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## **A Study of Land Use and Cropping Pattern following Land Reforms in a Tribal Area of Tamil Nadu**

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Land reform measures have suffered a slowdown worldwide in recent years. Adding to this, the policies of the International Monetary Fund and the World Bank are in favour of market reforms rather land reforms.(Haque, 1992) These changes appear to have influenced the New Economic Policy of the Government of India commencing from July 1991, which ‘does not explicitly say anything on the role of land reforms’ (Rao, 1992) . However, in the persisting agrarian structure, land continues to have its crucial importance in the utilisation of productive resources in rural India.

The Common Minimum Programme of the UPA Government at the Centre articulates that, ‘Landless families will be endowed with land through implementation of land ceiling and land redistribution legislation. No reversal of ceilings legislation will be permitted’ (The Hindu, 2004). Perhaps this has become imperative because of vast inequalities in the distribution of land, an acute scarcity of capital, especially among small and marginal farmers and an overcrowding of landless agricultural labour. Thus land reforms have remained an integral part of the socio-economic development of the peasantry.

The present paper is organised as follows:

1. The rationale for unique land reforms to the tribals,
2. Land reforms in Kalrayan hills of Tamil Nadu, and
3. Land use pattern and crop pattern in Kalrayan hills of Tamil Nadu.

### METHODOLOGY

The Kalrayan hills of Tamil Nadu is purposively chosen for the present research work, because land reform measures have been undertaken on a large scale from 1976 and yet not completed. The present study is based on time-series data taken from the Government of Tamil Nadu’s records from 1989 to 2001. To test whether there is any change in the land use pattern and cropping pattern in the hills, Spearman's rank correlation coefficient, Concordance coefficient and  $\chi^2$  methods (Kendall, 1975) have been used as follows:

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*Spearman's Rank Correlation Coefficient*

$$\rho_{sj} = 1 - \left[ \frac{6 \sum \{d^2(i)\}}{n(n^2 - 1)} \right]$$

Where:

- $\rho$  = rank correlation coefficient,
- $d(i)$  = difference between two ranks allotted according to criteria s and j to i-th unit,
- n = units ranked.
- s/j = 1...m = ranking criteria.

*Concordance Coefficient*

$$w = \frac{\sum \text{dif}^2}{\frac{1}{2}m^2(n^3 - n) - nt}$$

Where:

- w = concordance coefficient,
- $\text{dif}^2 = (\bar{x} - x)^2$ ,
- m = number of years,
- n = number of observations,
- t = number of observations in a group tied for a given rank.

 *$\chi^2$  Method*

$$\chi^2 = m(n-1)w$$

Where:

- m = number of years,
- n = number of observations,
- w = concordance coefficient.

*The Rationale for Unique Land Reforms to the Tribals*

Land reforms are all the more necessary for the comparatively closed system of tribal economy. Such land reform measures are crucial for protecting the tribals from exploitation. These reform measures designed for a more equitable distribution of land are uniformly applied both in tribal as well as non-tribal areas but, land reform measures should differ in tribal areas from non-tribal areas, because, of the subtle distinction observed in both the areas.

Implementation of land reforms in the tribal areas is both simple and complex. It is simple, because, the allotment of land is only to the tribals of a particular locality. While it is complex due to: insufficient land records owing to heritage ownership, socially, culturally, economically diverse tribal groups, and also the tribal areas are generally inaccessible. This situation is indeed tragic, for all the tribal people, since they were land owners in the beginning but their right on land was not recognised and there was total absence of official agencies or legal authorities in the tribal areas.

The distinguishing feature of the tribal people is their peculiar association with the area in which they inhabit. Others always have an eye on these natural assets of the tribals either land or invaluable forest, or both. Therefore, "the first blow to this ingrained belief came to an end with the reservation of forests in the name of scientific management done by the colonial rulers for the purpose of revenue" (Government of India, 1986-87). In course of time, even the right of the tribals to collect the minor forest produce has not been allowed by the authorities. Further, even after the end of colonial rule, the demand for forest land continues and now much of the lands are declared as 'forest land', exclusively under the control of the Government in order to arrest the deleterious deforestating effect of shifting cultivation, land slide and soil erosion.

