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## Temporal study of land utilization pattern and crop diversification in India

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### Abstract

The absolute geological space of India is 328.73 million hectares (mha) out of that 307.82 mha region announced for land usage (2015). India is independent in food grain creation and with around 284 million tones food grains stand second biggest food grains maker on the planet (2019). India previously accomplished food security yet for the issue of healthful security still a long ways behind the objective line. To accomplish the healthful security crop enhancement assumes a significant part (Ebert). Fuse of high esteemed harvests in sustenance just as compensation to customary crops. The information has been gathered from different auxiliary sources. Five decadal information of land usage and rate region covered by various food and non-food crops have been taken for this exploration. To examine the transient change in crop enhancement Herfindahl Index (HI) was utilized (Malik). During 1950-51 to 2014-15, the net region planted extensively expanded. The region under sugarcane, absolute sauces and flavors, all out leafy foods, all out oilseeds, complete filaments and grain crops have been expanded. While, the region under absolute cereals and millets, all out beats, other food crops and other non-food crops have been diminished. The worth of Herfindahl Index (HI) has been diminishing constantly. It shows the horticulture design changed from customary to business in India.

**Keywords:** Land utilization pattern, crop diversification, food grains, India

### Introduction

India is basically an agrarian country. In the midst of blossoming populace and changes in the economy, agribusiness is agreed high need to maintain food and dietary security and generally speaking financial improvement in our country. Aside from a wellspring of food, farming gives job to 44.5% of India's labor force. During 2018-19, India created 285 million tons (Mt) of food grains from the net developed space of around 140 million hectare (M ha)<sup>-1</sup>. It is extended that in 2050 the nation would need around 350 Mt of food grains to feed the developing population. Further, food utilization design is changing towards high-esteemed horticultural items which are more assets escalated. Against the rising interest and changing food utilization design, the normal assets supporting rural creation, like soil and water, have been contracting after some time. Thus, food grain creation should be expanded without upsetting the maintainability of regular assets. Among a few measures, realigning existing trimming designs with the accessibility of regular assets is given high need. Frequently, it is recommended to differentiate trimming design from high water-expecting harvests to less water requiring crops dependent on examination of yield and water profile at the territorial level. Land, water and sun powered radiation are the center normal assets fundamental for fruitful yield production<sup>4,5</sup>. Effective utilization of these assets in crop creation is the need of great importance to satisfy the food need of the everincreasing populace in India. In this unique circumstance, trimming power (proportion of gross edited region to net trimmed region) is a broadly utilized marker of land usage for future rural water the board and yield expansion arranging. The trimming force is the proportion between net trimmed region and net edited region, and consequently it gives a thought regarding usage proficiency of the land. Notwithstanding, the understanding of editing power alone may not give a total image of land-use proficiency, as it doesn't consider the sun based energy outfitting period.

Farming contributes about 15% offer in public GDP. Being a second biggest crowded country on the planet the food prerequisites is so high. To take care of the enormous 1.35 billion individuals, requires increasingly more cultivable land. After autonomy the industrialization and creating framework has been caught huge arable land. As the streets, rail lines and other assembling ventures has fostered the arable region has been contracting strongly. The complete topographical space of India is 328,73 mha out of that 307.82 mha region detailed

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for land use. India is independent in food grain creation and with around 284 million tones food grains stand biggest food grains maker on the planet. India previously accomplished food security however for the question of nourishing security still a long ways behind the objective line. To accomplish the dietary security crop enhancement assumes a significant part. Joining of high esteemed harvests in nourishment just as compensation to conventional yields. Harvest enhancement guarantees the dietary security, limits the homestead dangers and increment economical pay.

**Materials and Methods**

The information has been gathered from different optional sources. Five decadal information of land use and rate region covered by various food and non-food crops have been taken for this examination. To investigate the worldly change in crop broadening Herfindahl Index (HI) was utilized. The HI was utilized as follows:

$$HI = \sum p_i^2$$

$$p_i = a_i \div \sum a_i$$

Where,

$p_i$ : the proportion of area covered by  $i_{th}$  crop

$a_i$ : area covered by  $i_{th}$  crop

The value of HI ranges between 0 to 1. Zero indicates complete diversification and one indicates the complete specialization.

