

Trend and Inequality Analysis of the Size of Operational Holdings in Karnataka State, India

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Abstract: *Land is a free gift of nature with a fixed supply and is the basic asset of an agrarian economy. It is a prerequisite for cultivation, the major source of income, and an index of household status; thus, it is of immense significance to study the distribution patterns of landholdings for better agricultural planning. Landholding size determines investment in agriculture, productivity, farm mechanisation, and the sustainability of farm incomes themselves. "Today, land ownership is considered one of the most important sources of livelihood and social status for farmers, and the land market operates largely through tenancy rather than outright sale or purchase" A lot of research work has been done to study the aftereffects of land reforms, inequality in land distribution, etc. Hence, the present study is an attempt to make a trend and inequality analysis of the size of operational holdings in Karnataka state from 1970–71 to 2015–16, which includes an appreciation of the distributional pattern of operational land holdings and their area, the spatial distribution of the size of holdings and its changes in size distribution, and to suggest appropriate strategies in the light of prevailing government policies and programmes to improve the landholding settings. The district has been considered the smallest unit of study. The present study is mainly based on secondary sources of data, and the required data for the study was obtained from the Directorate, Department of Economic and Statistics, and State Agricultural Census Commissioner, Bengaluru; besides this, data were also collected from various government offices and websites. To achieve the objectives mentioned above, the relevant statistical and cartographic techniques (ArcGIS) along with Microsoft Excel and STATA 12 have been employed. To describe the spatial pattern of variations in the average size of land holdings in the Karnataka state during 2010–11 and 2015–16, all the districts are grouped into four categories: very high, high, medium, and low concentration areas. At last, the results were presented with suitable diagrams and figures.*

Keywords: size of land holdings, fragmentation, inequality, Gini coefficient, policies and programmes

1. Introduction

Land is a free gift of nature with a fixed supply and is the basic asset of an agrarian economy. It is a prerequisite for cultivation, the major source of income, and an index of household status; thus, it is of immense significance to study the distribution patterns of landholdings for better agricultural planning. Landholding size determines investment in agriculture, productivity, farm mechanisation, and the sustainability of farm incomes themselves. "Today, land ownership is considered one of the most important sources of livelihood and social status for farmers, and the land market operates largely through tenancy rather than outright sale or purchase" In practise, it is found that in different countries, the standard varies enormously in accordance with the pressure of cultivators on the cultivated area and the law of inheritance. Even granting homogeneous physical conditions, it is clear that the variation in capacity, resources, and ambitions of the farmers will create pressures on farms of corresponding size (J. Singh, 1974, p. 70). A lot of research work has been done to study the aftereffects of land reforms, inequality in land distribution, etc.

A new concept in Indian agriculture has been introduced: a census operation centred around the operational holdings. Such a survey was conducted for the first time in 1970–71. In this state, more than 65 percent of rural workers are engaged in farming, of which more than 48.0 percent are classified as cultivators. In the absence of opportunities for other occupations, sole reliance on land is legitimate, and it causes further subdivisions of land holdings into tiny, scattered plots. Land, like other assets, is inherited as private property, and a father's land is equally divided among his

children, mostly among sons, keeping in view the fertility and location of the land. This unending process is still running, and there is no such thing as a permanent farm. The size of the holding is thus determined by the law of succession and the increasing burden and dependency of the population on land, not by the socio-economic conditions in accordance with the type of farming practised. Thus, the size of the holding is bound to vary spatially and temporally. An attempt has been made to make a trend and inequality analysis of the size of operational holdings in Karnataka state from 1970–71 to 2015–16, which includes an appreciation of the distributional pattern of operational land holdings and their area, the spatial distribution of the size of holdings and its changes in size distribution, and to suggest appropriate strategies in the light of prevailing government policies and programmes to improve the landholding settings.

2. Study Area

Karnataka is one of the developed states of India. It is located in the south-western part of the Indian peninsula and lies between $11^{\circ} 31' 1''$ to $18^{\circ} 45' 1''$ northern latitude and $74^{\circ} 12' 1''$ to $78^{\circ} 40' 1''$ eastern longitude. The state is bounded by Maharashtra and Goa from the north, Tamil Nadu and Kerala from the south, the Arabian Sea from the west, and Andhra Pradesh from the east (Fig. 1). The Karnataka state extends for about 750 km from north to south and about 400 km from east to west. The total land area is 1.91.791 sq. km. It accounts for 5.83% of the total area of the country (32.88 lakh sq. km) and ranks 8th among the major states of India in terms of size. In 2011, the state had 30 districts, 176

taluks, 29340 villages, 347 towns, and 22 urban agglomerations.

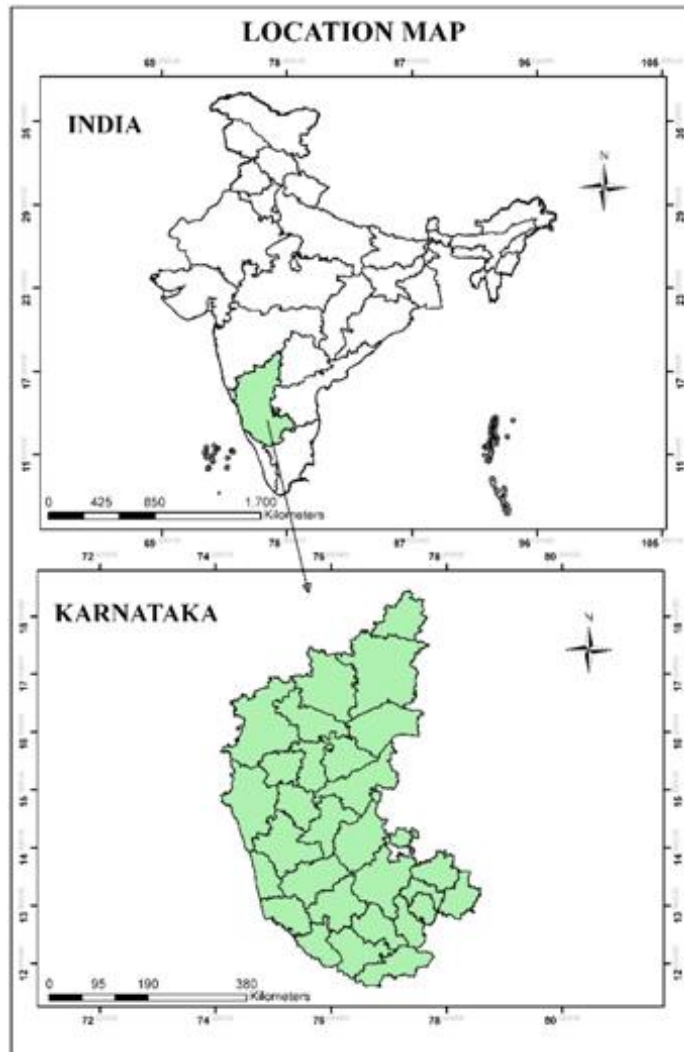


Figure 1: Location Map of Karnataka State in India

Agriculture in Karnataka state at a Glance:

Agriculture	Components	1990-91	2000-01	2010-11	2016-17	2017-18	2018-19
Net Area Sown	'000 Ha	10381	10410	10523	9855	9895	10664
Gross Cropped Area	'000 Ha	11759	12284	13062	11779	11994	13551
Gross Irrigated Area	'000 Ha	2598	3271	4279	3548	3639	4745
Gross Irrigated to Gross Cropped Area	%	22.09	26.63	32.76	30.12	30.34	35.01

Source: Economic Survey Report 2020-2021, published by Directorate of Economics & Statistics, Bengaluru

Karnataka state is divided in ten agro-climatic regions taking into consideration the geographical aspects. The contribution of agriculture sector to the overall GSDP saw an increase from 12.16 percent to 13.15 percent in 2020-21 against 2019-20. The predominance of rural populations makes the state's economy primarily agrarian. More than 65 percent of the state's workforce, however, is still dependent on agriculture and its allied activities for their livelihood. The economic development and prosperity of the masses depend mainly on agriculture. It has witnessed rapid industrialization in the recent past, particularly after the launch of policies of economic liberalisation in the state.