The tribals of India are known as socially, economically, politically, technologically and culturally diverse groups living under different and ecological conditions. In fact, due to multiplicity of such factors and complexity of problems involved, the tribes of India are being classified on the basis of their territorial distribution, linguistic affiliation, physical and racial characteristics, occupational economy, cultural contact and religious belief. Accordingly, any measure or reform will have to be linked with the tribal way of life, physical conditions of land, social customs, traditions and belief of each of the tribal areas. For that matter, even among the tribals a clear distinction is stated to be warranted between tribals living outside the Scheduled Areas termed as "Dispersed Tribals" and Tribals living within the Scheduled Areas described as "Predominantly Tribal areas".

In these circumstances, any conventional land reform measure or developmental programme will not provide the solution to the complex problems and intricate issues of tribals. As, "these people have a holistic view of life which cannot be neatly dissected into personal, social, religious and economic slices which may be separately handled. Accordingly, it is not possible to make a distinction between the so called developmental and non-developmental facets of administration. They are so indistinguishably interwoven that one without the other may have no meaning, nay, may even become dysfunctional" (Government of India, 1986-87). Therefore, any economic measure of the type of land reforms will have to be suitably designed taking care of the special situation prevailing in the tribal areas.

#### *Land Reforms in Kalrayan Hills of Tamil Nadu*

In India, land reform is a State subject and hence, sharp variations in the implementation of land reform measures have been observed. The principal acts on

land reforms in Tamil Nadu are the Tamil Nadu Land Reforms (Fixation of Ceiling on Land) Act, 1961 (Tamil Nadu Act 58 of 1961); and the Inam Estate (Abolition and Conversion in to Ryotwari) Act of 1963 and the Madras Inam (Supplementary) Act, 1963 (Madras Act 31 of 1963). These Acts are commonly applied both in the non-tribal and tribal areas of the state. The Inam Estate (Abolition and Conversion into Ryotwari) Act of 1963 was used to take over the Kalrayan hills from the Jagirdars in 1976.

In the post-land reform period, fresh survey and settlement operations were carried out by the Survey and Settlement Department, Government of Tamil Nadu, in accordance with the provisions contained in the Tamil Nadu Survey and Boundaries Act, 1923 (Tamil Nadu Act VIII of 1923). All these Acts are used to implement land reform measures in the non-tribal areas.

In the non-tribal areas, during the land settlement, lands will be assigned, in accordance with the extent of acquired land and on the basis of the number of applications from the needy people. The allotment of land according to the Act, "Notwithstanding anything contained in any judgment, decree or order of any court or other authority, all acts done and proceedings taken by any officer or authority under the Principal Act before the date of the publication of this Act in the Tamil Nadu Government Gazette, on the basis that a person who had a right to enjoy the land during his lifetime but had no power to alienate the land was a limited owner under the principal Act and shall, for all purposes be deemed to be and to have always been validly done" (Government of Tamil Nadu, 1980).

In Tamil Nadu, this Act and methods were used to implement land reforms in the Kalrayan hills. Accordingly, land was distributed to the tribals (8153.02 hectares that is 14.22 per cent of the total land area of the hills) (Government of Tamil Nadu, 1986). This resulted in changes in the land use and cropping pattern in the study area as discussed below.

#### *Land Use Pattern*

Land use pattern in these hills deals with nine different categories of land as per A-1 register in the State. First of all, "Forest Land" includes: forest belonging to the Government, and land classified as per Forest Conservation Acts. This category of land also includes forest owned by private people subject to the Acts. However, in the Kalrayan hills the forest land represents only the forest land of the Government and no private forest land is reported in the A-1 register of the Taluk offices.

Secondly, "land unfit for cultivation", contains hilly or mountainous, desert and other lands. In the study area this category of land includes only hilly land.

Another category of land is the "Land used for purposes other than cultivation." This land includes: roads and lanes, railway lines, rivers, temples, government wells, canals, tanks, ponds and the village site. Such lands are also called the "poramboke land".

The fourth category is the "Fallow land fit for cultivation", which contains, all lands fit for cultivation which were left fallow for a few years. Yet another category of land is "grazing land". This land contains all permanent grazing land. Sixthly, "Trees and Garden" lands include all lands fit for cultivation and those lands that are not shown in the net cultivated land. Seventhly, the "current fallow" land contains all lands cultivated in the previous season and left uncultivated in the current season. Further, "other fallow" land consists of all lands left uncultivated to a minimum of one year and a maximum of five years. This classification of land includes only those lands that were cultivated in the previous years. Finally, the "net cultivated land" includes all lands used for cultivation of various crops. These classifications of lands are given as per statistical reports A-1, A-2 and also corroborate with Report "G" of the Taluk office. Table 1 gives the details of land use pattern in the Kalrayan Hills during the study period.

