

Original Research Article

A study on the shift in cropping pattern from agriculture to horticulture in Coimbatore district, Tamil Nadu.

Abstract

India is predominantly a food crop producing country in the world and a leading producer of world's pulse (25.00 %), rice (22.00 %), wheat (13.00 %) and cotton (25.00 %). On the other hand, the country has gone through a substantial shift in cropping pattern from food crops (agricultural crops) to horticultural crops over the last five years (2011-15). The state Tamil Nadu has also witnessed a shift in cropping pattern towards horticulture. Therefore, micro-level research was undertaken in Malaipalayam and Vadavedampatti of Sultanpet block and Naickenpalayam and Nanjundapuram of Periyanaickenpalayam block in Coimbatore district. The sample size of the study was 120 farmers. The research found that most (23.50 %) of the farmers shifted their cropping pattern to horticulture during 2005-06 followed by 11.50 per cent during 2002-03. However, the shift in cropping pattern towards horticulture started during the 21st century.

It was observed from the study nearly one-fifth (20.84 %) of the farmers chosen Coconut as the sole crop in the place of Pulses (Field bean/Cowpea/Horse gram + Field bean-Mochai) – Maize/ Sorghum + Sugarcane + Fodder crops during 2016-17. Twenty-two farmers cultivated Coconut + Vegetables during 2016-17 yet, these same farmers had the cropping pattern of Sugarcane /Maize/ Sorghum + Pulses (Horse gram + Bengal Gram /Cowpea /Red gram /Green gram/ Field bean)/Cotton/ Paddy during 1999-2000.

The area under horticulture increased to more than three-fifths (67.35 %) of the total area among the farmers during 2009-10 (After Shift). However, the area (4.50 %) of horticulture was very less during 1999-2000 (Before Shift) when compared to the area (87.99 %) of agriculture to the total area. In this context, this paper elucidates the nature of the shift in cropping pattern from agriculture to horticulture and the present status/ trend of horticulture in Coimbatore district and future prospectus.

32 **Keywords:** Shift in cropping pattern; horticulture and agriculture

33 **Introduction**

34 India is predominantly a food crop producing country in the world and a leading
35 producer of world's pulse (25.00 %), rice (22.00 %), wheat (13.00 %) and cotton (25.00
36 %) (Deshpande, 2017). On the other hand, the country has gone through a substantial
37 shift in cropping pattern from food crops (agricultural crops) to horticultural crops
38 over the last five years (2011-15). (Horticultural Statistics at a glance - MoAFW,
39 2015). The expansion of the area under horticulture was 18.00 per cent and its growth
40 rate was about 2.70 per annum in 2014-15 (PIB, 2016). Moreover, the share of
41 horticulture was around 30.00 per cent to the total agricultural Gross Domestic
42 Product (GDP) during 2013-14 from about 17 per cent of the area. As far as Tamil
43 Nadu is concerned, the area under horticulture increased to 1.11 million hectares in
44 2013-14 from 1.00 million hectares in 2011-12 at the growth rate of 6.00 per cent
45 (<http://www.tn.gov.in/dear/Agriculture>). Therefore, this study was undertaken to
46 understand the nature and pattern of the shift in cropping pattern to horticulture from
47 agriculture at a micro level.

48 **Objectives**

- 49 1. To analyse the shift in cropping pattern to horticultural crops.
- 50 2. To assess the diversification and magnitude of horticultural crops after the
51 shift.

52 In order to determine the first objective of the shift in cropping pattern to horticulture,
53 the explorative and historical studies were used. The farmers were asked to point out
54 the year from which they have started shifting their cropping pattern to horticulture
55 from agriculture and three different time periods was fixed arbitrarily. In view of that,

- 56 • The Year, when less than 15.00 per cent of the farmers shifted to horticulture
57 from agriculture was fixed as **Before Shift** (i.e. Before the shift to
58 horticulture).
- 59 • On the other hand, the year when 95.00 per cent of the farmers shifted to
60 horticulture from agriculture was fixed as **After Shift** (i.e. After Shift to
61 horticulture).

62 • Similarly, the year 2016-17 was considered as **Latest Year** owing to the study
63 period.

