



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Vol XXXIII
No. 3

ISSN 0019-5014

CONFERENCE
NUMBER

OCTOBER-
DECEMBER
1978

INDIAN JOURNAL OF AGRICULTURAL ECONOMICS



INDIAN SOCIETY OF
AGRICULTURAL ECONOMICS,
BOMBAY

A STUDY ON THE FACTORS AFFECTING CHANGES IN THE CROPPING PATTERN IN NILGIRIS DISTRICT, TAMIL NADU

B. Sridharan and S. A. Radhakrishnan*

A number of factors influence the cropping pattern of any region or farm. The selection and allocation of land to different crops are the result of a number of decisions taken by individual farmers based on physical, economic and sociological factors. While the cropping pattern in the plains are more elastic, it is considered to be inelastic in the hill areas due to certain limitations. Hence a study of the cropping pattern of a hill area over a period of time will provide an insight into the factors that have caused the changes. The objective of this paper is to study the changes in the cropping pattern of the Nilgiris district (a hill district in Tamil Nadu State) over a period and to identify the causes therefor.

METHODOLOGY

The data for the study have been obtained from Season and Crop Reports published by the Government of Tamil Nadu. The data pertain to the period 1966-67 to 1976-77. Based on the share of each crop to the gross cropped area, percentages were worked out and ranks were assigned. Thereafter Kendall's rank correlation coefficients have been worked out between the rankings of different crops between the years. The total change over the period 1966-67 to 1976-77 was examined with the help of concordance coefficient 'w'. It has to be noted that if the correlation coefficient and the value of 'w' is statistically significant the cropping pattern has not changed significantly. On the contrary, if it is not significant it means that the cropping pattern has changed significantly.

BACKGROUND OF THE AREA

Topography

The Nilgiris district of Tamil Nadu is a hilly area. It has a total area of 2,55,000 hectares. More than 65 per cent of the area lies at an altitude of 1,800 to 2,500 metres while the remaining 35 per cent is at lower altitude.

Rainfall

The rainfall in the district varies considerably and ranges from 1,300 mm. (52") to 2,000 mm. (80") per annum, depending upon the altitude and topography of the place. The seasonwise rainfall for the last ten years is presented in Table I. The average rainfall is 1,700 mm. It can be observed from the table that the major portion of the rainfall is received in the South-West monsoon season and in the North-East monsoon season.

* Officer, Agricultural Credit Department, Union Bank of India and Agricultural Economist, Tamil Nadu Co-operative State Land Development Bank Ltd., Madras, respectively.

TABLE I—SEASONWISE RAINFALL

Year	(mm.)				
	South-West monsoon period (June-September)	North-East monsoon period (October-December)	Winter period (January-February)	Hot weather period (March-May)	Total annual rainfall
1966-67	969.4	755.7	49.2	146.0	1,920.3
1967-68	960.9	331.0	73.0	235.7	1,600.6
1968-69	932.0	264.8	10.1	187.6	1,394.5
1969-70	1,032.8	603.0	28.1	397.9	2,052.8
1970-71	793.9	466.8	30.1	287.9	1,578.7
1971-72	931.9	518.2	2.9	288.0	1,741.0
1972-73	691.9	764.3	0.5	195.3	1,652.0
1973-74	1,010.2	402.2	1.5	251.5	1,665.4
1974-75	1,034.3	217.0	25.7	278.3	1,555.3
1975-76	1,532.6	334.2	—	212.6	2,070.4
1976-77	917.0	438.6	25.8	325.6	1,707.0

Irrigation

As the area receives sufficiently good rainfall in the main cropping season, irrigation has not gained much importance. If the need arises irrigation is given only in dry spells from wells and spring channels that is also in lower elevations.

Soil

The soils of the area are red loam and slightly acidic in specific pockets. The soils are well drained with natural outlets. The State Government had launched a massive soil conservation operation during the fifties and a major portion of the arable land was terraced or provided with soil conservation measures.

RESULTS AND DISCUSSION

According to Ramasubban,¹ a study into the factors influencing the cropping pattern has to be necessarily preceded by an examination of occurrence of any changes. Further, he has distinguished two types of changes in the cropping pattern, *viz.*, (1) shifts and (2) deviations.

When two or more cropping patterns are compared on arranging the acreages under the same crops of the patterns on an increasing or decreasing order and if they do not exhibit similarity between them, 'shift' is said to occur. On the other hand, when differences occur on account of changes within the cropping pattern due to difference in the allocation of land between the same set of crops, then they are taken as 'deviations'.