3. Objectives

The present paper comprehensively evaluates the trend and inequality analysis of the size of operational holdings in the

districts of Karnataka State, India. In this context, the study has been undertaken with the following specific objectives:

- To study the distributional pattern of operational land holdings and area in Karnataka State (2015-16).
- To designate the spatial distribution of size of holdings and its changes in size distribution of holdings in the districts of Karnataka State (2010-11 and 2015-16).
- To understand the trend and inequality analysis in the size of land holdings and the operational area in the state and
- To recommend some suitable strategies in light of prevailing government policies and programmes to improve the landholding settings in the state.

4. Database and Methodology

The present study is mainly based on secondary sources of data, and the required data for the study was obtained from the Directorate, Department of Economic and Statistics, and State Agricultural Census Commissioner, Bengaluru; besides this, data were also collected from various government offices and websites. A large number of books, articles, various websites, dissertations, and published and unpublished works from different sources have been used. The district has been considered the smallest unit of study. To achieve the objectives mentioned above, the relevant statistical and cartographic techniques (ArcGIS) along with Microsoft Excel and STATA 12 have been employed. The analysis and inferences were finally carried out in textual and tabular formats, followed by a description of the study results with suitable diagrams and figures.

5. Results and Discussions

5.1 Distributional Pattern Operational Land Holdings by Size in Karnataka State

A definite standard size of farm most suitable for a definite type of farming cannot be maintained because of the increasing burden and dependency of the agricultural population on arable land and the working of the law of succession in Karnataka state. These result in the splitting of large holdings into small, often widely scattered pieces of land that fail to conform to any reasonable economic standard from the point of view of agricultural operations. To make discussion convenient, land holdings can be grouped into various classes. The all-India Report on Agricultural Census 2015-16 recognised five classes of holdings: marginal (less than an hectare), small (one hectare and above, but below two hectares), semi-medium (2 hectares and above, but less than 4 hectares), medium (4 hectares and above, but less than 10 hectares), and large (10 hectares and above). Class-wise distribution of operational holdings and their total area in Karnataka State is furnished in Table 1 and depicted in Fig. 2.

Table 1: Distributions of Land Holdings by Size in Karnataka State, 2015-16

Sl. No.	Size of Holdings	Number of Holdings	Area (In hectares)	Percentage of Total		Size of Holding (In hectares)
				Number	Area	
1	Below 0.5	2875899	701791	33.13	5.94	0.24
2	0.5 - 1.0	1891233	1378306	21.79	11.68	0.73
	Marginal	4767132	2080097	54.92	17.62	0.44
3	1.0 - 2.0	2213732	3107119	25.50	26.32	1.40
	Small	2213732	3107119	25.50	26.32	1.40
	Marginal & Small	6980864	5187216	80.42	43.94	0.74
4	2.0 - 3.0	831297	1962290	9.58	16.62	2.36
5	3.0 - 4.0	361427	1225902	4.16	10.38	3.39
	Semi-Medium	1192724	3188192	13.74	27.01	2.67
6	4.0 - 5.0	194827	854476	2.24	7.24	4.39
7	5.0 - 7.5	187511	1126305	2.16	9.54	6.01
8	7.5 - 10.0	69107	587980	0.80	4.98	8.51
	Medium	451445	2568761	5.20	21.76	5.69
9	10.0 - 20.0	49486	636051	0.57	5.39	12.85
10	20.0 & above	6220	224880	0.07	1.90	36.15
	Large	55706	860931	0.64	7.29	15.45
	All Sizes	8680739	11805100	100	100	1.36

Source: Agricultural Census Report on Operational Holdings in Karnataka 2015-16 Part-I & Part-II published by DES & Statistics and State Agricultural Census Commissioner, Bengaluru, June and November 2019

Table 1 displays the distributional pattern of the number and area of operational land holdings according to major size classes in Karnataka State in 2015-16. The total number of operational holdings in the state is 86.81 lakhs as per the 2015-16 Agricultural Census, compared to 78.32 lakhs in the previous census, which registered an increase of 10.84 percent. The total area operated under all operational holdings in the current census is found to be 118.05 lakh hectares, a marginal decrease of 2.9 percent compared to 121.62 lakh hectares during the previous census (2010-11). Among the five major size classes of holdings, marginal holdings (less than 1 hectare) account for a maximum share of 54.92 percent of the total number of holdings, followed by small holdings (1 to 2 hectares) at 25.50 percent, semi-medium holdings (2 to 4 hectares) at 13.74 percent, medium holdings (4 to 10 hectares) at 5.20 percent, and large holdings (10 hectares and above) at 0.64 percent, being the

least. As regards the area operated by different size classes of holdings, semi-medium size class holdings have the highest percentage of area operated, i.e., 27.01 percent, closely followed by the small class with 26.32 percent, the medium size class with 21.76 percent, the marginal size class with 17.62 percent, and the large size class with 7.29 percent, which is the least share.

The entire 86.81 lakh holdings spread across 118.05 lakh hectares of the operated area come under the "wholly owned and self-operated" holdings. Though wholly owned and self-operated holdings of marginal and small farmers (i.e., holdings of 0.01 to 1.99 hectares) account for more than two thirds (80.42%) of the total holdings under all categories, the area operated by them is more than one third (43.94%) of the total area operated (Table 1).

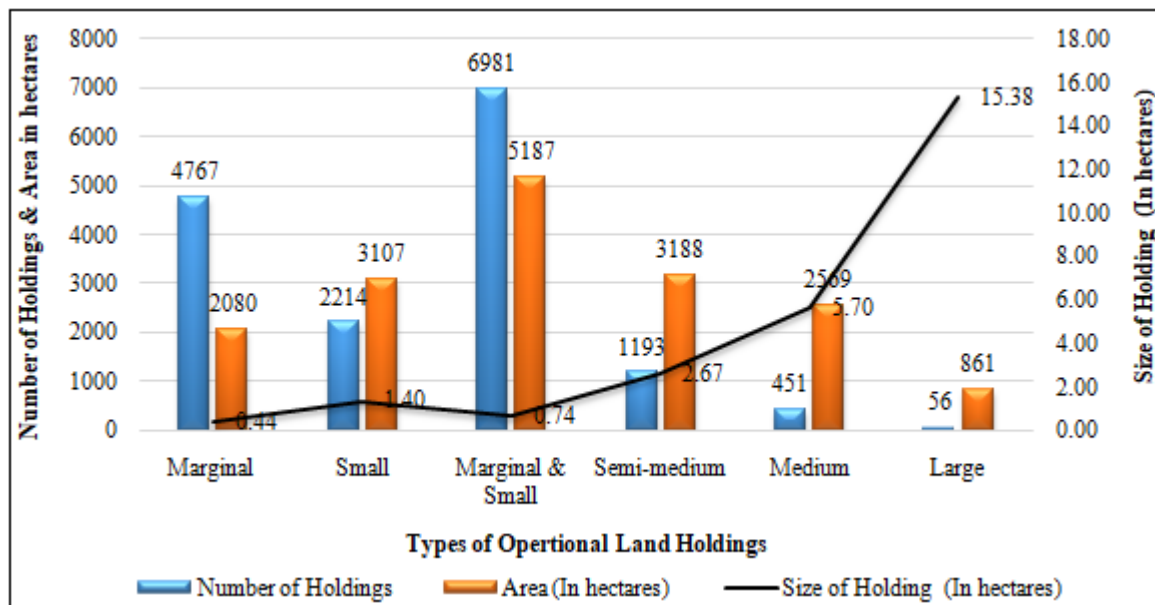


Figure 2: Distributional Pattern of Operational Land Holdings by Size in Karnataka State, 2015-16