64 The Percentage analysis was done for the Latest Year (2016-17), After Shift (to be
65 fixed) and Before Shift (to be fixed) by means of calculating the total percentage of
66 area under horticulture, agriculture, fallow lands and sold out lands for every farmer
67 to his total area. Then, the percentage of each farmer was divided by Dewey decimal
68 system (100) to arrive at performing arithmetic value/decimal value so as to analyse
69 the relationship of the dependent variable with respect to the independent variables. In
70 order to achieve the second objective of the study i.e magnitude and diversification of
71 horticultural among the farmers' holdings, the percentage of the area of different
72 horticultural crops such as fruits, vegetables, plantations, spices and condiments,
73 flowers and medicinal and aromatic plants to the net cultivated area (2016-17).

74 **Research methodology**

75 An ex post facto with historical study method was used in this study. With the help of
76 secondary data of Directorate of horticulture, the district Coimbatore was purposively
77 selected for the study as the district topped in the area under horticulture (13.37
78 million hectares) with the percentage share of 9.22 to the total horticultural area in
79 Tamil Nadu (Directorate of Horticulture, 2014-15). Out of the 12 blocks of Coimbatore
80 district, the Sultanpet and Periyanaickenpalayam blocks were selected randomly. A
81 total of four villages with more number of farmers practising horticulture were
82 selected purposively based on the discussion held with the various officials of the line
83 departments of agriculture and horticulture. Both the qualitative and quantitative data
84 collection methods were used for data collection. Two villages from each of the block
85 were selected for this study namely, *Malaipalayam and Vadavedampatti of Sultanpet*
86 *block and Naickenpalayam and Nanjundapuram of Periyanaickenpalayam block.*
87 For the purpose of the study, a sample size of 120 farmers (30 farmers from each of
88 the four villages) who have been growing horticultural crops was selected. The
89 snowball sampling and typical case techniques were used as sampling methods. The
90 per cent and cumulative percentage analysis were followed to analyse, tabulate and
91 interpret the data with the use of both Excel and SPSS.

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93

94 **Results and discussion**

95 The figure 1 indicates that the most (23.50 %) of the farmers shifted their cropping
 96 pattern to horticulture during 2005-06 followed by 11.50 per cent during 2002-03.
 97 However, for the purpose of the study, the year 2009-10 was envisaged as After Shift*
 98 (AS) for the reason that, 95 per cent of the farmers shifted to horticulture from agriculture.
 99 Similarly, 1999-2000 as Before Shift* (BS) on account that, less than 15.00 per cent
 100 shifted to horticulture from agriculture. It may be contemplated that, the shift in
 101 cropping pattern towards horticulture had been in transition for two decades and
 102 continuous till today. Besides, it is an indication that the shift to horticulture was not
 103 an abrupt phenomenon rather it has been a continuous process over the years.
 104 Predominant cropping pattern followed among the farmers are as followed (Table.1).

105 **Table 1. Predominant cropping pattern followed among the farmers in 2016-17**
 106 **(Latest Year) and 1999-2000 (After Shift)**

(n=120)

S.No.	Cropping pattern		No.	%
	2016-2017	1999-2000		
1.	Coconut alone	Pulses (Field bean /Cow pea/Horse gram + Field bean - Mochai) – Maize/ Sorghum + Sugarcane + Fodder crops	25	20.84
2.	Coconut + Vegetables	Sugarcane /Maize/ Sorghum + Pulses (Horse gram + Bengal Gram /Cow pea /Red gram /Green gram/ Field bean) /Cotton/ Paddy	22	18.34
3.	Coconut + Banana	Sugarcane + Sorghum/Maize /Castor/ Cotton + Fodder crops	6	5.00
4.	Coconut + Maize	Maize - Cow pea+ Sugarcane + Ground nut + Cotton/ Paddy	5	4.16
5.	Banana + Vegetables	Sugarcane + Maize	4	3.34
6.	Coconut + Vegetables- Maize	Maize-Green gram/Field bean (Mochai)/ Sugarcane + Fodder crops	4	3.34
7.	Coconut + Banana+ Vegetables	Maize/Paddy -Cow pea/Horse gram/ +Sugarcane	2	1.66
8.	Banana + Sugarcane	Sugarcane	2	1.66
9.	Banana + Vegetables+ Sugarcane + Sorghum	Maize + Sugarcane	1	0.83
10.	Vegetables + Minor millets	Maize	1	0.83