Table 1 gives the details of distribution of land in Kalrayan Block from 1989 to 2001. In 1986-87, the forest land constituted 72.33 per cent of the total land. While the net cultivated land was 20.91 per cent of the tribal land of the hill. While the total land of the hill remain unchanged with 57,209 hectares from 1989 to 2001. The forest land varied from 63.71 per cent (1989-90) to 62.61 per cent (2000-01). On the other hand, the net cultivated land had increased from 24.9 per cent in 1989-90 to 30.47 per cent in 2000-01. Moreover, the increase or decrease of net cultivated land in all these years also corroborated with such fluctuations in the forest land. Thus, in the absence of much variation in other types of land, the tribals use of forest land and other types of lands should have changed the extent of net cultivated land. Further, the 69.66 per cent of forest land as reported in the A-1 register of taluk office was much below the 79 per cent of forest land (1995-96) as shown in the Forest Department Records. This shows a favourable situation in the hill, but, the right of the tribals on forest land is not permissible as per the Forest Conservation Policy of the Government.

Spearman's Correlation between years in the land use pattern in Kalrayan Hills from 1989 to 2001 are given in Table 2. It is interesting to note that all the Correlation Coefficients are statistically significant at 1 per cent level (two tailed). This shows that there is no shift in the land use pattern in the tribal area. The Concordance Coefficient is 0.93275 and the value is significant at one per cent level ( $\chi^2 = 89.5437$  and tabulated value at one per cent for the degrees of freedom 18 is 20.090) (Refer Appendix 1). As a result, it can be concluded that there is no significant change in the land use pattern in the study area.

TABLE 1. LAND USE PATTERN IN KALRAYAN BLOCK FROM 1989 TO 2001

Sl. No.	Classification of land	(ha)											
		1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-2000	2000-01
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
1.	Forest land	36446 (63.71)	38107 (66.61)	34636 (60.54)	39352 (68.79)	34936 (61.07)	39831 (69.63)	39853 (69.66)	39036 (68.23)	35187 (61.51)	37241 (65.09)	36584 (63.95)	35821 (62.61)
2.	Land unfit for cultivation	1736 (3.03)	515 (0.91)	1255 (2.19)	691 (1.21)	2653 (4.64)	691 (1.21)	713 (1.25)	652 (1.15)	698 (1.22)	725 (1.27)	682 (1.19)	788 (1.38)
3.	Land used for purposes other than cultivation	976 (1.71)	767 (1.34)	876 (1.53)	1027 (1.8)	976 (1.71)	1008 (1.76)	986 (1.72)	790 (1.38)	812 (1.42)	843 (1.47)	758 (1.32)	649 (1.13)
4.	Fallow land fit for cultivation	762 (1.33)	762 (1.33)	894 (1.56)	980 (1.71)	994 (1.74)	407 (0.71)	429 (0.75)	364 (0.64)	425 (0.74)	465 (0.81)	516 (0.9)	504 (0.88)
5.	Grazing land	16 (0.03)	14 (0.02)	24 (0.04)	23 (0.04)	23 (0.04)	36 (0.06)	46 (0.08)	55 (0.09)	74 (0.13)	98 (0.17)	103 (0.18)	79 (0.14)
6.	Trees and garden	94 (0.16)	153 (0.27)	85 (0.15)	80 (0.14)	80 (0.14)	107 (0.19)	98 (0.17)	101 (0.18)	156 (0.27)	167 (0.3)	174 (0.3)	125 (0.22)
7.	Current fallows	2014 (3.52)	2445 (4.27)	1814 (3.17)	1420 (2.48)	2902 (5.07)	1357 (2.37)	1384 (2.42)	1234 (2.16)	1302 (2.28)	1364 (2.38)	1420 (2.48)	1323 (2.31)
8.	Other fallows	920 (1.61)	1037 (1.81)	894 (1.56)	575 (1.01)	969 (1.69)	475 (0.83)	449 (0.78)	347 (0.61)	430 (0.75)	512 (0.9)	658 (1.15)	490 (0.86)
9.	Net cultivated land	14245 (24.9)	13409 (23.44)	16731 (29.26)	13061 (22.82)	13676 (23.90)	13297 (23.24)	13251 (23.17)	14630 (25.57)	18125 (31.68)	15794 (27.61)	16314 (28.52)	17430 (30.47)
	Total	57209 (100.00)	57209 (100.00)	57209 (100.00)	57209 (100.00)	57209 (100.00)	57209 (100.00)	57209 (100.00)	57209 (100.00)	57209 (100.00)	57209 (100.00)	57209 (100.00)	57209 (100.00)

Note: Figures in parentheses are percentages to the total.