The reasons for the increase in the number of operational holdings during the current census, 2015–16, are due to: The impact of the division of larger families into smaller nucleus families leads to the subdivision and fragmentation of agricultural land. During the year 2015-16, the land records across the state were updated for the conduct of the 2016 Agricultural Census. Thus, updating the records showed an increase in the number of operational holdings. Implementation of certain government programmes cleared the small operational holdings of all disputes and debts. Which have contributed to the increase in the number of operational holdings. As the price of precious commercial crops in the international market rose, the barren land was also utilised for cultivation, leading to an increase in the number of operational holdings. Government policy on the lending of loans facilitated the small landholders, particularly SC and ST holders, to regularise the land records, resulting in an increase in the number of operational holdings. Government land was distributed to landless agricultural labourers, particularly among SC and ST holders, which resulted in an increase in the number of operational holdings.

The average size of operational holdings has come down marginally, from 1.55 hectares during the 2010–11 census to 1.36 hectares during the 2015–16 census, by 0.19 hectare, which is mainly due to sub-division and fragmentation of land holdings. This trend is common in every agricultural census. One notable feature is that the average size of holdings increases with an increase in size classes. The marginal size class showed the minimum of 0.44 hectares of average size holdings, followed by small size class holdings of 1.40 hectares, semi-medium size class 2.67 hectares, medium size class 5.69 hectares, and large size class 15.45 hectares, which is observed to be the maximum. The

decrease in average holding size between the two censuses is very insignificant in the case of marginal, small, and semi-medium size classes. It has increased in the large size class, and it remains the same in the medium category.

Fig.2 confirms the inequalities in the distribution of area in various size classes in Karnataka State. The average values of Gini's coefficient of concentration ratios turn out to be around 0.5399 and 0.4909 for the years 1970–71 and 2015–16. It has also been confirmed that even in states or nations, there was little change in this pattern. Unfortunately, the consistency in the spatial pattern of distribution established that the processes of diversification in the rural economy and dis-agriculturalization were very weak in the rural side of the study area.

5.2 Spatial Distribution of Size of Holdings:

The impact of the various land reform measures taken over time should be reflected in the pattern of land distribution and can be roughly measured by looking at the concentration of land in various size classes of holdings. In the following paragraphs, an attempt has been made to examine the pattern of land distribution in the state as well as its spatial pattern (district-wise) (Table 2). Among the 30 districts in the state, Belagavi topped the list with 6.20 lakh operational holdings, closely followed by Mandya with 5.62 lakhs, Hassan with 5.39 lakhs, Tumakur with 5.16 lakhs, Mysore with 4.55 lakhs, etc., and Kodagu with 0.68 lakh operational holdings. As regards the area of operational holdings, Belagavi captures first place in the state, indicating 10.10 lakh hectares of area operated, followed by Vijapura with 9.35 lakh hectares, Kalaburgi with 9.12 lakh hectares, Tumakuru with 6.51 lakh hectares, Raichur with 6.16 lakh hectares, etc., and Bengaluru (Urban) with 0.83 lakh hectares.

Table 2: Spatial Distribution of Size of Agricultural Land Holdings in Karnataka State, 2015-16

Sl. No	Name of the District	Components	Marginal	Small	Marginal & Small	Semi-medium	Medium	Large	All Sizes
1	Bagalkot	Numbers	89615	84788	174403	51916	21541	2149	250009
		Area	51319	122532	173851	141276	123115	31821	470063
		Average	0.57	1.45	1.00	2.72	5.72	14.81	1.88

2	Belagavi	Numbers	294982	170553	465535	103839	44991	5196	619561
		Area	141465	243289	384754	281797	256264	87227	1010042
		Average	0.48	1.43	0.83	2.71	5.70	16.79	1.63
3	Bellary	Numbers	139048	89459	228507	60091	24978	2716	316292
		Area	66101	121673	187774	155723	139678	38270	521445
		Average	0.48	1.36	0.82	2.59	5.59	14.09	1.65
4	Bengaluru Rural	Numbers	148860	30495	179355	10852	2861	279	193347
		Area	56548	41656	98204	28695	15762	3948	146609
		Average	0.38	1.37	0.55	2.64	5.51	14.15	0.76
5	Bengaluru Urban	Numbers	83080	17056	100136	5740	1278	80	107234
		Area	37213	23205	60418	15065	6782	1037	83302
		Average	0.45	1.36	0.60	2.62	5.31	12.96	0.78
6	Bidar	Numbers	94038	99037	193075	50957	15720	1629	261381
		Area	51940	139552	191492	134637	89053	21968	437150
		Average	0.55	1.41	0.99	2.64	5.66	13.49	1.67
7	Chamarajnar	Numbers	141825	52178	194003	18748	3480	255	216486
		Area	60818	71699	132517	47963	18743	3975	203198
		Average	0.43	1.37	0.68	2.56	5.39	15.59	0.94
8	Chikkaballapur	Numbers	172534	40548	213082	15225	4076	434	232817
		Area	69102	54894	123996	39805	22609	6757	193167
		Average	0.40	1.35	0.58	2.61	5.55	15.57	0.83
9	Chikkamagalur	Numbers	134046	55867	189913	27439	9504	1804	228660
		Area	62582	76814	139396	72395	53781	46261	311833
		Average	0.47	1.37	0.73	2.64	5.66	25.64	1.36
10	Chitradurga	Numbers	119385	97044	216429	57793	24632	3651	302505
		Area	65091	137698	202789	154531	141110	54832	553262
		Average	0.55	1.42	0.94	2.67	5.73	15.02	1.83
11	Dakshina Kannada	Numbers	154985	36721	191706	13285	3549	378	208918
		Area	60213	48758	108971	34110	19791	7221	170093
		Average	0.39	1.33	0.57	2.57	5.58	19.10	0.81
12	Davanagere	Numbers	146791	84843	231634	42808	13493	1128	289063
		Area	73410	118652	192062	114199	74670	16239	397170
		Average	0.50	1.40	0.83	2.67	5.53	14.40	1.37
13	Dharwad	Numbers	49097	57524	106621	35357	17705	2204	161887
		Area	29237	83798	113035	97043	103133	30231	343442
		Average	0.60	1.46	1.06	2.74	5.83	13.72	2.12
14	Gadag	Numbers	46349	68571	114920	42397	19522	2563	179402
		Area	28444	99393	127837	115621	112647	34254	390359
		Average	0.61	1.45	1.11	2.73	5.77	13.36	2.18
15	Hassan	Numbers	393407	103184	496591	33342	8382	986	539301
		Area	149419	143326	292745	87762	46550	22255	449312
		Average	0.38	1.39	0.59	2.63	5.55	22.57	0.83
16	Haveri	Numbers	90030	83997	174027	40637	13013	1268	228945
		Area	49222	119801	169023	108981	73115	17427	368546
		Average	0.55	1.43	0.97	2.68	5.62	13.74	1.61
17	Kalaburgi	Numbers	106374	154013	260387	111776	43871	5681	421715
		Area	60699	223449	284148	299161	250642	78424	912375
		Average	0.57	1.45	1.09	2.68	5.71	13.80	2.16
18	Kodagu	Numbers	30304	15823	46127	11962	7815	2257	68161
		Area	14969	21815	36784	32478	45924	49286	164472
		Average	0.49	1.38	0.80	2.72	5.88	21.84	2.41
19	Kolar	Numbers	229083	51950	281033	18316	4069	348	303766
		Area	86975	71247	158222	48489	22196	5173	234080
		Average	0.38	1.37	0.56	2.65	5.45	14.86	0.77
20	Koppal	Numbers	83131	79083	162214	50272	17857	1782	232125
		Area	47101	112565	159666	135144	100418	23173	418401
		Average	0.57	1.42	0.98	2.69	5.62	13.00	1.80
21	Mandya	Numbers	466286	70066	536352	21983	3141	175	561651
		Area	150957	93892	244849	56214	16396	3153	320612
		Average	0.32	1.34	0.46	2.56	5.22	18.02	0.57
22	Mysuru	Numbers	336293	91185	427478	23136	4135	227	454976
		Area	142519	118395	260914	59861	21834	5052	347661
		Average	0.42	1.30	0.61	2.59	5.28	22.26	0.76
23	Raichur	Numbers	110208	92290	202498	62173	29695	4848	299214
		Area	62743	130884	193627	168600	172498	81258	615983
		Average	0.57	1.42	0.96	2.71	5.81	16.76	2.06
24	Ramanagar	Numbers	213400	38624	252024	14095	2737	215	269071