11.	Others (Vegetables alone) +Vegetables+ Sugarcane- Vegetables + Major millets+ Minor millets/Flowers/Fruits/ Pulses)	Others (Maize+ Minor millets/ Sugarcane. Pulses-Oil seeds (Ground nut/Fodder crops)	48	40.00
Total			120	100.00

108 Table 1 evinces that, nearly one-fifth (20.84 %) of the farmers chosen Coconut as the
109 sole crop in the place of Pulses (Field bean/Cowpea/Horse gram + Field bean-
110 Mochai) – Maize/ Sorghum + Sugarcane + Fodder crops during 2016-17. Twenty-two
111 of the farmers were cultivating Coconut + Vegetables during 2016-17 yet, the same
112 farmers had the cropping pattern of Sugarcane /Maize/ Sorghum + Pulses (Horse
113 gram + Bengal Gram /Cowpea /Red gram /Green gram/ Field bean)/Cotton/ Paddy in
114 1999-2000.

115 Moreover, six of the farmers had the cropping pattern of Coconut + Banana in 2016-17 as
116 against the cropping pattern of Sugarcane + Sorghum/Maize /Castor/ Cotton + Fodder
117 crops in 1999-2000 (Before Shift), similarly five of the farmers had Coconut + Maize
118 as their cropping pattern in 2016-17 as contrary to the Maize - Cow pea+ Sugarcane +
119 Groundnut + Cotton/ Paddy in 1999-2000. On the other hand, eight of the farmers
120 cultivated Banana + Vegetables and Sugarcane + Maize in 2016-17 when compared
121 to the cropping pattern of Sugarcane + Maize and Maize-Green gram/Field bean
122 (Mochai)/ Sugarcane + Fodder crops.

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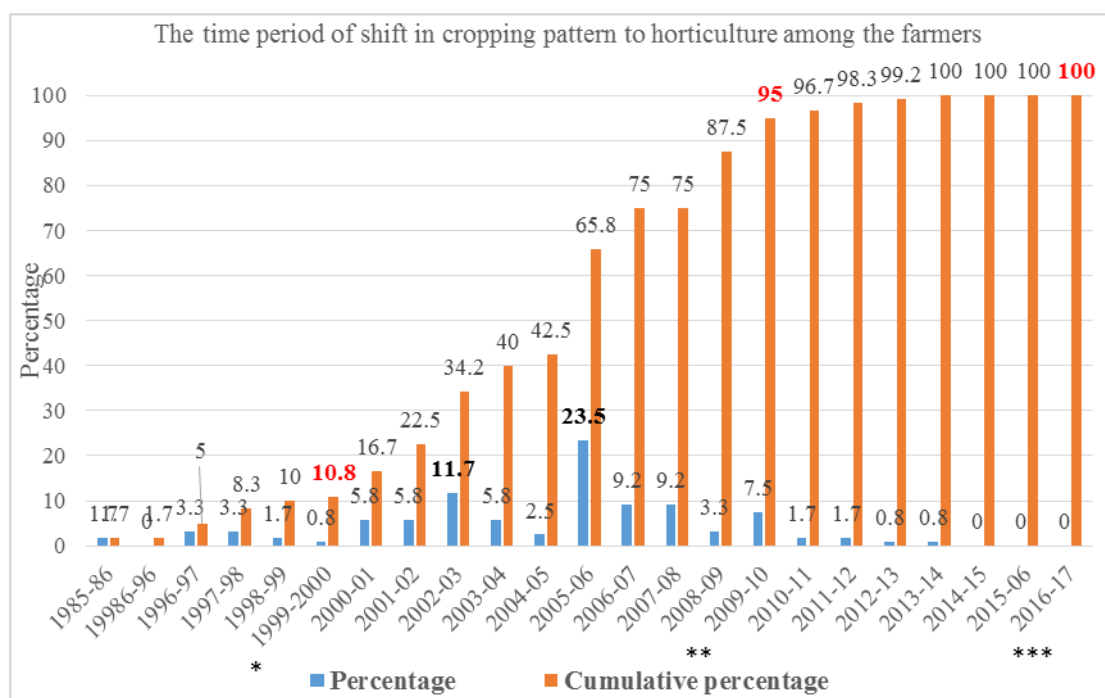