**Land utilization pattern in India**

The announcing region grouped into general class's viz., total cropped area, net area sown, forest, not available for cultivation, other uncultivated land and fallow lands (Gupta and Sharma). The examination of table 1 demonstrates that detailing region for land use out of complete geological region ceaselessly increments. The revealing region for land use was 284.32 mha in 1950-51 which was expanded to 307.82 mha in 2014-15. The woodland region has been expanded more than 1.5 occasions from 40.48 mha in 1950-51 to 71.79 mha in 2014-15. The land not accessible for development has diminished from 47.52 mha in 1950-51 to 43.88 mha in 2014-15. Region under non-agrarian utilizations expanded threefold from 9.36 million hectare in 1950-51 to 26.88 mha in 2014-15. The infertile and unculturable land pointedly diminished from 38.16 mha in 1950-51 to 17 mha in 2014-15. Other crude land barring decrepit diminished by very nearly 100 % from 49.45 mha in 1950-51 to 25.83 mha in 2014-15. Lasting field and other nibbling land extensively expanded from 6.68 mha in 1950-51 to 10.26 mha in 2014-15. Land under different tree crops and forests excluded from net region planted diminished multiple times from 19.83 mha in 1950-51 to 3.1 mha in 2014-15. The region under culturable waste land diminished strongly from 22.94 mha in 1950-51 to 12.47 mha in 2014-15. Neglected terrains nearly stay consistent from 28.12 mha in 1950-51 to 26.18 mha in 2014-15. The net region planted extensively expanded from 118.75 mha in 1950-51 to 140.13 mha in 2014-15.

**Table 1:** Agricultural Land by use in India (million hectare)

Classification	1950-51	1990-91	2000-01	2010-11	2014-15
Total Area	328.73	328.73	328.73	328.73	328.73
Reported Area for Land Utilization (1 to 5)	284.32	304.86	305.19	307.48	307.82
1. Forest	40.48	67.81	69.84	71.59	71.79
2. Not Cultivable Land Available (a+b)	47.52	40.48	41.23	43.58	43.88
(a) Non- Agricultural Land	9.36	21.09	23.75	26.4	26.88
(b) Barren and Un-cultivable Land	38.16	19.39	17.48	17.18	17
3. Other Uncultivable land except Fallow Land (a+b+c)	49.45	30.22	27.74	26.15	25.83
(a) Permanent Pasture and Grazing Land	6.68	11.4	10.66	10.3	10.26
(b) Land under Miscellaneous Tree Crops and Marine Groves excluded in Net Area Sown	19.83	3.82	3.44	3.2	3.1
(c) Culturable Waste Land	22.94	15	13.63	12.65	12.47
4. Fallow Lands (a+b)	28.12	23.37	25.04	24.6	26.18
(a) Fallow Lands except present Fallows	17.45	9.66	10.27	10.32	11.09
(b) Current Fallows	10.68	13.7	14.78	14.28	15.09
5. Net Area Sown (6+7)	118.75	143	141.34	141.56	140.13
6. Gross Cropped Area	131.89	185.74	185.34	197.68	198.36
7. Area Sown more than once	13.15	42.74	44	56.12	58.23
8. Cropping Intensity	111.07	129.89	131.13	139.64	141.55
Net Irrigated Area	20.85	48.02	55.2	63.67	68.38
Gross Irrigated Area	22.56	63.2	76.19	88.94	96.46

Source: Land Use Statistics 2014-15, Directorate of Economics & Statistics

As contrast year 1950-51 with year 2014-15, the gross edited region expanded extensively from 131.89 mha to 198.36 mha. Region planted more than once expanded over 200% as 13.15 mha in 1950-51 to 58.23 mha 2014-15. Editing power expanded from 111.07 mha in 1950-51 to 141.55 mha in 2014-15. Net inundated region expanded multiple occasions from 20.85 mha in 1950-51 to 68.38 mha in 2014-15. The gross inundated region strongly expanded multiple occasions

from 22.56 mha in 1950-51 to 96.46 mha in 2014-15. The figure 1. Portrays as contrast 1950-51 with 2014-15, the net region planted and region under timberland expanded from 42% to 46% and 14% to 23% separately. Additionally, for same transient period the region under decrepit land, not accessible for development and other uncultivable land barring neglected diminished from 10% to 9%, 17% to 14% and 17% to 8% individually.