		Area	77295	51964	129259	36466	14760	3358	183843
		Average	0.36	1.35	0.51	2.59	5.39	15.62	0.68
25	Shimogga	Numbers	146306	57199	203505	22777	6906	736	233924
		Area	71256	78866	150122	60270	38687	10787	259866
		Average	0.49	1.38	0.74	2.65	5.60	14.66	1.11
26	Tumakuru	Numbers	301432	123216	424648	65304	22926	2725	515603
		Area	133907	172509	306416	175680	128409	40773	651278
		Average	0.44	1.40	0.72	2.69	5.60	14.96	1.26
27	Udupi	Numbers	151657	23362	175019	10996	3541	326	189882
		Area	47750	31244	78994	28946	19640	5553	133133
		Average	0.31	1.34	0.45	2.63	5.55	17.03	0.70
28	Uttar Kannada	Numbers	151335	31351	182686	12761	3560	234	199241
		Area	46716	43319	90035	33883	19497	3144	146559
		Average	0.31	1.38	0.49	2.66	5.48	13.44	0.74
29	Vijayapur	Numbers	63100	132545	195645	106159	53714	7461	362979
		Area	40237	192391	232628	286134	314345	101619	934726
		Average	0.64	1.45	1.19	2.70	5.85	13.62	2.58
30	Yadagir	Numbers	80151	81160	161311	50588	18753	1971	232623
		Area	44849	117839	162688	137263	106712	26455	433118
		Average	0.56	1.45	1.01	2.71	5.69	13.42	1.86
Karnataka State		Numbers	4767132	2213732	6980864	1192724	451445	55706	8680739
		Area	2080097	3107119	5187216	3188192	2568761	860931	11805100
		Average	0.44	1.40	0.74	2.67	5.69	15.45	1.36

Source: Agricultural Census Report on Operational Holdings in Karnataka 2015-16 Part-I & Part-II published by DES & Statistics and State Agricultural Census Commissioner, Bengaluru, June and November 2019.

The average size of operational holdings declined in all the districts in the 2015-16 census compared to the 2010-11 census. With regard to the total average size of operational holdings, Vijayapura district ranked first in the state with 2.58 hectares, followed by Kodagu with 2.41 hectares, Gadag with 2.18 hectares, Kalaburgi with 2.16 hectares, etc., and Mandya with 0.57 lakh hectares in 2015-16. To describe the spatial pattern of variations in average size of land holdings in the Karnataka state during 2015-16, all the districts are grouped into four categories, namely, very high, high, medium, and low average size of holdings areas, as represented in Fig. 3. The spatial distribution shows that the **very high** average size of holdings category of farmers is more than 2.24 hectares only in Kodagu (2.43) and Vijayapur (2.58) districts, and the **high** average size of

holdings is noticed in the ranges from 1.50 to 2.24 hectares only in Haveri (1.61), Belagavi (1.63), Bellary (1.65), Bidar (1.67), Koppal (1.80), Chitradurga (1.83), Yadagir (1.86), Bagalkot (1.88), Raichur (2.06), Dharwad (2.12), Kalburgi (2.16) and Gadag (2.18) districts of the state. The **medium** average size of holdings ranges from 0.75 to 1.49 hectares in Bengaluru (rural) (0.76), Mysore (0.76), Kolar (0.77), Bengaluru (urban) (0.78), and Dakshina Kannada (0.81). Chikkaballapur (0.83). Hassan (0.83), Chamarajnar (0.94), Shivamogga (1.11), Tumakuru (1.26), Chikkamagalur (1.36), and Davanagere (1.37) districts of the state While Mandya (0.57), Ramanagar (0.68), Udupi (0.70), and Uttara Kannada (0.74) districts of the state registered in **low** (less than 0.74 hectare) average holdings zones.

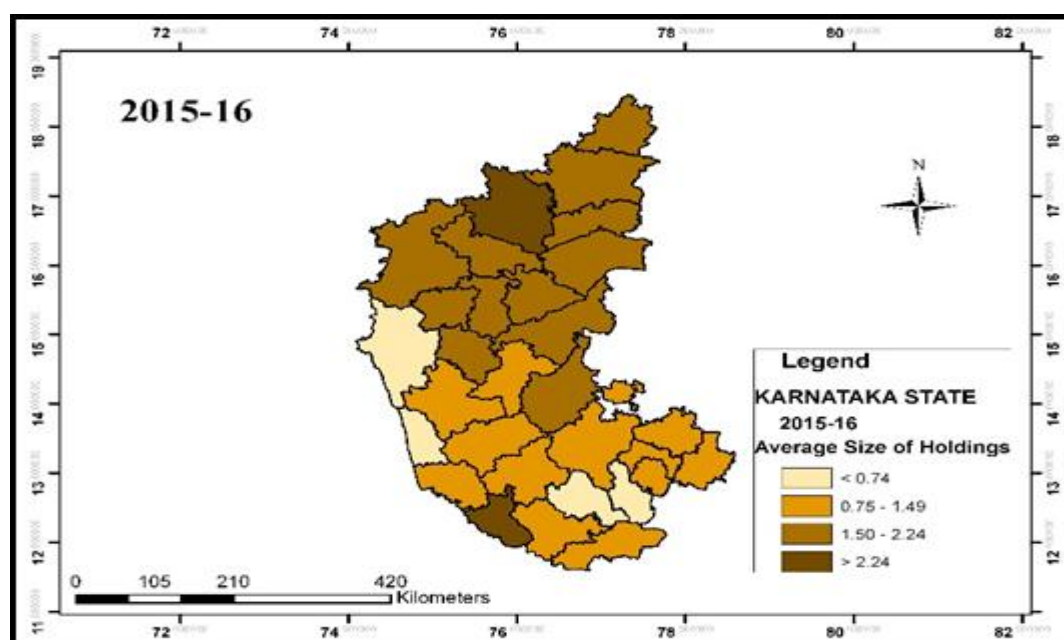


Figure 3: Average Size of Land Holdings in Karnataka State; 2015-16

Table 3: Spatial Distribution of Average Size of Agricultural Land Holdings in Karnataka State, 2015-16