Figure 1. The time period of the shift in cropping pattern to horticulture from agriculture among the farmers

130 (n=120)

131 Note: 1999-2000* (Before Shift), 2009-10** (After Shift) and 2016-17*** (Latest Year)

132

133 **Shift in cropping pattern to horticulture in terms of per cent area**

134 The shift in cropping pattern was measured on the basis of the reference to the major
 135 change made by the farmers in terms of reallocating land from food crops
 136 (agricultural crops) to the chosen horticultural crops (Mehta, 2009, p. 301). Therefore,
 137 the shift in cropping pattern toward horticulture can be evinced from the percentage of
 138 area reallocated to the horticultural crops by the farmers in the place of agricultural
 139 crops such as coconut in the place of sugarcane and maize and vegetables in the place
 140 of pulses. (Reference Table 1)

141 **Table 2. Share of horticulture, agriculture, fallow lands and sold out lands to the**
 142 **total area**

143 (n=120)

S.No.	Category (Area)	1999-2000		2009-2010		2016-2017	
		Acre	%	Acre	%	Acre	%

1.	Horticulture	31.50	4.50	436.15	63.68	458.65	67.35
2.	Agriculture	615.40	87.99	112.75	15.76	45.25	6.65
3.	Fallow lands	52.50	7.51	108.00	16.46	165.50	24.31
4.	Sold out lands	0.00	0.00	28.00	4.10	11.50	1.69
Total		699.40	100.00	684.90*	100.00	680.90*	100.00

144 Note AS-After Shift (2009-10), BS-Before Shift (1999-2000) and LY-Latest Year (2016-17). *
145 Additional land bought between 2000-2009 (13.1 acres) and 2011-17 (0.1 acres) was included in
146 the total areas.

147 Table 2 indicates that the area (4.50 %) of horticulture was
148 very less during 1999-2000 (Before Shift) when compared to the area (87.99 %) of
149 agriculture to the total area among the farmers. It might be reasoned that, during
150 1999-2000, a vast majority (90.20 %) of the farmers were growing the agricultural
151 crops like sugarcane (37.95 %) wherever assured irrigation facility was available and
152 maize (15.55 %), field bean (8.66 %), cowpea (4.18 %) etc., were cultivated on a
153 rainfed conditions.

154 However, the area under horticulture increased to more than three-fifths of the total
155 area among the farmers during 2009-10 (After Shift). It might be due to the increased
156 linkages and awareness about marketing, traders' linkage, transports facility; and
157 contract farming in coconut, besides, subsidised and guaranteed loan, extension
158 services of the department of horticulture about the subsidies for the horticultural crop
159 like banana persuaded the farmers to bring more area under the banana. Also, the
160 assured irrigation through bore wells/tube wells/canals; increased awareness on drip
161 irrigation and the schemes thereof, amid the dwindling groundwater resource might
162 have motivated the farmers who have shifted their cropping pattern in favour of
163 Horticulture *vis-à-vis* the increased demand for coconut, banana and vegetables in the
164 nearby Kerala markets might have motivated the farmers to bring more area under
165 horticulture. In addition, the advisory services and institutional supports ensured by
166 the governments (Both state and central government) under various schemes and
167 programmes viz., National Horticulture Mission, Mission Integrated Development for
168 horticulture (MIDH). Similarly, the Horticulture Development Boards have played its
169 part in providing extension and advisory services in sustaining the cultivation of
170 horticultural crops. Even more, the favourable climatic condition was also a
171 significant reason behind the shift in cropping pattern to horticulture.

172 Even as, the demand for these crops has been increasing among the consumers hence,
 173 fetching a remunerative price in the markets. Ever since the shift, the area under
 174 horticulture has grown at the growth rate of 5.79 per cent among the farmers, while,
 175 the area under agriculture reduced abruptly at the rate of -54.75 from 87.99 per cent
 176 during 1999-2000 to 6.65 during 2016-17.