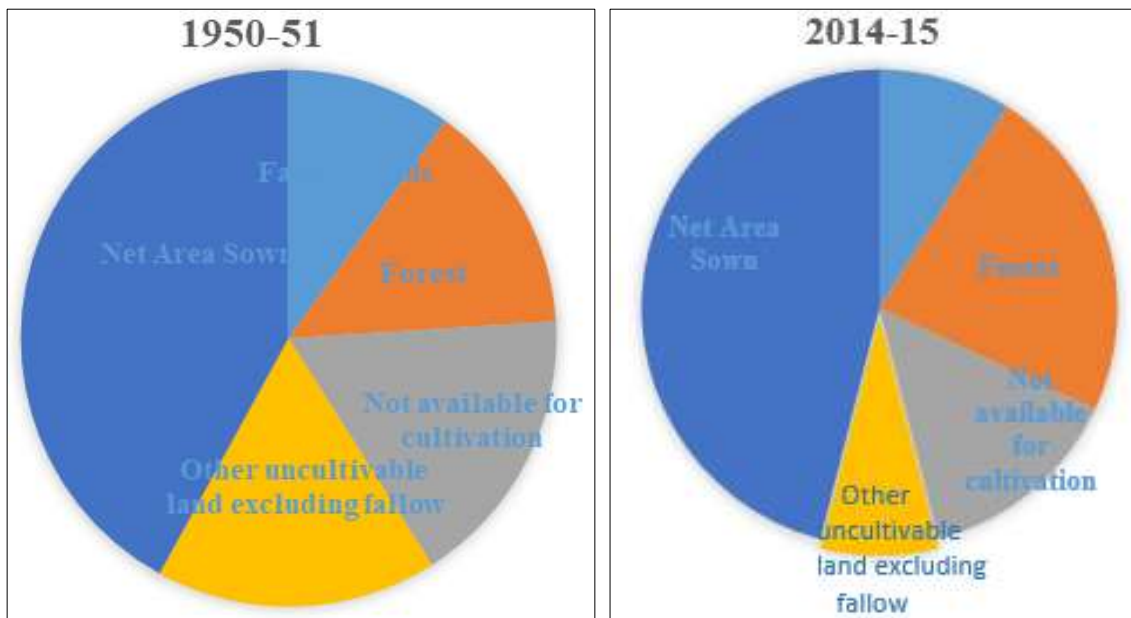


Fig 1: Agriculture Land by Use in India

**Trends of crop diversification**

The extent of region covered by various food crops and non-food crops portrays in table 2. For the worldly investigation of region shared by crops have been taken for the time of 1950-

51, 1960-61, 1970-71, 1980-81, 1990-91, 2000-01, 2010-11 and 2014-15. The worldly information of most recent eighty years shows the reasonable patterns of region covered by various yields.

Table 2: Percentage area share of different crops

Crops	1950-51	1960-61	1970-71	1980-81	1990-91	2000-01	2010-11	2014-15
Total Cereals & Millets	61.1	60.3	61.4	60.9	55.5	54.9	51.8	51.8
Total Pulses	15.6	15.5	13.9	13.3	13.4	11.6	12.8	10.9
Sugarcane	1.3	1.6	1.6	1.8	2.1	2.5	2.8	2.8
Total Condiments and Spices	0.9	1.1	1.1	1.3	1.4	1.5	1.7	1.7
Total Fruits & Vegetables	1.7	1.7	2.2	2.9	3.6	4.6	4.8	5.2
Other Food Crops	0.6	0.8	0.2	0.2	0.1	0.1	0.1	0.1
Total Oilseeds	8.3	8.4	8.9	9.1	13.6	13.3	14.6	14.5
Total Fibres	5.1	5.7	5.9	5.3	4.8	5.4	6.3	6.8
Fodder Crops	3.3	3.8	4.2	4.7	4.7	5	4.2	4.7
Other Non-Food Crops	2.1	1.1	0.6	0.5	0.8	1.1	0.9	1.5
HI	0.409	0.400	0.410	0.403	0.351	0.341	0.315	0.312

It is evident from table 2, fig. 2a and fig. 2b that the area under total cereals & millets and total pulses decreased

continuously during 1950-51 to 2014-15.