Sources: 1. Government of Tamil Nadu: Divisional Statistical Office, Kallakuruchi.  
2. Government of Tamil Nadu: Divisional Statistical Office, Sankarapuram.

TABLE 2. SPEARMAN'S CORRELATION BETWEEN YEARS IN THE LAND USE PATTERN IN KALRAYAN HILLS FROM 1989 TO 2000

Years (1)	1989-90 (2)	1990-91 (3)	1991-92 (4)	1992-93 (5)	1993-94 (6)	1994-95 (7)	1995-96 (8)	1996-97 (9)	1997-98 (10)	1998-99 (11)	1999-2000 (12)
1989-90	1.000	.870	0.900	0.833	0.917	0.917	0.917	0.917	0.917	0.917	0.850
1990-91	0.870	1.000	0.870	0.971	0.895	0.895	0.895	0.895	0.895	0.895	0.946
1991-92	0.900	0.870	1.000	0.933	0.950	0.950	0.950	0.950	0.950	0.950	0.950
1992-93	0.833	0.971	0.933	1.000	0.917	0.917	0.917	0.917	0.917	0.917	0.983
1993-94	0.917	0.895	0.950	0.917	1.000	1.000	1.000	1.000	1.000	1.000	0.967
1994-95	0.917	0.895	0.950	0.917	1.000	1.000	1.000	1.000	1.000	1.000	0.967
1995-96	0.917	0.895	0.950	0.917	1.000	1.000	1.000	1.000	1.000	1.000	0.967
1996-97	0.917	0.895	0.950	0.917	1.000	1.000	1.000	1.000	1.000	1.000	0.967
1997-98	0.917	0.895	0.950	0.917	1.000	1.000	1.000	1.000	1.000	1.000	0.967
1998-99	0.917	0.895	0.950	0.917	1.000	1.000	1.000	1.000	1.000	1.000	0.967
1999-2000	0.850	0.946	0.950	0.983	0.967	0.967	0.967	0.967	0.967	0.967	1.000
n	9	9	9	9	9	9	9	9	9	9	9

All Rank Correlation coefficients are significant at the 0.01 level (two-tailed).



### *Crop Pattern*

In the Kalrayan hills, the tribals cultivated 19 types of crops from 1989 to 2001. The long list of crops presented in Table 3 clearly indicates that the Kalrayan hill tribes had experience in raising various crops. The major food crops raised by them were paddy, varagu, samai,<sup>1</sup> ragi (*elcusine coscorana*), cumbu (*pennisetum typhoidum*) and cholam (*sorghum vulgare*), whereas, the major commercial crops cultivated by them were tapioca and sugarcane.

Further, they also cultivated groundnut, gingili, pulses mulberry, jackfruit, lemon, fruits, vegetables, etc. Varagu crop topped in the cropping pattern with 43 per cent in 1989-90 and decreased to 21.05 per cent in 2000-01. While paddy crop was second only in the rank, it showed an increasing trend from 1989-90 (16.51 per cent) to 2000-01 (23.66 per cent). Moreover, the decreased extent of land for varagu was compensated with increasing area of land in raising paddy and commercial crops, i.e., tapioca and some extent sugarcane and groundnut. The gross cultivated land was 18,501 hectares in 1989-90 and it decreased to 15,243 hectares in 2000-01. If we compare the net cultivated land as given in Table 2, it is clear that the gross cultivated area of land was more than the net area sown. This shows that the tribals cultivated many crops and adopted crop rotation. It is observed that paddy was raised in one season while pulses or ragi or cumbu were cultivated in the second season.

The correlation coefficient between the pairs of years in the crop pattern from 1989-90 to 2000-01 in tribal area is given in Table 4. All the correlation coefficients are statistically significant at one per cent level (two-tailed). Therefore, it can be inferred that there is no shift in the crop-pattern in the tribal area. The Concordance coefficient is 0.9788 and the value is significant at 1 per cent level ( $\chi^2 = 211.4299$  and tabulated value at 1 per cent for the df. 18 is 37.2) (Refer Appendix 2). It can be concluded that there is no significant change in the crop pattern in the study area.

