Original Research Article

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

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, India. 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 the year 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.

Keywords: Shift in cropping pattern; horticulture and agriculture

Introduction

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 %) (Deshpande, 2017). 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). (Horticultural Statistics at a glance - MoAFW, 2015). The expansion of the area under horticulture was 18.00 per cent and its growth rate was about 2.70 per annum in 2014-15 (PIB, 2016). Moreover, the share of horticulture was around 30.00 per cent to the total agricultural Gross Domestic Product (GDP) during 2013-14 from about 17 per cent of the area. As far as Tamil Nadu is concerned, the area under horticulture increased to 1.11 million hectares in 2013-14 from 1.00 million hectares in 2011-12 at the growth rate of 6.00 per cent (http://www.tn.gov.in/dear/Agriculture). Therefore, this study was undertaken to understand the nature and pattern of the shift in cropping pattern to horticulture from agriculture at a micro level.

Objectives

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

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

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

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

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

Research methodology

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

Results and discussion

The figure 1 indicates that the 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, for the purpose of the study, the year 2009-10 was envisaged as After Shift* (AS) for the reason that, 95 per cent of the farmers shifted to horticulture from agriculture. Similarly, 1999-2000 as Before Shift* (BS) on account that, less than 15.00 per cent shifted to horticulture from agriculture. It may be contemplated that, the shift in cropping pattern towards horticulture had been in transition for two decades and continuous till today. Besides, it is an indication that the shift to horticulture was not an abrupt phenomenon rather it has been a continuous process over the years. Predominant cropping pattern followed among the farmers are as followed (Table.1).

Table 1. Predominant cropping pattern followed among the farmers in 2016-17 (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**

Table 1 evinces that, 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 of the farmers were cultivating Coconut + Vegetables during 2016-17 yet, the same farmers had the cropping pattern of Sugarcane /Maize/ Sorghum + Pulses (Horse gram + Bengal Gram /Cowpea /Red gram /Green gram/ Field bean)/Cotton/ Paddy in 1999-2000.

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

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

(n=120)

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

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

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

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

(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**

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

Table 2 indicates that 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 among the farmers. It might be reasoned that, during 1999-2000, a vast majority (90.20 %) of the farmers were growing the agricultural crops like sugarcane (37.95 %) wherever assured irrigation facility was available and maize (15.55 %), field bean (8.66 %), cowpea (4.18 %) etc., were cultivated on a rainfed conditions.

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

Even as, the demand for these crops has been increasing among the consumers hence, fetching a remunerative price in the markets. Ever since the shift, the area under horticulture has grown at the growth rate of 5. 79 per cent among the farmers, while, the area under agriculture reduced abruptly at the rate of -54.75 from 87.99 per cent during 1999-2000 to 6.65 during 2016-17.

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

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

Table 3. Share of horticultural crops, agriculture, fallow lands and sold out lands to the total area in location

(n=120)

S. No.	Category	2016-2017		2009-2010		1999-2000	
I.	**Horticulture**	**Acre**	**%**	**Acre**	**%**	**Acre**	**%**
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**

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

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

Table 4. Share of agricultural crops, horticulture, fallow lands and sold out lands to the total area in location

(n=120)

S. No.	Category	2016-2017		2009-2010		1999-2000	
I.	**Agriculture**	**Acre**	**%**	**Acre**	**%**	**Acre**	**%**
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**

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

Besides, the skills and capacities of the farmers in the production of jaggery had played a central role and provided a substantial income to these sugarcane growers.

However, water constraint and increased labour cost for harvesting sugarcane and non-encouraging Fair and Remunerative Price (FRP) for sugarcane led to the decrease in sugarcane area to 1.76 per cent during 2016-17 from 37.95 per cent during 1999-2000 among the farmers. Moreover, increasing large scale and highly mechanised jaggery units in Coimbatore and in around of Western Tamil Nadu started producing low-cost jaggery to the market, thus, limiting the production of cottage jaggery.

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

Besides, minor millets (4.11 %), fibre crops (0.86 %), oil crops (1.14 %), food grains (1.07 %) had a substantial per cent share to the total area during1999-2000. But, these crops also lost their per cent share of the area to the horticultural crops in a period of ten years from 1999 to 2010, because of the increased area under coconut and banana and other horticultural crops.

The growth trend of the horticulture among the farmers

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

(n=120)

Figure 2. Growth Trend of Horticulture area among the farmers in location

Diversification of horticultural crops-Herfindahl index 2016-17

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

Table 5. Diversity of horticultural crops in 2009-10 (After Shift) and between 2011-12 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

Table 5 indicates that the diversity of horticultural crops in the middle range of the Herfindahl index (figure 3) hence as a result of diversification towards coconut and banana, But, it is not shown the complete specialisation on account that the

diversification of horticultural crops is just below 0.5 therefore; several horticultural crops can be grown to widen the diversity of horticulture and to promote sustainable

Figure 3. Diversification index for horticultural crops in Coimbatore

agroecosystem in Coimbatore district as well as in the entire agro zones of Tamil Nadu.

The magnitude of the shift in horticulture

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

Figure 4. The magnitude of the shift in horticulture

Conclusion

- The increased awareness on horticultural schemes, incentives and subventions and knowledge on water saving techniques (e.g. drip irrigation) and assured irrigation facilities (well/bore wells/tube wells/canals) played a crucial role in the shift in cropping pattern to horticultural crops.
- Increased markets, transports, traders of city markets, are also the reasons for the shift in cropping pattern in favour of horticulture as these crops make assured returns and higher price.
- The study found that the shift to horticulture was not so diverse since, many of the farmers have been shifting toward coconut, and as a consequence, it may not be viable to sustain the agro eco-system in long term.

Policy recommendations

- ✓ Nevertheless the area under horticulture has been increasing, the fallow lands have increased too. So, necessary steps can be taken by the government to bring the fallow land under the cultivation of fruits, vegetables and millets through an appropriated scheme which would provide a fillip to the farmers to diversify the farmlands.
- ➢ To bring more area under cultivation of vegetables, spices, medicinal plants, integrated extension advisory services are required and the farmers' awareness about newer varieties and hybrids of vegetables, spices and medicinal plants which require less intensive and reduced protective measures in production
- ➢ The collective farming of the government of Tamil Nadu can further be strengthened to enhance the quality services of the Farmers Interest Groups (FIGs), Farmer Producer Companies (FPCs), etc., toward sustainable Horticulture Development in Coimbatore region.

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

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