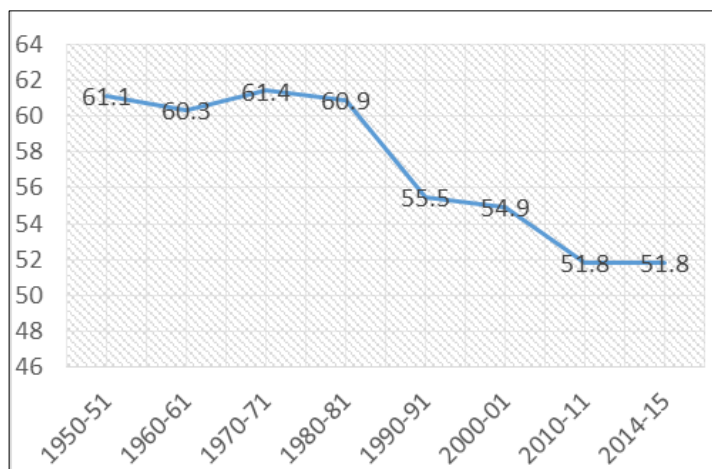


Fig 2a: Total Cereals & Millets

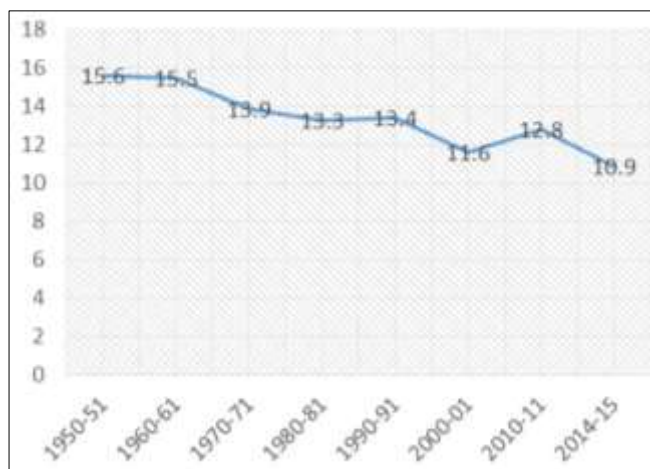
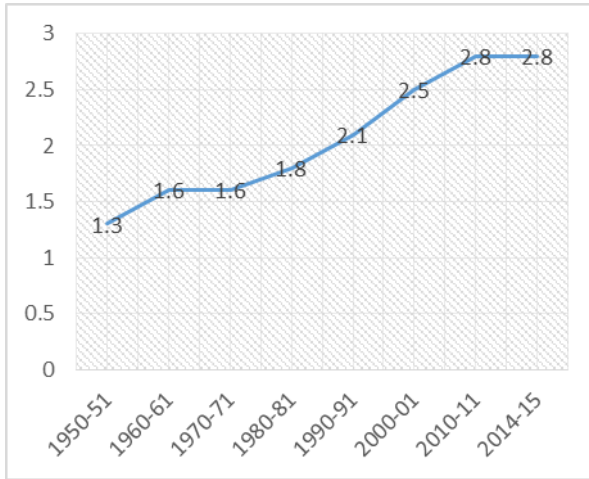
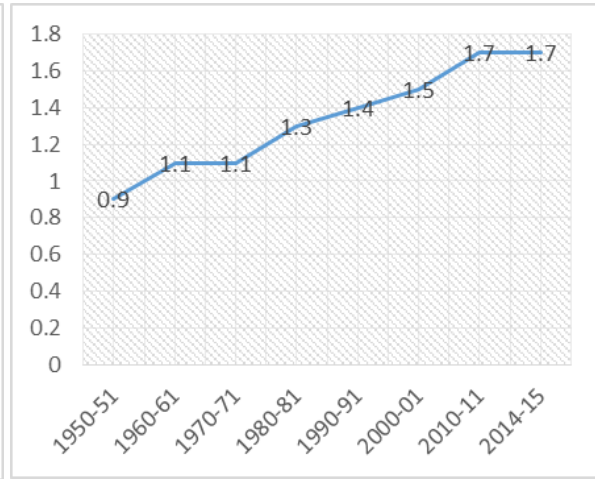