TABLE 3. CROPPING PATTERN IN THE KALRAYAN BLOCK FROM 1989 TO 2001

Sl. No. (1)	Name of Crop (2)	1989-90 (3)	1990-91 (4)	1991-92 (5)	1992-93 (6)	1993-94 (7)	1994-95 (8)	1995-96 (9)	1996-97 (10)	1997-98 (11)	1998-99 (12)	1999-2000 (13)	2000-01 (14)
1.	Paddy	3055 (16.51)	2831 (16.96)	3558 (22.96)	3140 (22.5)	3058 (21.17)	3183 (21.8)	3246 (23.14)	3352 (22.83)	3573 (23.13)	3438 (21.56)	3594 (20.94)	3607 (23.66)
2.	Cholam	238 (1.29)	276 (1.65)	203 (1.31)	390 (2.79)	277 (1.92)	332 (2.28)	344 (2.45)	321 (2.19)	364 (2.36)	431 (2.70)	503 (2.93)	496 (3.25)
3.	Sugarcane	971 (5.25)	922 (5.52)	1071 (6.91)	956 (6.85)	886 (6.13)	720 (4.93)	814 (5.8)	867 (5.90)	890 (5.76)	942 (5.91)	934 (5.44)	971 (6.37)
4.	Ragi	771 (4.17)	962 (5.76)	1300 (8.39)	950 (6.81)	838 (5.8)	1049 (7.18)	1056 (7.53)	1110 (7.56)	1265 (8.19)	1320 (8.28)	1403 (8.17)	1067 (6.99)
5.	Thinai	296 (1.6)	392 (2.35)	372 (2.4)	509 (3.64)	439 (3.04)	567 (3.88)	616 (4.39)	592 (4.03)	648 (4.19)	717 (4.5)	810 (4.72)	775 (5.08)
6.	Varagu	7956 (43.00)	6415 (38.42)	3231 (20.85)	3856 (27.63)	3965 (27.44)	3242 (22.21)	3199 (22.8)	3325 (22.64)	4635 (30.00)	4519 (28.34)	5014 (29.21)	3209 (21.05)
7.	Samai	1259 (6.81)	1160 (6.95)	1003 (6.47)	1034 (7.41)	1042 (7.21)	1070 (7.33)	1054 (7.51)	1206 (8.21)	1200 (7.77)	1322 (8.29)	1358 (7.91)	1422 (9.33)
8.	Tamarind	2 (0.01)	2 (0.01)	2 (0.01)	2 (0.01)	2 (0.01)	2 (0.01)	2 (0.01)	2 (0.01)	2 (0.01)	2 (0.02)	2 (0.01)	2 (0.01)
9.	Fruits, vegetables and roots	178 (0.96)	315 (1.89)	260 (1.68)	184 (1.32)	193 (1.34)	69 (0.47)	150 (1.07)	164 (1.12)	170 (1.10)	331 (2.08)	406 (2.37)	390 (2.56)
10.	Groundnut	818 (4.42)	275 (1.65)	851 (5.49)	640 (4.59)	710 (4.91)	561 (3.84)	435 (3.1)	513 (3.49)	350 (2.27)	395 (2.48)	419 (2.44)	351 (2.30)

(Contd.)

TABLE 3 (CONCLD.)