The area as well as the percentage to the total cropped area for different crops for the years 1966-67 to 1976-77 for the Nilgiris district is presented in Table II. It can be observed from the table that there is not much variation or shift in the cropping pattern between the years 1966-67 and 1976-77. However, some deviations do occur as the farmers respond to changes in seasonal conditions, price differentials and other influencing variables.

1. T. V. Ramasubban, "Some Statistical Measures to Determine Changes in Cropping Pattern", *Agricultural Situation in India*, Vol. XVII, No. 11, February 1963, pp. 1153-1158.

TABLE II—CROPPING PATTERN OF THE NILGIRIS DISTRICT

Sr. No.	Crop (1)	1966-1967		1967-1968		1968-1969		1969-1970		1970-1971		1971-1972	
		Area (2)	Per cent (3)	Area (5)	Per cent (6)	Area (7)	Per cent (8)	Area (9)	Per cent (10)	Area (11)	Per cent (12)	Area (13)	Per cent (14)
1.	Rice	3,278	6.36	2,810	5.34	2,984	5.85	3,181	5.87	3,220	5.89	3,628	6.32
2.	Wheat	484	0.94	540	1.03	265	0.54	542	1.00	409	0.75	1,171	2.04
3.	Ragi	1,248	2.42	1,463	2.78	1,756	3.44	1,609	2.97	1,528	2.79	1,471	2.56
4.	Sannai	1,337	2.59	1,267	2.40	1,307	2.56	1,327	2.46	1,379	2.53	1,298	2.26
5.	Pulses	238	0.46	289	0.60	258	0.51	276	0.51	296	0.54	315	0.55
6.	Other cereals	421	0.82	382	0.73	338	0.66	542	1.00	594	1.09	593	1.04
	Total food crops	7,006	13.59	6,751	12.88	6,908	13.56	7,477	13.81	7,426	13.59	8,476	14.79
7.	Vegetables	1,563	3.03	1,539	2.92	914	1.79	1,366	2.52	1,249	2.28	1,096	1.91
8.	Potato	8,273	16.06	8,829	16.78	8,132	15.93	8,023	14.82	8,131	14.87	9,008	15.70
9.	Tapioca	311	0.60	303	0.58	374	0.73	514	0.95	571	1.04	527	0.92
10.	Banana	580	1.13	603	1.14	589	1.15	590	1.09	512	0.94	568	0.99
11.	Other fruits	425	0.82	412	0.78	378	0.74	387	0.71	412	0.75	316	0.55
12.	Oilseeds	44	0.09	85	0.16	63	0.12	93	0.17	80	0.15	72	0.13
13.	Ginger	262	0.51	357	0.68	376	0.74	528	0.98	573	1.05	774	1.35
14.	Other condiments and spices	189	0.37	158	0.30	137	0.27	172	0.32	163	0.30	146	0.25
	Total	11,647	22.61	12,286	23.34	10,963	21.47	11,673	21.56	11,691	21.38	12,507	21.80
15.	Cardamom	183	0.36	183	0.35	227	0.45	185	0.34	185	0.34	189	0.33
16.	Pepper	106	0.21	170	0.32	75	0.15	110	0.20	106	0.19	112	0.20
17.	Tea	19,191	37.24	19,520	37.10	20,722	40.60	22,115	40.84	22,711	41.54	23,224	40.47
18.	Coffee	8,844	17.16	8,995	17.10	8,659	16.97	9,001	16.62	8,690	15.90	8,923	15.55
19.	Rubber	334	0.65	342	0.65	323	0.63	326	0.60	346	0.63	332	0.58
20.	Cinchona	530	1.03	533	1.01	519	1.02	514	0.95	528	0.95	412	0.72
21.	Lemongrass	291	0.56	265	0.50	276	0.54	297	0.55	255	0.47	219	0.38
	Total	29,479	57.21	30,008	57.03	30,901	60.36	32,548	59.10	32,541	59.52	33,411	58.23
22.	Other crops	3,397	6.59	3,553	6.75	2,364	4.63	2,455	4.53	3,013	5.51	2,985	5.29
	Grand total	51,529	100.00	52,598	100.00	50,136	100.00	54,153	100.00	54,671	100.00	57,379	100.00

(Contd.)