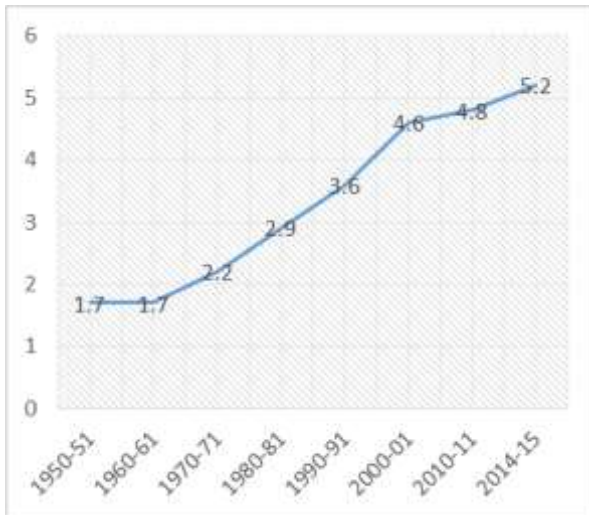
Fig 2b: Total Pulses



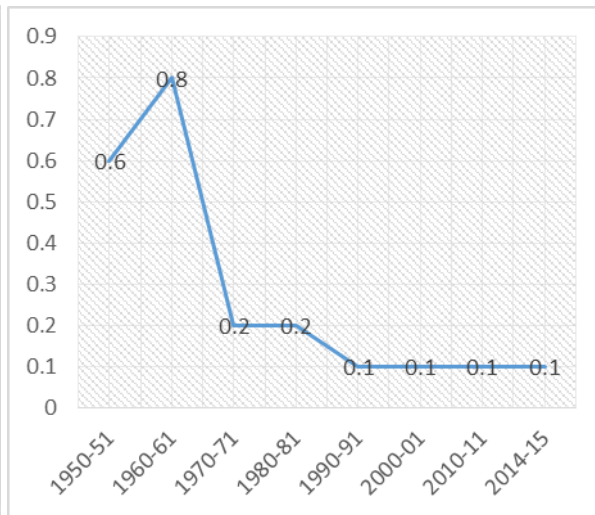
**Fig 2c:** Sugarcane



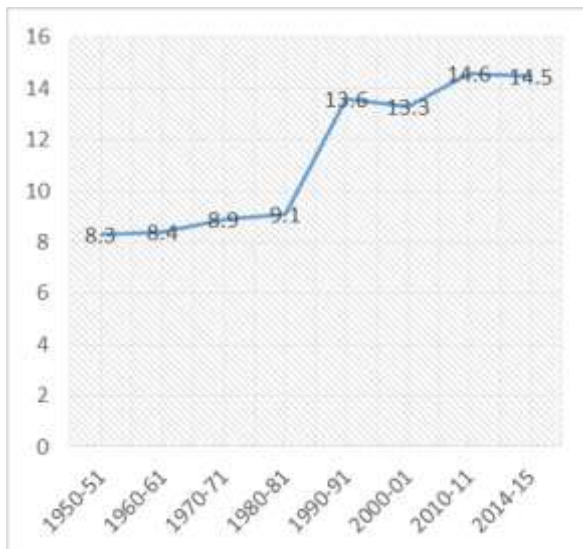
**Fig 2d:** Total Condiments and Spices



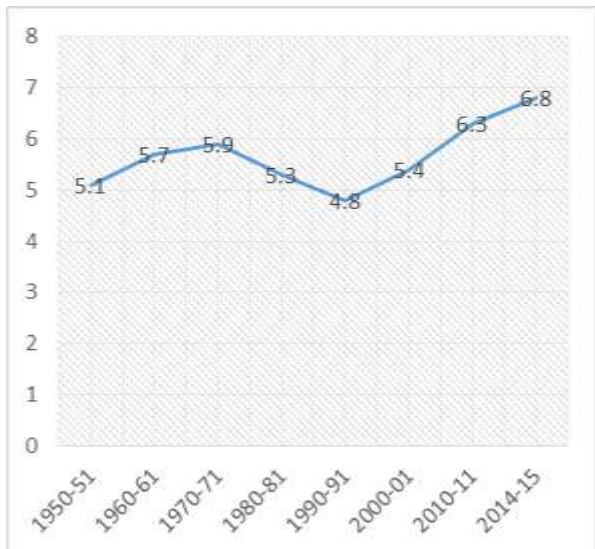
**Fig 2e:** Total Fruits & Vegetables



**Fig 2f:** Other Food Crops



**Fig 2g:** Total Oilseeds



**Fig 2h:** Total Fibres

Fig. 2c and Fig. 2d plainly portrays that the region under sugarcane expanded about twice from 1.3 mha to 2.8mha and add up to fixings and flavors additionally expanded around multiple times from 0.9 mha to 1.7 mha in tested time region. From 1950-51 to 2014-15, the above figures show all out products of the soil expanded from 1.7 mha to 5.2 mha,

complete oilseeds expanded from 8.3 mha to 14.5 mha, all out strands expanded from 5.1 mha to 6.8 mha and feed crops expanded from 3.3 mha to 4.7 mha. Though, other food crops and other nonfood crops announced decrease from 0.6 mha to 0.1 mha and 2.1mha to 1.5 mha, separately.