Sl. No	Name of the District	2015-16			2010-11			Changes Over 2010-11		
		No of Holding	Area In Hect	Avg. Size of Holding	No of Holding	Area In Hect	Avg. Size of Holding	No of Holding	Area In Hect	Avg. Size of Holding
1	Belagavi	620	1010	1.63	531	992	1.87	89	18	-0.24
2	Bagalkot	250	470	1.88	228	487	2.14	22	-17	-0.26
3	Vijayapur	363	935	2.58	342	951	2.78	21	-16	-0.20
4	Kalburgi	422	912	2.16	396	938	2.37	26	-26	-0.21
5	Bidar	261	437	1.67	251	452	1.80	10	-15	-0.13
6	Raichur	299	616	2.06	332	696	2.10	-33	-80	-0.04
7	Koppal	232	418	1.80	218	434	1.99	14	-16	-0.19
8	Gadag	179	390	2.18	164	390	2.38	15	0	-0.20
9	Dharwad	162	343	2.12	143	343	2.40	19	0	-0.28
10	Uttara Kannada	199	147	0.74	193	150	0.78	6	-3	-0.04
11	Haveri	229	369	1.61	218	377	1.73	11	-8	-0.12
12	Bellary	316	522	1.65	275	538	1.96	41	-16	-0.30
13	Chitradurga	303	553	1.83	291	561	1.93	12	-8	-0.10
14	Davanagere	289	397	1.37	283	414	1.46	6	-17	-0.09
15	Shivamogga	234	260	1.11	214	262	1.22	20	-2	-0.11
16	Udupi	190	133	0.70	200	150	0.75	-10	-17	-0.05
17	Chikkamagalur	229	312	1.36	223	313	1.40	6	-1	-0.04
18	Tumakuru	516	651	1.26	414	676	1.63	102	-25	-0.37
19	Kolar	304	234	0.77	237	234	0.99	67	0	-0.22
20	Bengaluru (U)	107	83	0.78	81	79	0.98	26	4	-0.20
21	Bengaluru (R)	193	147	0.76	179	152	0.85	14	-5	-0.09
22	Mandya	562	321	0.57	396	309	0.78	166	12	-0.21
23	Hassan	539	449	0.83	436	463	1.06	103	-14	-0.23
24	Dakshina Kannada	209	170	0.81	209	178	0.85	0	-8	-0.04
25	Kodagu	68	165	2.43	69	168	2.43	-1	-3	-0.01
26	Mysuru	455	348	0.76	386	369	0.96	69	-21	-0.19
27	Chamarajanagar	216	203	0.94	212	215	1.01	4	-12	-0.07
28	Ramanagar	269	184	0.68	271	202	0.75	-2	-18	-0.06
29	Chikkaballapur	233	193	0.83	214	226	1.06	19	-33	-0.23
30	Yadgir	233	433	1.86	226	442	1.96	7	-9	-0.10
	State	8681	11805	1.36	7832	12161	1.55	849	-356	-0.19

Source: Agricultural Census Report on Operational Holdings in Karnataka 2015-16 Part-I & Part-II published by DES & Statistics and State Agricultural Census Commissioner, Bengaluru, June and November 2019

The spatial pattern of changes in average size of land holdings during 2015-16 over in 2010-11 in the Karnataka state displays varies from a least of -0.09 hectares in Davanagere district to a highest of -0.37 hectares in Tumakuru district of the state (Table-3 and Fig.4). To describe of the spatial distribution, it has grouped conveniently into four categories and it shows that, very high zone noticed (more than -0.30 ha) in Bellary (-0.30) and Tumakuru (-0.37) districts, high (-0.20 to -0.29) in Dharwad (-0.28), Bagalkot (-0.26), Belagavi (-0.24) Hassan (-0.23), Chikkaballapur (-0.23), Kolar (-0.22), Mandya (-

0.21), Kalburgi (-0.21), Vijayapur (-0.20), Bengaluru (Urban) (-0.20) and Gadag (-0.20) districts, medium (-0.10 to -0.19) only in Mysore (-0.19), Koppal (-0.19), Bidar (-0.13), Haveri (-0.12), Shivamogga (-0.11), Chitradurga (-0.10) and Yadgir (-0.10) districts, while ten districts of the state namely Davanagere (-0.09), Bengaluru (Rural) (-0.09), Chamarajanagar (-0.07), Ramanagar (-0.06), Udupi (-0.05), Chikkamagalur (-0.04), Uttara Kannada (-0.04), Dakshina Kannada (-0.04), Raichur (-0.04) and Kodagu (-0.01) observed in low (Less than -0.09) zone of the Karnataka state (Fig-4).

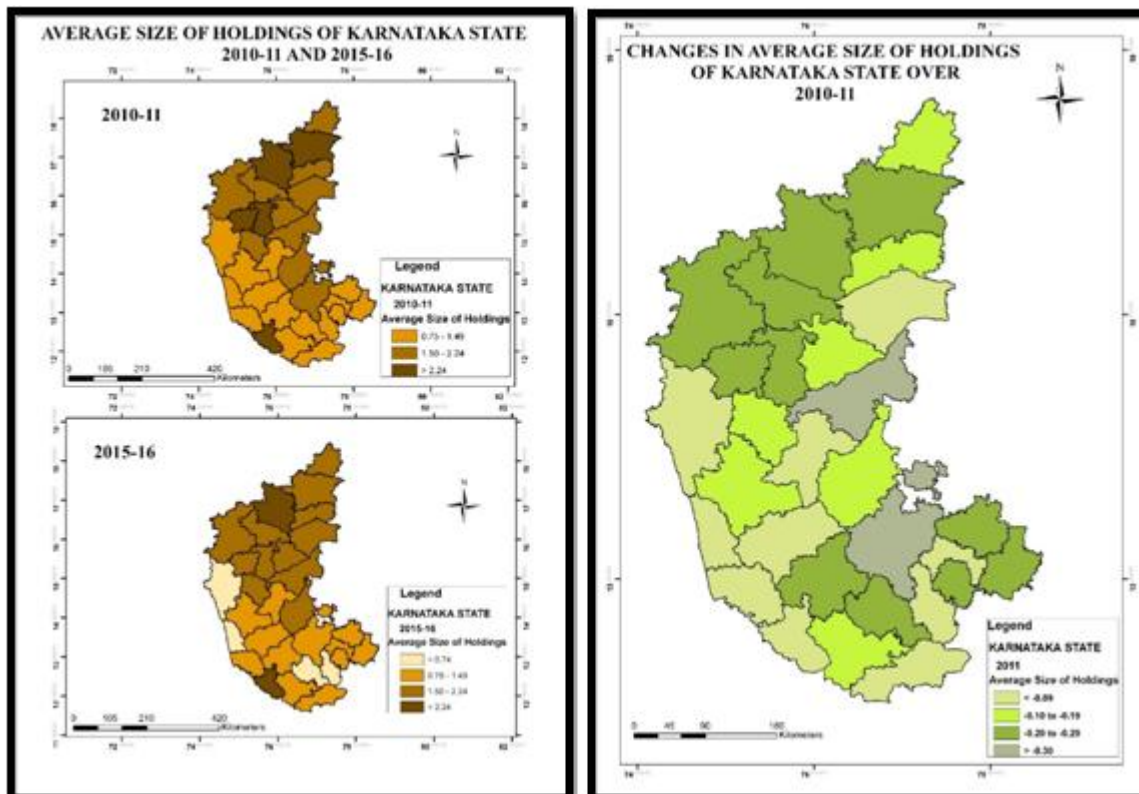


Figure 4: Changes in Average Size of Land Holdings in Karnataka State over 2010-11

5.3 Changes in Size-Distribution of Holdings:

To have a factual knowledge of the process of sub-division of holdings, information pertaining to them at ten censuses of the Karnataka state has been presented in Tables 4 to 5 and Fig. 4. It is very clear from the tables and figures that the number and area of operational holdings falling in the marginal, small, and semi-medium classes have been increasing at the expense of medium and large holdings. But the average size of respective groups has been decreasing in the state during the study period. Thus, under optimal holdings, holdings are multiplying, which still degrades the situation. During the first Agricultural Census 1970–71, the

number of operational holdings in Karnataka state, which was 35.51 lakh, increased by over 144.47 percent compared to the tenth Agricultural Census 2015–16 figures of 86.81 lakh holdings (Table 4 and Fig. 5).