FARMING SYSTEMS IN HILL AREAS

TABLE II (Concl'd.)
(hectares)

Sr. No.	Crop (1)	1972-1973		1973-1974		1974-1975		1975-1976		1976-1977		
		Area (15)	Per cent (16)	Area (17)	Per cent (18)	Area (19)	Per cent (20)	Area (21)	Per cent (22)	Area (23)	Per cent (24)	Rank (25)
1.	Rice	3,565	6.28	3,184	5.54	3,455	5.92	3,434	5.71	3,379	5.66	4
2.	Wheat	400	0.70	788	1.37	1,282	2.20	817	1.36	584	0.98	12
3.	Ragi	1,339	2.36	1,498	2.61	2,295	3.94	1,305	2.17	1,363	2.28	7
4.	Samai	1,293	2.28	1,192	2.08	1,351	2.32	1,208	2.01	1,134	1.90	8
5.	Pulses	325	0.57	236	0.41	322	0.55	281	0.47	339	0.57	15
6.	Other cereals	938	1.65	731	1.27	783	1.34	699	1.16	687	1.15	11
	Total food crops	7,860	13.84	7,629	13.28	9,488	16.27	7,744	13.78	7,486	12.54	
7.	Vegetables	1,059	1.87	1,896	3.30	584	1.00	1,986	3.30	1,720	2.88	6
8.	Potato	9,153	16.12	9,594	16.71	8,673	14.87	8,352	13.88	8,896	14.89	3
9.	Tapioca	482	0.85	378	0.66	752	1.29	827	1.37	702	1.18	10
10.	Banana	448	0.79	422	0.73	431	0.74	365	0.61	312	0.52	18
11.	Other fruits	346	0.61	401	0.70	351	0.60	332	0.55	333	0.56	16.5
12.	Oilseeds	82	0.14	37	0.06	29	0.05	30	0.05	23	0.04	22
13.	Ginger	639	1.13	647	1.13	545	0.93	1,044	1.73	846	1.42	9
14.	Other condiment and spices	187	0.33	177	0.31	228	0.39	277	0.46	269	0.45	19
	Total	12,406	21.84	13,552	23.60	11,594	19.87	13,213	21.95	13,101	21.94	
15.	Cardamom	189	0.33	219	0.38	158	0.27	199	0.33	199	0.33	20.5
16.	Pepper	112	0.20	125	0.22	129	0.22	198	0.33	197	0.33	20.5
17.	Tea	23,366	41.16	23,477	40.88	23,499	40.30	23,237	41.94	25,438	42.58	1
18.	Coffee	8,925	15.72	8,715	15.18	8,867	15.21	8,963	14.89	8,899	14.90	2
19.	Rubber	337	0.59	329	0.57	355	0.61	359	0.60	337	0.56	16.5
20.	Cinchona	393	0.69	333	0.58	355	0.62	355	0.59	355	0.59	14
21.	Lemongrass	195	0.35	176	0.31	310	0.53	393	0.65	543	0.90	13
	Total	33,517	59.04	33,374	58.12	33,673	57.76	35,704	52.33	35,968	60.19	
22.	Other crops	2,996	5.28	2,872	5.00	3,560	6.10	3,516	5.84	3,185	5.33	5
	Grand total	56,769	100.00	57,427	100.00	58,315	100.00	60,177	100.00	59,740	100.00	

Source: Director of Statistics, Madras.

To test whether there is a shift in the cropping pattern, Kendall's rank correlation coefficient was used. Ranks were assigned to each crop on the basis of its percentage to the total cropped area. Rank coefficients of correlations were worked out for each pair of years. For example, the cropping pattern for the year 1966-67 was compared with 1967-68. The correlation coefficients are given below:

Between	1966-67	and	1967-68	→	0.9134**
„	1967-68	and	1968-69	→	0.8701**
„	1968-69	and	1969-70	→	0.8701**
„	1969-70	and	1970-71	→	0.8874**
„	1970-71	and	1971-72	→	0.8788**
„	1971-72	and	1972-73	→	0.9134**
„	1972-73	and	1973-74	→	0.8701**
„	1973-74	and	1974-75	→	0.9221**
„	1974-75	and	1975-76	→	0.8528**
„	1975-76	and	1976-77	→	0.9048**

All the correlation coefficients were found to be statistically significant at one per cent, which indicates that there is no shift in the cropping pattern.

Further, the total change over the period 1966-67-1976-77 was examined by the test of concordance. The data are presented in Annexure I. The concordance coefficient was found to be 0.9486 and significant at one per cent. Hence it can be definitely concluded that there has been no shift in the cropping pattern between the years or over a period of eleven years.