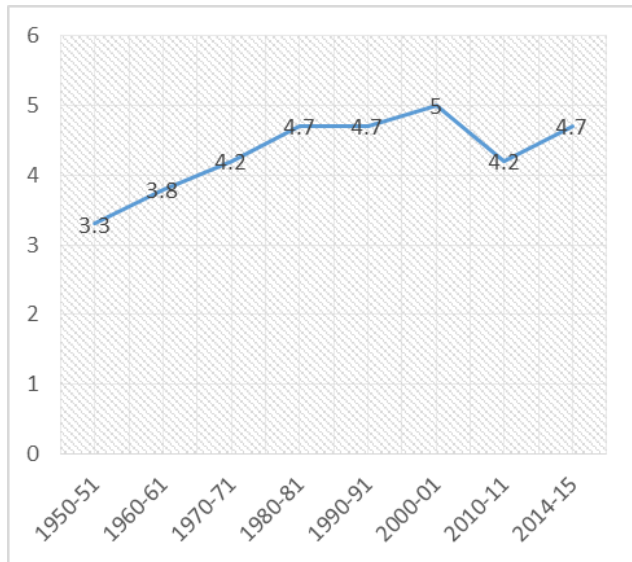


Fig 2i: Fodder Crops

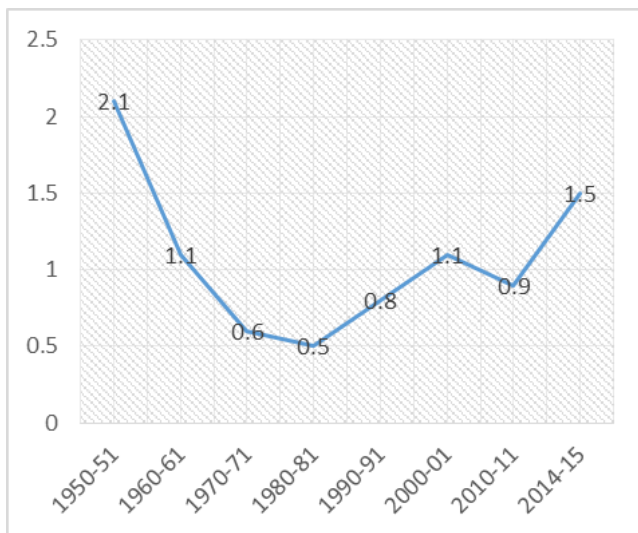


Fig 2j: Other Non-Food Crops

**Extent of Crop Diversification**

The worth of Herfindahl Index (HI) has been diminishing persistently. It mirrors that degree of harvest enhancement has expanded ceaselessly as horticulture being marketed the portion of region diminished under cereals and expanded under other food crops and other non-food crops. Table 1 and fig. 3 plainly demonstrate the HI diminished from 0.409 to 0.312 in 1950-51 to 2014-15 period. Discernibly, the most extreme HI saw during 1970s in light of Green Revolution in late 1960s hence least harvest enhancement has been seen in this period. Because of green transformation extraordinarily the region under paddy and wheat expanded strongly.



Fig 3: Herfindahl Index

**Conclusion**

This fleeting examination is conveyed in the time-frame between 1950-51 to 2014-15. In this time-frame the revealing region for land use was expanded. The woods region has been expanded more than 1.5 occasions. The land not accessible for development has diminished. Region under non-rural utilizations expanded threefold. The infertile and unculturable land strongly diminished. Other crude land barring neglected diminished by just about 100 %. Lasting field and other munching land significantly expanded. Land under random tree yields and marine forests avoided in net region planted diminished. The region under culturable waste land diminished forcefully. Decrepit grounds nearly stay steady. Subsequently, the net region planted extensively expanded. The region under sugarcane, complete fixings and flavors, absolute products of the soil, all out oilseeds, all out strands and grain crops have been expanded. Though, the region under complete grains and millets, all out beats, other food crops and other non-food crops have been decreased. The worth of Herfindahl Index (HI) has been diminishing ceaselessly and alternately crop enhancement has expanded. It shows the agribusiness design changed from customary to business in India.

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