTAGE SHARE: IN 2012-13

Table: 2

Sl No	Name of Districts	Area under Oilseeds (in Hectares)		Net sown Area (in Hectares)	Percentage share of total Area under oilseeds to total net sown area in respective district
		Area	Ranks		
1	Belagavi	139019	9.88 % 1	766580	18.13%
2	Bijapur	115632	8.22 % 2	748804	15.44%
3	Chitradurga	109943	7.81 % 3	387100	28.40%
4	Bidar	103456	7.35 4	350792	29.49
5	Raichur	101672	7.22 5	458062	22.19
6	Tumkur	95385	6.78 6	509542	18.71
7	Gadag	92655	6.58 7	352624	26.27
8	Ballary	90000	6.39 8	414072	21.73
9	Koppal	87640	6.23 9	350198	25.02
10	Bagalkot	80201	5.70 10	477581	16.79
11	Dharwad	80129	5.6 11	288642	27.76
12	Gulburga	57525	4.09 12	895826	6.42
13	Yadgir	42991	3.05 13	303522	14.16
14	Chikkaballapur	32530	2.31 14	205467	15.83
15	Chamarajanagar	31869	2.26 15	184396	17.28
16	Haveri	30137	2.14 16	363207	8.29
17	Davanagere	23548	1.67 17	389010	6.05
18	mysore	19835	1.41 18	344908	5.75
19	Chikkamagalore	15396	1.09 19	292988	5.25

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20	Ramana-gar	12264	0.87 20	164302	7.46
21	Hasan	12031	0.85 21	359192	3.34
22	Kolar	11495	0.81 22	183214	6.27
23	Mandya	9941	0.70 23	232404	4.27
24	U Kannada	2746	0.19 24	112302	2.44
25	Udupi	2135	0.15 25	100128	2.13
26	Shivamog-ga	2008	0.14 26	227965	0.88
27	Bangalore R	1744	0.12 27	125770	1.38
28	Bangalore	1268	0.09 28	51433	2.46
29	Kodagu	596	0.04 29	169922	0.35
30	D Kan-nada	561	0.03 30	131446	0.42
	Total	1406352	100%	9941399	100 %

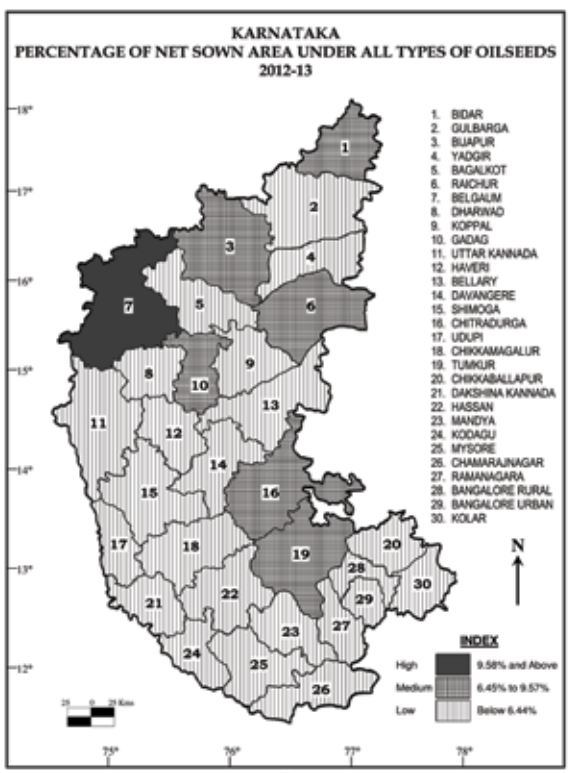

Fig. 2

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DISTRICT WISE RANKING OF AREA UNDER ALL TYPES OF OILSEEDS AND THEIR PERCENTAGE SHARE IN 2012-13