Sl. No.	Name of Crop	1989-90	1990-91	1991-92	1992-93	1993-94	1994-95	1995-96	1996-97	1997-98	1998-99	1999-00	2000-01
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
11.	Cocunut	7 (0.04)	5 (0.03)	5 (0.03)	5 (0.04)	5 (0.03)	5 (0.03)	5 (0.04)	5 (0.03)	5 (0.03)	5 (0.03)	5 (0.03)	5 (0.03)
12.	Gingli	4 (0.02)	2 (0.01)	5 (0.03)	5 (0.04)	3 (0.02)	7 (0.05)	15 (0.11)	16 (0.11)	12 (0.08)	14 (0.09)	19 (0.11)	13 (0.09)
13.	Mulberry	15 (0.08)	-	-	-	-	-	-	-	-	-	-	-
14.	Prantain	178 (0.96)	315 (1.89)	325 (2.17)	380 (2.72)	376 (2.62)	306 (2.1)	323 (2.3)	342 (2.33)	195 (1.26)	223 (1.4)	257 (1.50)	284 (1.86)
15.	Jackfruit	5 (0.03)	5 (0.03)	5 (0.03)	5 (0.03)	5 (0.03)	5 (0.03)	5 (0.04)	5 (0.03)	5 (0.03)	5 (0.03)	5 (0.03)	5 (0.03)
16.	Lemon	20 (0.11)	20 (0.12)	20 (0.13)	20 (0.14)	20 (0.14)	20 (0.14)	20 (0.14)	20 (0.14)	20 (0.13)	20 (0.13)	20 (0.12)	20 (0.13)
17.	Tapioca	676 (3.65)	911 (5.46)	970 (6.26)	810 (5.8)	962 (6.66)	1073 (7.35)	871 (6.21)	893 (6.08)	675 (4.37)	730 (4.58)	871 (5.07)	922 (6.05)
18.	Cumbu	1379 (7.45)	1395 (8.36)	1771 (11.43)	600 (4.3)	954 (6.6)	1648 (11.29)	1477 (10.53)	1536 (10.46)	820 (5.31)	906 (5.68)	948 (5.52)	1034 (6.78)
19.	Pulses	673 (3.64)	492 (2.95)	542 (3.5)	471 (3.37)	713 (4.93)	741 (5.08)	396 (2.83)	436 (2.97)	637 (4.12)	647 (4.06)	623 (3.63)	670 (4.39)
	Total	18501 (100.00)	16695 (100.00)	15494 (100.00)	13957 (100.00)	14448 (100.00)	14600 (100.00)	14028 (100.00)	14684 (100.00)	15449 (100.00)	15948 (100.00)	17167 (100.00)	15243 (100.00)

Note: Figures in parentheses are percentages to the total.

Sources: 1. Government of Tamil Nadu: Divisional Statistical Office, Kallakuruchi.

2. Government of Tamil Nadu: Divisional Statistical office, Sankarapuram.

TABLE 4. SPEARMAN'S RANK CORRELATION BETWEEN THE YEARS IN THE CULTIVATION OF CROPS IN KALRAYAN HILLS FROM 1989 TO 2001

Years (1)	1989-90 (2)	1990-91 (3)	1991-92 (4)	1992-93 (5)	1993-94 (6)	1994-95 (7)	1995-96 (8)	1996-97 (9)	1997-98 (10)	1998-99 (11)	1999-2000 (12)	2000-01 (13)
1989-90	1.000	0.924	0.957	0.947	0.951	0.934	0.946	0.949	0.927	0.932	0.931	0.923
1990-91	0.924	1.000	0.963	0.927	0.963	0.962	0.960	0.965	0.964	0.966	0.969	0.974
1991-92	0.957	0.963	1.000	0.958	0.965	0.964	0.983	0.983	0.964	0.958	0.965	0.956
1992-93	0.947	0.927	0.958	1.000	0.971	0.939	0.958	0.960	0.972	0.974	0.964	0.955
1993-94	0.951	0.963	0.965	0.971	1.000	0.979	0.965	0.974	0.958	0.961	0.956	0.954
1994-95	0.934	0.962	0.964	0.939	0.979	1.000	0.981	0.981	0.961	0.961	0.968	0.963
1995-96	0.946	0.960	0.983	0.958	0.965	0.981	1.000	0.996	0.979	0.975	0.984	0.977
1996-97	0.949	0.965	0.983	0.960	0.974	0.981	0.996	1.000	0.974	0.972	0.977	0.974
1997-98	0.927	0.964	0.964	0.972	0.958	0.961	0.979	0.974	1.000	0.996	0.996	0.989
1998-99	0.932	0.966	0.958	0.974	0.961	0.961	0.975	0.972	0.996	1.000	0.996	0.995
1999-00	0.931	0.969	0.965	0.964	0.956	0.968	0.984	0.977	0.996	0.996	1.000	0.995
2000-2001	0.923	0.974	0.956	0.955	0.954	0.963	0.977	0.974	0.989	0.995	0.995	1.000
n	19	19	19	19	19	19	19	19	19	19	19	19

All Rank Correlation coefficients are significant at the 0.01 level (two-tailed).