177 Moreover, the intensive requirement of labourers during the peak seasons of food
 178 crop production for instance sowing, weeding and harvesting might have been one of
 179 the reasons to switch over to horticultural crops. Table 2 also notes that the area of
 180 fallow lands had increased to 24.31 per cent in 2016-17 from 7.51 per cent in 1999-
 181 2000. It might be that, the shift to high-value horticultural crops (coconut and banana)
 182 require more share of water although cultivations of these crops are facilitated through
 183 micro-irrigation than the crops like maize, sorghum, cowpea, field bean, minor millets
 184 etc.,

185 Therefore, the farmers were found to have shifted towards horticultural crops in
 186 particular towards coconut with the per cent share of 39.48 during 2016-17. But, the
 187 current fallow may well be taken up for cultivation if it receives optimum rainfall.
 188 Meanwhile, some per cent of the lands were sold (4.1 %) during 2009-10 and (1.69 %)
 189 during
 190 2016-17, it might be that the urbanisation of Coimbatore gives more land value

191 **Table 3. Share of horticultural crops, agriculture, fallow lands and sold out lands**
 192 **to the total area**

(n=120)

S. No.	Category	2016-2017		2009-2010		1999-2000	
		Acre	%	Acre	%	Acre	%
I.	Horticulture						
1.	Plantations	365.60	53.70	349.60	51.04	7.00	1.00
2.	Vegetables	73.40	10.77	71.90	10.50	14.25	2.04
3.	Spices	15.15	2.23	14.15	2.07	7.00	1.00
4.	Fruits	3.00	0.44	0.00	0.00	1.00	0.14
5.	Flowers	1.50	0.21	0.5	0.07	2.25	0.32
	Total	458.65	67.35	436.15	63.68	31.50	4.50
II.	Agriculture	45.25	6.65	108.00	15.76	615.40	87.99
III.	Fallow lands	165.50	24.31	112.75	16.46	52.5	7.51

IV.	Sold out lands	11.5	1.69	28	4.10	0.00	0.00
Grand total		680.90	100.00	684.90	100.00	699.4	100.00

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195 Most of the area was under plantations (coconut and banana) and vegetables (Tomato,
196 brinjal, bhendi to name few) with the per cent share of 53.70 and 10.77 respectively in
197 2016-17 (Table 3). Even as during 2009-10 among the farmers. The favourable
198 climatic condition coupled with the assured price, market facilities and contract
199 farming increased was one of the major reasons for the shift towards horticulture so as
200 the extension services like marketing intelligence and dissemination of current price
201 etc.,

202 In the same way, awareness about the use of drip irrigation and knowledge of
203 intercultural practices in the cultivation of certain horticultural crops (coconut) might
204 have encouraged the farmers to shift to horticulture on a long scale. In this context,
205 the fruits and flowers' cultivation were very meagre because the farmers had chosen
206 relatively less laborious and toilsome crops like coconut and banana.

207 **Table 4. Share of agricultural crops, horticulture, fallow lands and sold out lands**
 208 **to the total area**

209 (n=120)

S. No.	Category	2016-2017		2009-2010		1999-2000	
		Acre	%	Acre	%	Acre	%
I.	Agriculture						
1.	Major millets	19.25	2.83	52.25	7.58	133.25	19.05
2.	Sugar crops	12.00	1.76	21.50	3.16	265.40	37.95
3.	Minor millets	8.50	1.25	18.75	2.74	28.75	4.11
4.	Fodder crops	5.50	0.81	3.50	0.52	10.75	1.54
5.	Food crops	0.00	0.00	0.00	0.00	7.50	1.07
6.	Pulses	0.00	0.00	12.00	1.76	152.75	21.84
7.	Oil crops	0.00	0.00	0.00	0.00	8.00	1.14
8.	Fibre crops	0.00	0.00	0.00	0.00	6.00	0.86
9.	Root crops	0.00	0.00	0.00	0.00	3.00	0.43
	Total	45.25	6.65	108.00	15.76	615.40	87.99
II.	Horticulture	458.65	67.35	436.15	63.68	31.50	4.50
III.	Fallow lands	165.50	24.31	112.75	16.46	52.50	7.51
IV.	Sold out lands	11.50	1.69	28.00	4.10	0.00	0.00
	Total area	680.90	100.00	684.90	100.00	699.40	100.00

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211 Table 4 gives an insight into the major crop wise share of agriculture to the total area
 212 among the farmers. It is clear that during 1999-2000 the sugar crops (Sugarcane) had
 213 a major portion (37.95 %) of the area under cultivation. For the reason that sugarcane
 214 was produced under *contract farming* with *Sakthi Sugars limited* Bhavani Taluk,
 215 Erode Dist. Tamil Nadu.