Though there is no shift in the cropping pattern between the years 1966-67 and 1976-77, it is worthwhile to examine the existing cropping pattern and factors that have contributed to it. According to Sridharan,² the factors influencing the cropping pattern can be broadly classified into physical, economic, biological, technological and institutional. Economic factors are again sub-divided into two sub-classes, namely, internal economic factors and external economic factors. Internal economic factors are size of farm family, labour, capital and ownership. Under external economic factors are included market location and price. From the above classification of economic factors, it can be presumed that internal economic factors will have a definite bearing at the micro level. As this study limits itself to a study of the cropping pattern of the Nilgiris district, the study confines itself only to those factors whose influence can be discerned at the macro level.

The cropping pattern along with ranks for the years 1966-67 and 1976-77 is given in Table II. For the sake of convenience, the crops have been grouped into two major groups, *viz.*, food crops and cash crops. Vegetables, potato, banana, tapioca, etc., have been grouped under the second category as they are grown mainly for the market. Tea, coffee, rubber, cardamom, pepper, cinchona, etc., also come under cash crops but has been sub-classified as plantation crops for obvious reasons.

2. B. Sridharan: A Micro Level Study on Factors Influencing Cropping Pattern in Coimbatore District, Ph. D. Dissertation submitted to Tamil Nadu Agricultural University, 1971 (unpublished).

From a study of the table it can be seen that plantation crops occupy 57.21 per cent and 60.19 per cent of the total cropped area in 1966-67 and 1976-77 respectively. The area occupied by other cash crops and food crops was the lowest, being 22.61 and 22.94 per cent and 13.59 and 12.54 per cent respectively during the corresponding periods.

Coming to the individual crops, it can be seen that tea, coffee and potato are the most important crops constituting more than 70 per cent of the cropped area in the district. These crops maintained their ranks throughout the eleven-year period. A close study of Table II will reveal that the area under tea has considerably increased while the area under coffee is almost constant. The physical factors such as soil, elevations ranging from 1,800 to 2,500 metres with high rainfall of 1,300 to 2,000 mm. influence the farmers' choice of tea. Local enquiries revealed that old coffee plantations especially in higher elevations are being removed and planted with tea. Whenever new plantations are established tea is preferred to coffee. This is because of the following reasons. While marketing arrangements remained the same for coffee, for tea the co-operative processing and marketing organization (INDCO) which has recently come up in the area procures all the tea produced at the door steps of the farms. Further tea can be plucked every week or once in ten days and thus farmers get regular flow of income throughout the year. Contrary to this, coffee growers have to take the produce to the coffee pool-depot and the sale produce is received in two or four instalments spread over a period of 2 to 3 months in a year. The advantage of regular flow of income from tea attracts the small farmers. The existing land reform measures prohibit the growth of large estates. Hitherto uncultivated lands were assigned to landless agricultural labourers with the condition that they should not alienate the property for the next 20 years. Thus when conditions are favourable for the growth of small farmers, area under tea also increases because of the advantages discussed earlier.

As is well-known, price is one of the major factors influencing the acreage of the crops. Between tea and coffee, there is not much difference in the unit price. The unit price of both the commodities have risen nearly four times from the 1971-72 prices. The tea price has increased from Rs. 7.51 in 1971-72 to Rs. 25.30 per kg. in 1977-78. Correspondingly, the price of coffee has increased from Rs. 6.25 in 1971-72 to Rs. 23.82 per kg. in 1977-78. However, the increase in income from tea will be more since the yield in quantity is higher in tea as compared to coffee.

The yield factor is more pronounced due to the technological improvements in the cultivation of tea as compared to coffee. More number of clonal and hybrid selections have been introduced in tea crop.

It may be observed from Table II that there are fluctuations in the area under potato. The potato area showed a declining trend between the years 1966-67 and 1969-70 but it increased between 1971-72 and 1973-74. From 1974-75 to 1976-77 the area has remained constant.

The main reasons for this trend is the attack of golden nematode and virus diseases of potato. The golden nematode of potato was first discovered

in India by Jones in 1961 in a field in the Ootacamund area of the district. It is reported that systematic surveys taken up from 1963-69 in an area of 9,000 hectares indicated that 1,200 hectares were infected with the nematode. In view of the great importance the crop has in the economy of the country and of the district in particular intensive steps were taken by the Government and other agencies. In fact restoring potato cultivation by means of pest control, introducing improved seed material and discouraging mono-cropping was the main task of the Indo-German Nilgiris Development Project started in 1967.³

However, intensive action to control, if not eradicate, the nematode was taken during the year 1970-71 with the introduction of powerful nematocides like "Dasanit". As a result of this, the nematode population was controlled, which is reflected in the increase in area under potato during 1971-72 to 1973-74. In the subsequent stages of the project, crop diversification was introduced as a step to eradicate the nematode. Consequently, the area under vegetables showed a slightly increasing trend and a marginal decline in the potato area. Since the area under all other crops constituted only 30 per cent and there is also not much significant variation in their area, detailed discussion was not found necessary.