## CONCLUSION

Land reform measures are essential to initiate tribal development in order to promote more unproductive utilisation of land resources. The land reforms laws should be uniquely designed to suit to each tribal area in our country. In this study, no significant change in the land use pattern and cropping pattern was found during the study period. It is due to inadequate distribution of lands through land reforms, the resultant change in the socio-economic conditions of the tribals, and the soil conditions in the Kalrayan hills. Therefore, to put an end to these stagnant conditions of the tribals fresh survey and settlement should be conducted. Perhaps a more equitable distribution of land should be promoted. In addition, suitable law should be enacted to stop land alienation in the hills.

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## NOTE

1. These are all millets raised in hill areas in Tamil Nadu.

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APPENDIX I

Land (1)	1989-		1990-		1991-		1992-		1993-		1994-		1995-		1996-		1997-		1998-		1999-		2000-		Total (14)	$\bar{X} - X$ (15)	$(X-X)^2$ (16)
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)			
Forest Land	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	12	48	2304	
Land unfit for cultivation	4	7	4	6	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	59	1	1	
Land used for purposes other than cultivation	5	5	6	4	6	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	55	5	25	
Fallow land fit for cultivation	7	6	5.5	5	5	7	7	6	7	5	7	7	7	7	6	7	7	7	7	7	7	7	6	75.5	-15.5	240.25	
Grazing land	9	9	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	107	-47	2209	
Trees and garden	8	8	7	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	95	-35	1225	
Current fallows	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	36	24	576	
Other fallows	6	4	5.5	7	7	6	6	7	7	7	6	6	6	6	7	7	6	6	6	6	6	6	7	73.5	-13.5	182.25	
Net cultivated land	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	2	24	36	1296	
																								537		8058.5	

$$\bar{X} = 60$$

$$W = \frac{8058.5}{1/12 \times 12^2 (9^3 - 9) - 11 \times 0.5} = 0.93275$$

$$\chi^2 = 12 \times 8 \times 0.93329 = 89.5437$$

APPENDIX 2

Crops (1)	1989	1990-	1991-	1992-	1993-	1994-	1995-	1996-	1997-	1998-	1999-00	2000-	Total (14)	$\bar{X} - X$ (15)	$(x-x)^2$ (16)
	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)			
Paddy	2	2	1	2	2	2	2	1	2	2	2	1	21	99	9801
Cholam	11	11	13	11	11	11	11	12	10	10	9	10	130	-10	100
Sugarcane	5	6	5	4	6	8	7	7	5	5	6	6	70	50	2500
Ragi	7	5	4	5	7	6	5	5	3	4	3	4	58	62	3844
Thinai	10	9	10	9	10	9	8	8	8	8	8	9	106	14	196
Varagu	1	1	2	1	1	1	1	2	1	1	1	2	15	105	11025
Samai	4	4	6	3	3	5	4	4	4	3	4	3	47	73	5329
Tamrind	18	15.5	17	17	15	17	16	17	17	17	16	17	199.5	-79.5	6320.25
Fruits, Vegetables and roots	12.5	10.5	12	13	12	13	13	13	13	12	11	11	146	-26	676
Groundnut	6	12	8	7	9	10	9	9	11	11	10	12	114	6	36
Coconut	15	14.5	16	16	13.5	16.5	16.5	16.5	16.5	16.5	15.5	16.5	189.5	108	11664
Gingili	17	15.5	15.5	15.5	14	15	15	15	15	15	14	15	181.5	-61.5	3782.25
Mulberry	14	0	0	0	0	0	0	0	0	0	0	0	14	106	11236
Plantain	12.5	10.5	11	12	11	12	12	11	12	13	12	13	142	-22	484
Jackfruit	16	14.5	15.5	15.5	13.5	16.5	16.5	16.5	16.5	16.5	15.5	16.5	189.5	-69.5	4830.25
Lemon	13	13	14	14	12	14	14	14	14	14	13	14	163	-43	1849
Tapioca	8	7	7	6	4	4	6	6	7	7	7	7	76	44	1936
Cumbu	3	3	3	8	5	3	3	3	6	6	5	5	53	67	4489
Pulses	9	8	9	10	8	7	10	10	9	9	8	8	105	15	225
													2020		80322.75

$\bar{X} = 120$

$$W = \frac{80322.75}{1/12 \times 12^2 (19^3 - 19) - 11 \times 23} = 0.9788$$

$$\chi^2 = 12 \times 18 \times 0.9788 = 211.4299$$