Among the five major size classes of holdings, marginal holdings (less than one hectare) account for a maximum share of 54.92 percent of the total number of holdings, followed by small holdings (one to two hectares) at 25.50 percent, semi-medium holdings (two to four hectares) at 13.74 percent, medium holdings (four to ten hectares) at 5.20 percent, and large holdings (more than ten hectares and above) at 0.64 percent, being the least in 2015-16.

Table 4: Trends in Number of Operational Holdings according to Major Size Classes of Agricultural Censuses in Karnataka State from 1970-71 to 2015-16

Sl. No	Size Class	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2001-11	2015-16	Changes Over 1970-71
1	Marginal	1081	1274	1489	1792	2262	2610	3252	3655	3849	4767	3686
	In %	30.44	33.43	34.56	36.43	39.16	41.95	45.94	48.21	49.14	54.91	71.85
% variation over preceding censuses			17.85	16.88	20.35	26.23	15.38	24.60	12.39	5.31	23.85	340.98
2	Small	840	888	1057	1293	1586	1707	1909	2014	2138	2214	1374
	In %	23.66	23.30	24.53	26.29	27.46	27.44	26.97	26.57	27.30	25.50	26.78
% variation over preceding censuses			5.71	19.03	22.33	22.66	7.63	11.83	5.50	6.16	3.55	163.57
Marginal & Small		1921	2162	2546	3085	3848	4317	5161	5669	5987	6981	5060
In %		54.10	56.73	59.09	62.72	66.62	69.39	72.91	74.78	76.44	80.42	98.64
% variation over preceding censuses			12.55	17.76	21.17	24.73	12.19	19.55	9.84	5.61	16.60	263.40
3	Semi Medium	788	818	918	1035	1163	1204	1259	1278	1267	1193	405
	In %	22.19	21.46	21.30	21.04	20.14	19.35	17.78	16.86	16.18	13.74	7.89
% variation over preceding censuses			3.81	12.22	12.75	12.37	3.53	4.57	1.51	-0.86	-5.84	51.40
4	Medium	623	632	662	646	636	594	569	555	511	451	-172
	In %	17.54	16.58	15.36	13.13	11.01	9.55	8.04	7.32	6.52	5.20	-3.35
% variation over preceding censuses			1.44	4.75	-2.42	-1.55	-6.60	-4.21	-2.46	-7.93	-11.74	-27.61
5	Large	219	199	183	153	129	106	90	79	67	56	-163
	In %	6.17	5.22	4.25	3.11	2.23	1.70	1.27	1.04	0.86	0.65	-3.18
% variation over preceding censuses			-9.13	-8.04	-16.39	-15.69	-17.83	-15.09	-12.22	-15.19	-16.42	-74.43

	All Classes	3551	3811	4309	4919	5776	6221	7079	7581	7832	8681	5130
	In %	100	100	100	100	100	100	100	100	100	100	100
	% variation over preceding censuses		7.32	13.07	14.16	17.42	7.70	13.79	7.09	3.31	10.84	144.47

Source: Agricultural Census Report on Operational Holdings in Karnataka 2015-16 Part-I & Part-II published by DES & Statistics and State Agricultural Census Commissioner, Bengaluru, June and November 2019.

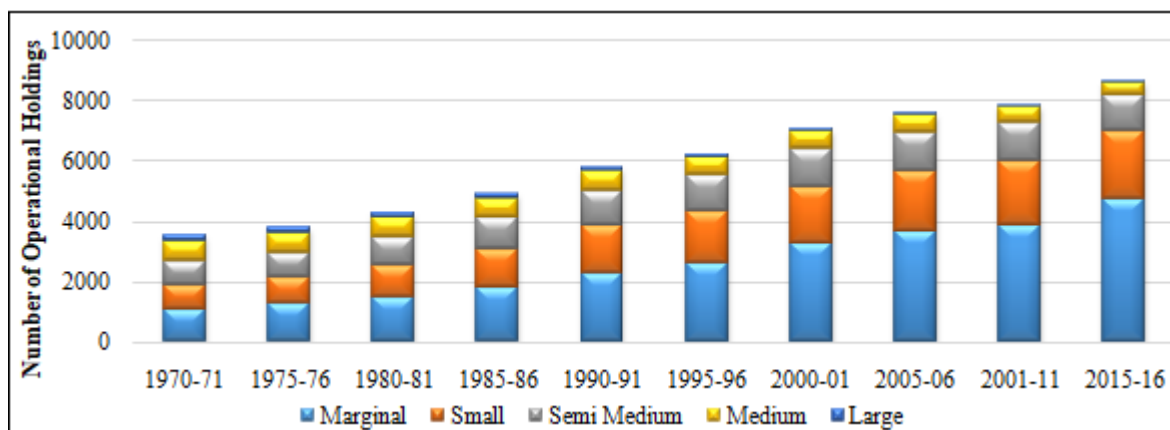


Figure 5: Trends in Number of Operational Holdings according to Major Size Classes in Karnataka State:1970-71 to 2015-16

Regarding the area operated, during the first census of 1970–71, it was 113.68 lakh hectares and increased to 118.05 lakh hectares during the 2015–16 census, with an increase of about 3.84 percent (Table.5 and Fig.6). The trend in the area operated during the first agriculture census in 1970–71 shows a slight decrease of 0.10 percent compared to the 1976–77 census. An increasing trend was observed during the subsequent three censuses (1980–81, 1985–86, and 1990–91), and once again in the 1995–96 census, it fell marginally by 1.72 percent and then increased by 1.64 and 0.63 percent during the 2000–01 and 2005–06 censuses, respectively, and it marginally fell by 1.80 and 2.94 percent during 2010–11 and 2015–16, respectively.

The number of marginal size class holdings has increased from 10.81 lakhs in the 1970–71 census to 47.67 lakhs in the 2015–16 census by around 71.85 percent, and the area of operational holdings has also increased from 5.49 lakh hectares in 1970–71 to 20.80 lakh hectares in 2015–16 by

350.34 percent. In the case of the large-size class holdings, both the number and area of operational holdings have considerably decreased. The number of operational holdings has come down from 2.19 lakhs in the 1970–71 census to 0.56 lakhs in 2015–16 by 3.18 percent. Similarly, the area has decreased from 36.01 lakh hectares to 8.61 lakh hectares by 627.00 percent compared to the current and previous censuses. However, in respect of small size classes, the number and area of operational holdings have shown an increasing trend compared to the previous census, i.e., the number and area of operational holdings have increased by 26.78 and 431.58 percent, respectively. Under the semi-medium size class, the number and area of operational holdings have shown an increase of 7.89 and 224.94 percent, respectively. Similarly, in the case of medium-sized class holdings, the number and area of operational holdings decreased by 3.35 percent and 279.86 percent, respectively, between the 1970–71 and 2015–16 censuses.