Conclusion

From the study it is concluded that though there is no shift in the cropping pattern between 1966-67 and 1976-77 in the Nilgiris district, the acreage allocation between the crops is influenced by physical, economic, biological and sociological factors.

3. German Agency for Technical Co-operations Ltd.: Indo-German Nilgiris Development Project 1967-1977: 10 Years of Indo-German Co-operation, Eschborn, 1978, pp. 16-20.

ANNEXURE 1

TEST OF CONCORDANCE—DATA AND CALCULATIONS

(ranks of crops)

Sr. No.	Crop	1966-67	1967-68	1968-69	1969-70	1970-71	1971-72	1972-73	1973-74	1974-75	1975-76	1976-77	Total x	Diff. $\bar{x}^* - x$	Diff. ²
1.	Rice	5	5	4	4	4	4	4	4	5	5	4	48.0	78.5	6162.25
2.	Wheat	11	10	10.5	13.5	8	13	9	9	8	11	12	123.0	3.5	12.25
3.	Ragi	8	7	6	6	6	6	7	7	6	7	7	72.0	54.5	2970.25
4.	Samai	7	8	7	8	7	7	8	8	7	8	8	82.0	44.5	1980.25
5.	Other cereals	12.5	13	14	10.5	9	11	9	10	9	12	11	121.0	5.5	30.25
6.	Pulses	18	16	18	16	16.5	17	17	17	17	18	15	186.5	-60.0	3600.00
7.	Cardamom	20	19	19	19	19	19.5	18	18	20	20.5	20.5	213.5	-87.0	7569.00
8.	Ginger	17	14	11.5	12	10	10	11	11	12	9	9	125.5	1.0	1.00
9.	Pepper	21	20	21	21	21	21	21	21	21	20.5	20.5	229.0	-102.5	10506.25
10.	Condimnt and spices	19	21	20	20	20	19.5	19.5	19.5	19	19	19	216.0	-89.5	8010.25
11.	Banana	9	9	9	12	12	12	12	12	13	14	18	139.0	-2.5	6.25
12.	Other fruits	12.5	12	11.5	15	13.5	16.5	15	13	16	17	16.5	158.5	-32.0	1024.00
13.	Tapioca	15	17	13	13.5	11	13	11	14	10	10	10	137.5	-11.0	121.00
14.	Potato	3	3	3	3	2	2	2	2	3	3	3	30.0	96.5	9312.25
15.	Vegetables	6	6	8	8	9	8	6	6	11	6	6	81.0	45.5	2070.25
16.	Oilseeds	22	22	22	22	22	22	22	22	22	22	22	242.0	-115.5	13340.25
17.	Rubber	14	15	15	16	15	15	16	16	15	15	16.5	168.5	-42.0	1764.00
18.	Coffee	2	2	2	2	3	3	3	3	2	2	2	26.0	100.5	10100.25
19.	Tea	1	1	1	1	1	1	1	1	1	1	1	11.0	115.5	13340.25
20.	Cinchona	10	11	10	13.5	18	14	15	14	15	14	14	149.5	-23.0	529.00
21.	Lemongrass	16	18	16	17	17	18	18	19.5	18	13	13	183.5	-57.0	3249.00
22.	Other crops	4	4	5	5	5	5	5	5	4	4	5	51.0	75.5	5700.25
															101398.50

* \bar{x} is mean 126.5 as calculated below.

$$\bar{x} = \frac{m(n+1)}{2} = \frac{11(22+1)}{2} = 126.5$$

$$t = 5 \left[\frac{(2^3 - 2)}{12} \right] + 2 \left[\frac{(4^3 - 4)}{12} \right] = 13.5$$

$$w = \frac{\sum \text{dif.}^2}{1/12 m^2 (n^3 - n)} = \frac{101398.5}{1/12 \cdot 11^2 (22^3 - 22)} = 11(13.5)$$

$$x^2 = m(n-1)w = 11 \times 21 \times 0.9486 = 219.1266$$

$$= 0.9486$$