Table: 3

o	Name of Districts	Area (in Hectares) Ranks		Net sown Area (in Hectares)	Percentage share of total Area under oilseeds to total net sown area in respective district
1	Bidar	103456	7.3 % 1	350792	29.49 %
2	Chitra-durga	109943	7.81 % 2	387100	28.40 %
3	Dharwad	80129	5.69 % 3	288642	27.76%
4	Gadag	92655	6.58 4	352624	26.27
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8	Tumkur	95385	6.78 8	509542	18.71
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10	Chamara-janagar	31869	2.26 10	184396	17.28
11	Bagalkot	80201	5.70 11	477581	16.79
12	Chikkabal-lapur	32530	2.31 12	205467	15.83
13	Bijapur	115632	8.22 13	748804	15.44
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17	Gulburga	57525	4.09 17	895826	6.42
18	Kolar	11495	0.89 18	183214	6.27
19	Da-vanagere	23548	1.67 19	389010	6.05
20	mysore	19835	1.41 20	344908	5.75
21	Chik-kamaga-lore	15396	1.09 21	292988	5.25
22	Mandya	9941	0.70 22	232404	4.27
23	Hasan	12031	0.85 23	359192	3.34
24	Bangalore	1268	0.09 24	51433	2.46
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26	Udupi	2135	0.15 26	100128	2.13
27	Bangalore R	1744	0.12 27	125770	1.38
28	Shivamog-ga	2008	0.14 28	227965	0.88
29	D Kan-nada	561	0.03 29	131446	0.42
30	Kodagu	596	0.04 30	169922	0.35
	Total	1406352	100%	9941399	100 %

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DISTRICT WISE SOWN AREA, PRODUCTION AND PER HEC TARE YIELD OF ALL TYPES OF OILSEEDS, AND THEIR PERCENTAGE SHARE IN 2012-13

Table: 4

Sl No	Name of Districts	Area under oil-seeds (in Hectares)	%	All types of Oilseeds Production (in tones	%	yield in Kg
1	Belagavi	139019	9.88	124809	11.41	898
2	Bijapur	115632	8.22	63170	5.77	546
3	Chitradurga	109943	7.81	95872	8.77	872
4	Bidar	103456	7.35	66680	6.09	644
5	Raichur	101672	7.22	64666	5.91	636
6	Tumkur	95385	6.78	74817	6.84	784
7	Gadag	92655	6.58	71742	6.56	774

8	Ballary	90000	6.39	50802	4.64	564
9	Koppal	87640	6.23	71646	6.55	817
10	Bagalkot	80201	5.70	60632	5.54	756
11	Dharwad	80129	5.69	87761	8.02	1095
12	Gulburga	57525	4.09	26862	2.45	467
13	Yadgir	42991	3.05	27671	2.53	643
14	Chikkaballapur	32530	2.31	39389	3.60	1211
15	Chamarajanagar	31869	2.26	15141	1.38	475
16	Haveri	30137	2.14	35372	3.23	1174
17	Davanagere	23548	1.67	27531	2.51	1169
18	mysore	19835	1.41	18239	1.66	919
19	Chikkamagalore	15396	1.09	14418	1.31	936
20	Ramanagar	12264	0.87	9117	0.83	743
21	Hasan	12031	0.85	14644	1.33	1217
22	Kolar	11495	0.81	10660	0.97	927
23	Mandya	9941	0.70	7699	0.70	774
24	U Kannada	2746	0.19	4688	0.42	1707
25	Udupi	2135	0.15	3730	0.34	1747
26	Shivamogga	2008	0.14	3119	0.28	1553
27	Bangalore R	1744	0.12	1274	0.11	730
28	Bangalore	1268	0.09	605	0.05	477
29	Kodagu	596	0.04	20	0.001	34
30	D Kannada	561	0.03	352	0.032	627
	Total	1406352	100	1093128	100	777
	Mean &S.D		3.33 3.12		3.33 3.11	

Correlation Aspects:

In this study taking **independent variable** and **dependent variable,** an application of **Karl Pearson's Product moment correlation** is done on five major oilseed crops grown in Karnataka (wide table 5). The correlation between area irrigated (independent variable) under five major oilseed crops and their production (dependent variable) shows positive correlation ship in all the five oilseed crops. However, the value of correlation shows 0.65 for s**unflower,** 0.42 in case of **soybean,** 0.32 for **groundnut,** 0.25 in case of **safflower**, and 0.036 for **sesamum**.

In the absence of specific area under irrigation for each of the oilseed crop, it is to be presumed that the district wise area under irrigation has significant impact on the farmers, whereby the farmers are interested to cultivate oilseed crops, as such these crops fetch good price for oilseeds in market, therefore the farmers have taken interest to produce more from irrigated crops of oilseeds. Under the circumstance it is needless to say that the said **two factors i.e. area under irrigation and productions of oilseeds are positively correlated**. Therefore in order to expand the area under cultivation and to increase the production of oilseeds in Karnataka, **it is necessary to enhance the area of irrigation in such districts where oilseeds are cultivated**.

The correlation ship between **sown area** (independent variable) under **five major oilseeds crops** and the **production of oilseeds** (dependent variable), reveals **positive correlation ship,** where the **'r' value** range from0.92 for **groundnut**, 0.89 for **sesamum** and 0.75 **for sunflower** 0.63 in case of **safflower,** 0.49 for **soybean.** It is a clear and glaring situation that the net sown areas under each of the oilseed crop and quantity of oilseed production have positive correlation ship in the districts of Karnataka where five major oilseeds are cultivated.