216 Besides, the skills and capacities of the farmers in the production of jaggery had
 217 played a central role and provided a substantial income to these sugarcane growers.
 218 However, water constraint and increased labour cost for harvesting sugarcane and
 219 non-encouraging Fair and Remunerative Price (FRP) for sugarcane led to the decrease

220 in sugarcane area to 1.76 per cent during 2016-17 from 37.95 per cent during 1999-
221 2000 among the farmers. Moreover, increasing large scale and highly mechanised
222 jaggery units in Coimbatore and in around of Western Tamil Nadu started producing
223 low-cost jaggery to the market, thus, limiting the production of cottage jaggery.

224 On the other hand, pulses and major millets were occupied a considerable area with
225 the per cent share of 21.84 and 19.01 respectively during 1999-2000. However, these
226 crops had lost their area to horticultural crops in the long run. It would be reasoned
227 that the yield of pulses was low, besides, harvesting and post-harvest management
228 were relatively toilsome when compared to the horticultural crops.

229 Besides, minor millets (4.11 %), fibre crops (0.86 %), oil crops (1.14 %), food grains
230 (1.07 %) had a substantial per cent share to the total area during 1999-2000. But, these
231 crops also lost their per cent share of the area to the horticultural crops in a period of
232 ten years from 1999 to 2010, because of the increased area under coconut and banana
233 and other horticultural crops.

234 **The growth trend of the horticulture among the farmers**

235 It was done to calculate the growth of horticulture among the farmers who have shifted to
236 horticulture for the past six years (2011-12 to 2016-17) and in 2009-10 (After Shift). It
237 can be inferred from the given figure 2 that, the trend of the area under horticulture
238 had shown stability over the period of 6 years. However, it can be illustrated that during
239 2014-15, the trend had shown an inclination phase yet, from the following year (2015-
240 16) onwards, it again shows an increasing trend. Thus, it is clear that increased
241 extension services, schemes, subsidies for horticultural crops coupled with the
242 reduced labourers and increased wages were the major reasons for the increase of area
243 under horticultural crops.

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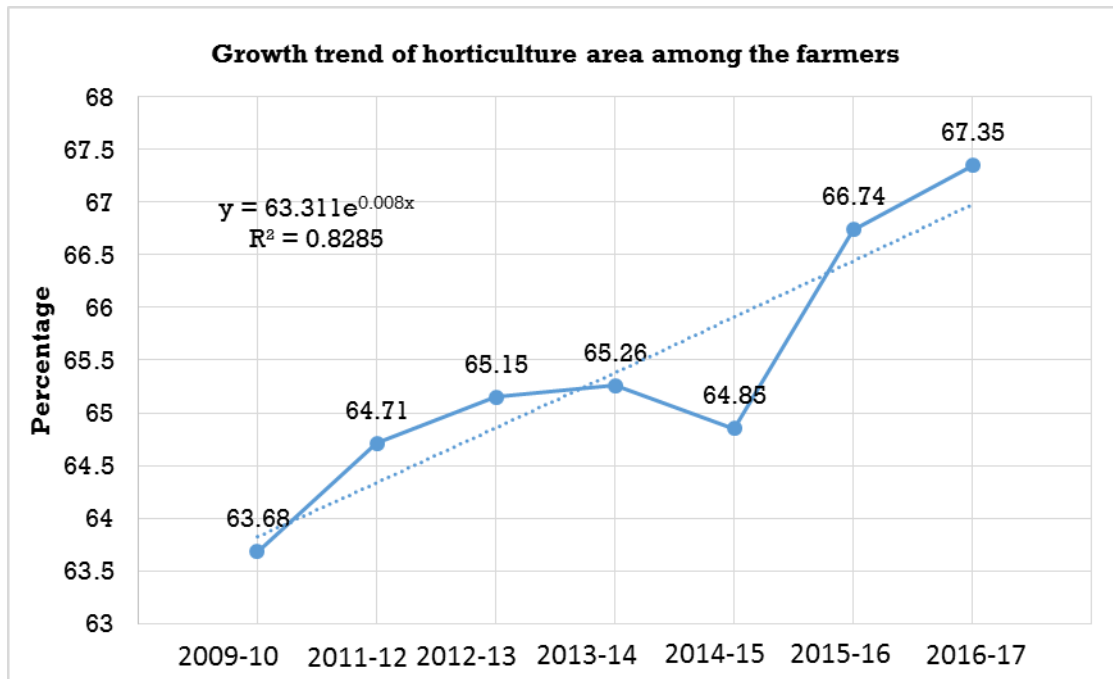