Table 5: Trends in Area of Operational Holdings according to Major Size Classes of Agricultural Censuses in Karnataka State from 1970-71 to 2015-16

Sl. No	Size Class	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2001-11	2015-16	Changes Over 1970-71
1	Marginal	549	638	733	866	1072	1248	1492	1651	1851	2080	1531
	In %	4.83	5.62	6.24	7.29	8.70	10.31	12.12	13.33	15.22	17.62	350.34
% variation over preceding censuses			17.85	16.88	16.21	14.89	18.14	23.79	16.42	19.55	10.66	12.11
2	Small	1221	1319	1543	1888	2308	2480	2742	2876	3020	3107	1886
	In %	10.74	11.61	13.14	15.89	18.73	20.48	22.28	23.22	24.83	26.32	431.58
% variation over preceding censuses			5.71	19.03	8.03	16.98	22.36	22.25	7.45	10.56	4.89	5.01
Marginal & Small		1770	1957	2276	2754	3380	3728	4234	4527	4871	5187	3417
In %		15.57	17.23	19.38	23.18	27.43	30.79	34.40	36.55	40.05	43.94	781.92
% variation over preceding censuses			12.55	17.76	10.56	16.30	21.00	22.73	10.30	13.57	6.92	7.60
3	Semi Medium	2205	2288	2572	2880	3200	3298	3429	3468	3393	3188	983
	In %	19.40	20.15	21.90	24.24	25.97	27.24	27.86	28.00	27.90	27.01	224.94
% variation over preceding censuses			3.81	12.22	3.76	12.41	11.98	11.11	3.06	3.97	1.14	-2.16
4	Medium	3792	3858	4018	3881	3770	3490	3317	3206	2904	2569	-1223
	In %	33.36	33.97	34.21	32.67	30.60	28.82	26.95	25.89	23.88	21.76	-279.86
% variation over preceding censuses			1.44	4.75	1.74	4.15	-3.41	-2.86	-7.43	-4.96	-3.35	-9.42
5	Large	3601	3254	2880	2364	1971	1593	1327	1184	994	861	-2740
	In %	31.68	28.65	24.52	19.90	16.00	13.16	10.78	9.56	8.17	7.29	-627.00

% variation over preceding censuses		-9.13	-8.04	-9.64	-11.49	-17.92	-16.62	-19.18	-16.70	-10.78	-16.05
All Classes	11368	11357	11746	11879	12321	12109	12307	12385	12162	11805	437
In %	100	100	100	100	100	100	100	100	100	100	100
% variation over preceding censuses		7.32	13.07	-0.10	3.43	1.13	3.72	-1.72	1.64	0.63	-1.80

Source: Agricultural Census Report on Operational Holdings in Karnataka 2015-16 Part-I & Part-II published by DES & Statistics and State Agricultural Census Commissioner, Bengaluru, June and November 2019.

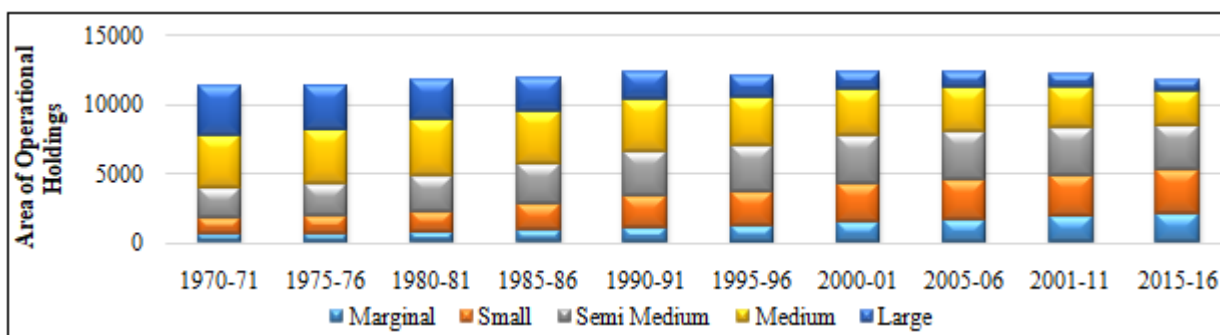


Figure 6: Trends in Area of Operational Holdings according to Major Size Classes in Karnataka State:1970-71 to 2015-16

The trend of the average size of operational holdings was gradually decreasing at every census period. It may be noted that the average size of operational holdings, which was 3.20 hectares in the first Agricultural Census of 1970–71, has decreased to 1.36 hectares during the 2015–16 census, indicating a shortfall of 57.52 percent, which is mainly due to sub-division and fragmentation of land holdings. This trend is common in every Agricultural Census (Table 6 and Fig. 7). One notable feature is that the average size of holdings increases with an increase in size classes. The

marginal size class showed the minimum of 0.44 hectares of average size holdings, followed by small size class holdings of 1.40 hectares, semi-medium size class 2.67 hectares, medium size class 5.69 hectares, and large size class 15.45 hectares, which is observed to be the maximum. The decrease in average holding size between the two censuses is very insignificant in the case of marginal (-0.07 ha), small (-0.05 ha), and semi-medium (-0.13 ha) size classes. It has further decreased in the large size class (-1.07 ha), and it remains the same in the medium category (-0.39 ha).

Table 6: Trends in Average Size of Operational Holdings according to Major Size Classes of Agricultural Censuses in Karnataka State from 1970-71 to 2015-16

Sl. No	Size Class	1970-71	1975-76	1980-81	1985-86	1990-91	1995-96	2000-01	2005-06	2001-11	2015-16	Changes Over 1970-71
1	Marginal	0.51	0.50	0.49	0.48	0.47	0.48	0.46	0.45	0.48	0.44	-0.07
	% variation over preceding censuses		-1.39	-1.70	-1.83	-1.93	0.90	-4.05	-1.54	6.46	-9.27	-14.08
2	Small	1.45	1.49	1.46	1.46	1.46	1.45	1.44	1.43	1.41	1.40	-0.05
	% variation over preceding censuses		2.19	-1.72	0.03	-0.34	-0.16	-1.13	-0.58	-1.08	-0.65	-3.46
	Marginal & Small	1.96	1.99	1.95	1.94	1.93	1.93	1.90	1.88	1.89	1.84	-0.12
	% variation over preceding censuses		1.26	-1.72	-0.44	-0.73	0.10	-1.86	-0.81	0.73	-2.84	-6.21
3	Semi Medium	2.80	2.80	2.80	2.78	2.75	2.74	2.72	2.71	2.68	2.67	-0.13
	% variation over preceding censuses		-0.04	0.17	-0.68	-1.12	-0.45	-0.57	-0.37	-1.31	-0.21	-4.50
4	Medium	6.09	6.10	6.07	6.01	5.93	5.88	5.83	5.78	5.68	5.70	-0.39
	% variation over preceding censuses		0.29	-0.57	-1.02	-1.33	-0.88	-0.78	-0.91	-1.62	0.23	-6.41
5	Large	16.44	16.35	15.74	15.45	15.28	15.03	14.74	14.99	14.84	15.38	-1.07
	% variation over preceding censuses		-0.55	-3.76	-1.82	-1.11	-1.64	-1.89	1.65	-1.01	3.63	-6.49
	All Classes	3.20	2.98	2.73	2.41	2.13	1.95	1.74	1.63	1.55	1.36	-1.84
	% variation over preceding censuses		-6.91	-8.53	-11.41	-11.67	-8.75	-10.68	-6.03	-4.95	-12.43	-57.52

Source: Agricultural Census Report on Operational Holdings in Karnataka 2015-16 Part-I & Part-II published by DES & Statistics and State Agricultural Census Commissioner, Bengaluru, June and November 2019.