The correlation ship between the **amount of rainfall** (independent) and **production** of oilseeds (dependent variable) in all the districts where five major oilseeds are cultivated **reveals negative correlation ship where 'r' value** range from -0.40 in case of **groundnut,** -0.38 for **sunflower**, -0.19 in case of **safflower**, -0.18 in case of **sesamum** and -0.13 in case of **soybean.** Here there is no correlation ship between amount of rainfall and production because the 'r' value is negative. This shows that, the variability of rainfall makes demand for some irrigation whenever needed to cultivate all types of oilseeds to get high yield.

The correlation ship between **consumption of fertilizers,** (independent variable) and **production** (dependant variable) of five major oilseed crops reveal **positive correlation ship**, where '**r**' values range from 0.69 for **sunflower,** 0.31 for **soybean,** 0.22 for **safflower**0.16 for **sesamum** and**,** 0.15 in case of **groundnut.** However, in case of **groundnut** cultivation the '**r' value** is 0.15 which is **positively very insignificant**. In the absence of specific data of consumption of fertilizer for each of the five-oilseed crops it can be presumed that farmers do use the fertilizers for all the five-oilseed crops, but in varying quantity and consequently the 'r' values are different. **It is a matter of satisfaction that these values show positive correlation and therefore, in order to increase the production of these oilseeds crops it is necessary on the part of farmers to increase the use of fertilizers especially of organic type so as to increase the production of oilseeds.**

The correlation ship between total cropped area and net sown area under groundnut shows positive significant relation, mainly because of rain fed conditions, whereas incase of other four oilseeds, the correlation is negative.

Conclusion:

An important factor responsible for the shortage of calories in diet of the people in the developing countries is very low intake of fats & oils per head. Thus even with adequate availability of cereal food grains, the problem of malnutrition may continue because of shortage of fats & oils in the food. At present in India the per capita intake of fats & oils is less than 10 grams per person, per day though the recommended intake is 40 grams per person per day. It should be noted that, the shortage of fats in the diet of the people of the developing countries creates a problem not only of calories but also of protein. The relatively small amount of protein in the diet of many people in India may be providing calories, and in this way it fails to perform its expected function of tissue building. Fats also act as important sources of some of vitamins & essential fatty acids, which play an important role in key metabolic process including the formation of membranes. Therefore it is most important matter, even for geographers to study the spatio-temporal analysis of production of oilseeds, so as to meet the requirements of edible oil for human consumption. In this direction the present paper is an endeavor to know the area sown under major oilseed crops in Karnataka and their production during 2012-13.

Out of 64% of land under agriculture in Karnataka, about 14% is occupied by all types of oilseeds and this can be further increased by way of cultivating 9% of land which is under cultivable waste. The objectives laid in the Technology Mission on oilseeds have to be continuously implemented, for which department concerned of Central government, State governments and Agriculture universities have to do their share unfailingly. It is hoped that this piece of research endeavor carried out by this

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researchers will add to the knowledge of understanding of oil-seeds cultivation in association with the agricultural system in Karnataka.

RESULT OF THE KARL PEARSON'S PRODUCT MOMENT CORRELATION TECHNIQUE

Table 5

Independent variable----------→ Sown Area Dependent (Oilseeds) Variable ----------→ Production		**fertilizer** **Production**	**Rainfall** **Production**	**Irrigation** **Production**	Total Cropped Area Net sown area Under five oilseeds
Name of the crops					
Groundnut **r = →**	+0.92 Positive	+0.15 Positive	-0.40 Negative	+0.32 Positive	+0.97 Positive
Sunflower **r = →**	+0.75 Positive	+0.69 Positive	-0.38 Negative	+0.65 Positive	-0.51 Negative
Safflower **r = →**	+0.63 Positive	+0.22 Positive	-0.19 Negative	+0.25 Positive	-0.36 Negative
Sesamum **r = →**	+0.89 Positive	+0.16 Positive	-0.18 Negative	+0.036 Positive	-0.19 Negative
Soybean **r = →**	+0.49 Positive	+0.31 Positive	-0.13 Negative	+0.42 Positive	-0.17 Negative

The Karl Pearson's Product Moment Correlation formula is as follows:

$$r = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sqrt{\sum (x - \bar{x})^2 \sum (y - \bar{y})^2}}$$

The range of the correlation coefficient is from 1 to +1. If there is a strong positive linear relationship between the variables, the value of 'r' will be close to +1. If there is a strong negative linear relationship between the variables, the value of 'r' will be close to -1.

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