Figure 2. Growth Trend of Horticulture area among the farmers

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253 Diversification of horticultural crops-Herfindahl index 2016-17

254 The diversification of horticultural crops was analysed using Herfindahl Index (HI) to
 255 comprehend the diversity among the farmers in 2009-10 and from 2011-12 to 2016-
 256 17. The diversity of horticultural crops is depicted in table 5 and figure 24.

**257 Table 5. Diversity of horticultural crops in 2009-10 (After Shift) and between 2011-
 258 12 to 2015-16 among the farmers**

S.No.	2009-10	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17
1.	0.39	0.40	0.41	0.41	0.39	0.39	0.41

259 Table 5 indicates that the diversity of horticultural crops in the middle range of the
 260 Herfindahl index (figure 3) hence as a result of diversification towards coconut and
 261 banana, But, it is not shown the complete specialisation on account that the
 262 diversification of horticultural crops is just below 0.5 therefore; several horticultural

263 crops can be grown to widen the diversity of horticulture and to promote sustainable
264 agroecosystem in Coimbatore district as well as in the entire agro zones of Tamil

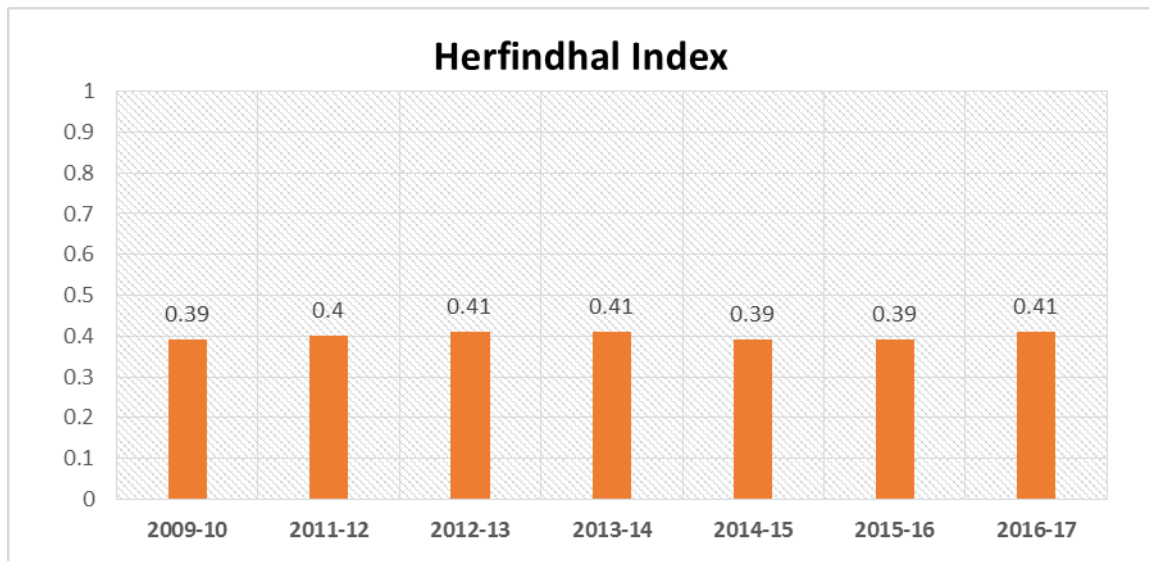


Figure 3. Diversification index for horticultural crops in Coimbatore

265 Nadu.

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267 **The magnitude of the shift in horticulture**

268 The figure 4 explicates that the Plantations (72.55 %) viz, coconut and banana and
269 vegetables (15.57) share more area to the net area cultivated among the farmers
270 during 2016-17, even as during 2009-10. Whereas, the percentage share of agriculture
271 was only about 8.98 per cent as against 95.13 per cent in 1999-2000.