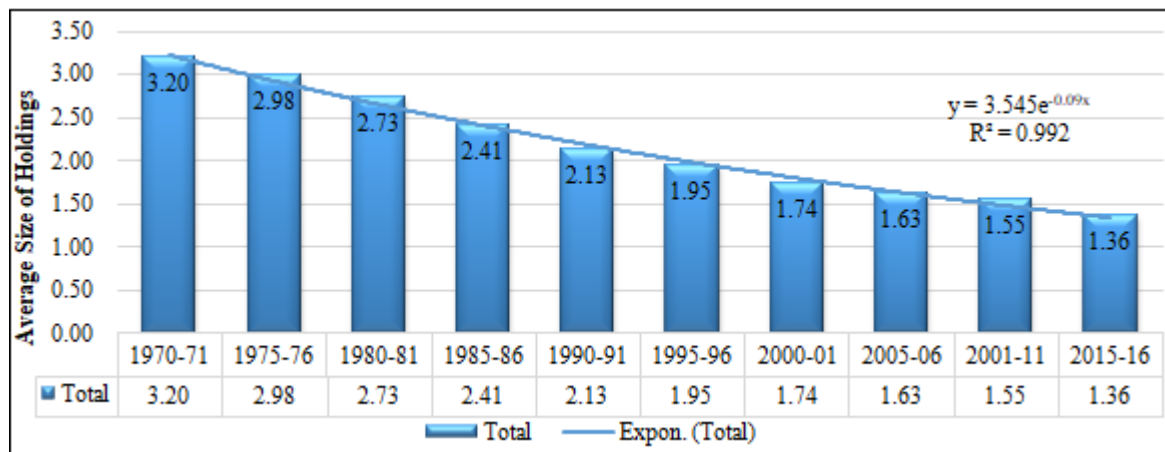


Figure 7: Trends in Average Size of Operational Holdings in Karnataka State:1970-71 to 2015-16

6. Policies & Programmes

The multi-pronged strategy for agricultural development now comprises focusing on agricultural growth through sustainable use of natural resources such as land and water while at the same time taking steps to improve the socio-economic conditions of agriculturalists. Innovative approaches are being adopted for better management of the farming sector. Importance is being placed on improved institutions and organisations so that farmers' welfare is built into the system. Several steps are being taken to strengthen diverse aspects of the agricultural system, mainly through land reforms. Some of the prime initiatives introduced by the government of India have been listed below.

The National Policy for Farmers 2007 (NPF 2007), formulated by the Ministry of Agriculture and Farmers Welfare, recommended that "prime farmland must be conserved for agriculture except under exceptional circumstances, provided that the agencies that are provided with agricultural land for non-agricultural projects should compensate for treatment and full development of equivalent degraded or wastelands elsewhere. For non-agricultural purposes, as far as possible, land with low biological potential for farming would be earmarked and allocated". State governments have been advised to " earmark lands with low biological potential, such as uncultivable land, land affected by salinity, acidity, etc., for non-agricultural development activities, including industrial and construction activities".

Similarly, the **National Rehabilitation and Resettlement Policy, 2007 (NRRP)**, formulated by the Department of Land Resources, Ministry of Rural Development, recommends that only the minimum area of land commensurate with the purpose of a project may be acquired. Also, as far as possible, industrial projects may be set up on wasteland, degraded land, or unirrigated land. Acquisition of agricultural land for non-agricultural use in the project may be kept to the minimum; multi-cropped land may be avoided to the extent possible for such purposes; and acquisition of irrigated land, if unavoidable, may be kept to the minimum.

In addition, the **Right to Compensation, Transparency in Land Acquisition, Rehabilitation, and Resettlement Act** encompasses proper rehabilitation and resettlement, fair compensation, and some degree of restriction in the diversion of agricultural land.

1) Way Forward for Policy Implications:

The present study has suggested the following possible policy initiatives that could be considered for the better management of land resources in the river basin: The findings could be utilised for evolving long-term measures for sustainable land use by planners, policymakers, and other agencies and institutions. Agriculture, being one of the most important sectors, necessitates an appropriate policy vision to redeem the agricultural sector from stagnation and instability and put it on the stream of sustainable growth on the one hand and to assert the ongoing tendency of the large-scale commercialization of agriculture on the other. The implications of the study are briefly presented below.

- **Land Use: Policy** For proper management of natural resources and to ensure sustainable agricultural growth in the country, there is a need for a clear land use policy. As per the Seventh Schedule of the Constitution of India, land and water fall under the purview of state governments, and it is for states to bring about suitable legislation for regulating the conversion of agricultural land into non-agricultural purposes. Land use planning should be integrated with all developmental programmes, especially the MNREGA, for holistic rural development, natural resource management, and eco-restoration.
- **Land Reform:** Considering the skewed ownership pattern of land, it is necessary to strengthen the implementation of laws relating to land reforms, with particular reference to tenancy laws, leasing, facilitation of contract farming, distribution of ceiling-surplus land and wasteland, providing adequate access to common property and wasteland resources, and consolidation of holdings.
- **Control on Fragmentation of Land:** Land fragmentation leads to a reduction in landholding size and makes it uneconomical for optimal farm operations, the application of science and technology, and mechanisation. Besides, fragmentation necessitates too many field boundaries and bunds and leads to the wastage of land. Therefore, laws ensuring reforms in land tenancy rules and automatic land rights inheritance need to be legislated to encourage sharecropping and

contract farming and to render physical boundaries and fencing irrelevant.

- Revisiting various succession acts: Multiple succession acts need to be revised, and a common succession act needs to be put in place for smooth inheritance. It is necessary to ensure that land rights go to the inheritors, but land fragmentation is avoided.
- Control on Fragmentation of Land: Land fragmentation leads to a reduction in landholding size and makes it uneconomical for optimal farm operations, the application of science and technology, and mechanisation. Besides, fragmentation necessitates too many field boundaries and bunds and leads to the wastage of land. Therefore, laws ensuring reforms in land tenancy rules and automatic land rights inheritance need to be legislated to encourage sharecropping and contract farming and to render physical boundaries and fencing irrelevant.
- Policy on Diversion of Land and Land Tenancy: Productive agricultural land should not be diverted to industrial or urbanisation activities. In cases of extreme national need, it should be stipulated that industries provided with agricultural or other land for development projects compensate for the treatment and full development of the equivalent degraded land or wasteland elsewhere. Each state should promulgate land tenancy legislation or policy so that tenants instead of landowners can benefit from the various subsidy and crop insurance programmes and, therefore, tenant land is put to crop production.

7. Conclusions

Land and water are the two most important natural resources for the development of agriculture. The success of agriculture mainly depends on the proper and scientific utilisation of these resources. The present paper has analysed the trend and inequality analysis of the size of operational holdings in Karnataka state across ten census periods (i.e., from 1970–71 to 2015–16). The entire 86.81 lakh holdings spread across 118.05 lakh hectares of the operated area come under the "wholly owned and self-operated" holdings. Though wholly owned and self-operated holdings of marginal and small farmers (i.e., holdings of 0.01 to 1.99 hectares) account for more than two thirds (80.42%) of the total holdings under all categories, the area operated by them is more than one third (43.94%) of the total area operated in 2015-16. During the first Agricultural Census 1970–71, the number of operational holdings in Karnataka state, which was 35.51 lakh, increased by over 144.47 percent compared to the tenth Agricultural Census 2015–16 figures of 86.81 lakh holdings. Regarding the area operated, during the first census of 1970–71, it was 113.68 lakh hectares and increased to 118.05 lakh hectares during the 2015–16 census, with an increase of about 3.84 percent. For the state as a whole, the Gini-coefficient of concentration degree of inequality in the distribution of operated land has declined from 0.5399 percent in 1970–71 to 0.4909 percent in 2015–16.

The trend of the average size of operational holdings was gradually decreasing at every census period. It may be noted that the average size of operational holdings, which was 3.20 hectares in the first Agricultural Census of 1970–71, has

decreased to 1.36 hectares during the 2015–16 census, indicating a shortfall of 57.52 percent, which is mainly due to sub-division and fragmentation of land holdings. The variations in number and area of operational holdings falling into marginal, small, and semi-medium classes have been increasing at the expense of medium and large holdings. But the average size of respective groups has been decreasing in the state during the study period, i.e., from 1970–71 to 2015–16. Thus, under optimal holdings, holdings are multiplying, which still degrades the situation.

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