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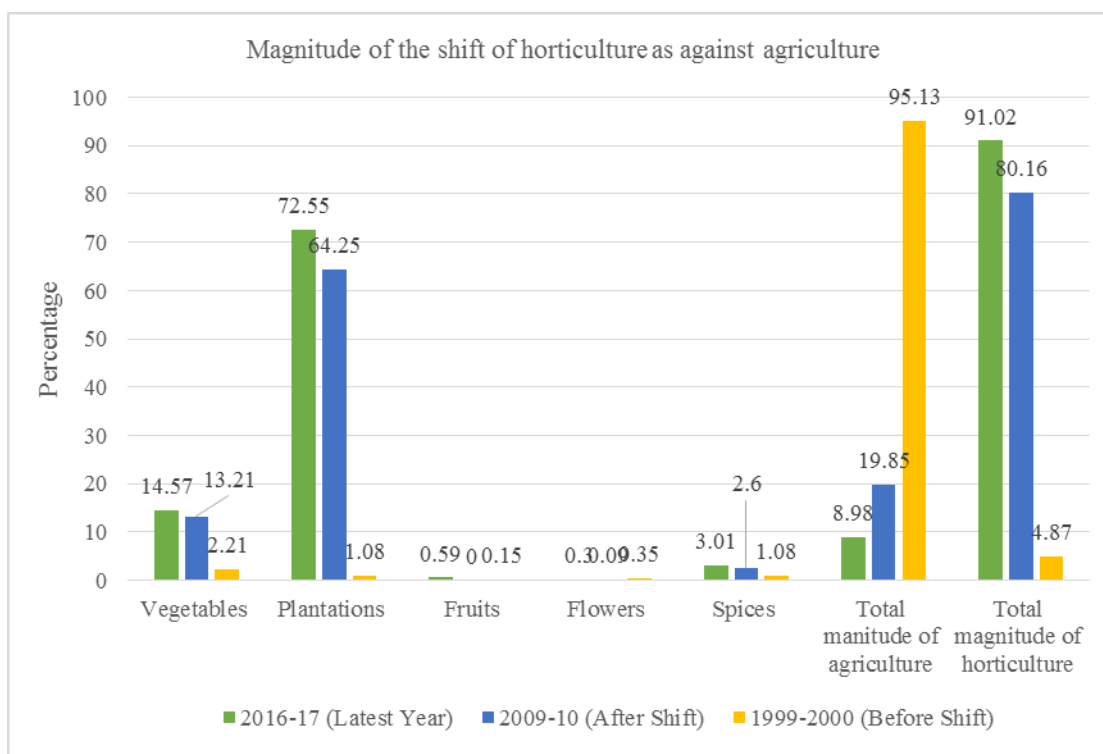


Figure 4. The magnitude of the shift in horticulture

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284 Conclusion

285 ➤ The increased awareness on horticultural schemes, incentives and subventions
 286 and knowledge on water saving techniques (e.g. drip irrigation) and assured
 287 irrigation facilities (well/bore wells/tube wells/canals) played a crucial role in
 288 the shift in cropping pattern to horticultural crops.

289 ➤ Increased markets, transports, traders of city markets, are also the reasons for
 290 the shift in cropping pattern in favour of horticulture as these crops make
 291 assured returns and higher price.

292 ➤ The study found that the shift to horticulture was not so diverse since, many of the
 293 farmers have been shifting toward coconut, and as a consequence, it may not be
 294 viable to sustain the agro eco-system in long term.

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298 **Policy recommendations**

299 ✓ Nevertheless the area under horticulture has been increasing, the fallow lands
300 have increased too. So, necessary steps can be taken by the government to
301 bring the fallow land under the cultivation of fruits, vegetables and millets
302 through an appropriated scheme which would provide a fillip to the farmers to
303 diversify the farmlands.

304 ➤ To bring more area under cultivation of vegetables, spices, medicinal plants,
305 integrated extension advisory services are required and the farmers'
306 awareness about newer varieties and hybrids of vegetables, spices and
307 medicinal plants which require less intensive and reduced protective measures
308 in production

309 ➤ The collective farming of the government of Tamil Nadu can further be
310 strengthened to enhance the quality services of the Farmers Interest Groups
311 (FIGs), Farmer Producer Companies (FPCs), etc., toward sustainable
312 Horticulture Development in Coimbatore region.

313 **Conflict of Interest: The authors declare that they have no conflict of interest.**

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