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esource appraisal for alternative land use planning in Salem district, amil Nadu

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Abstract: The natural resources of Salem district were assessed to find out the problem and potential areas, their suitability for various crops grown and to formulate alternative land use plan suitable for the district. Erratic rainfall, soil erosion, depth, gravelliness and available water holding capacity are the major constraints affecting the productivity of land resources in the district. Land capability classification showed about 70 per cent of area suitable for cultivation and the remaining areas suitable only for forestry and other purposes. About 30 per cent area in the district is not suitable for irrigation due to shallow soil depth and hilly topography. Land evaluation showed the suitability of the areas for the major crops grown in the district. The resource appraisal showed the failure of annual crops in the rainfed areas in most years and the necessity to change the existing cropping pattern in the future. Mango is found to be the ideal crop in the drought prone areas and tapioca in other parts of the district.

Key words : Resource assessment, Land use planning, Alternative land use.

oduction

Salem district (refers to the undivided strict), located in the central upland plateau gion of Tamil Nadu, is predominantely an ricultural tract. It is endowed with rich mineral posits and receives fairly good amount of nfall from both the monsoons. Soil resources ry from shallow to very deep, loamy to yey soils and capable of supporting a variety crops.

With all its natural resources and its strategic cation, the district has not made a mark the agricultural scene of the state. In the st, the district was popular for the mango rieties, but at present the area under mango very less. For other crops grown in the strict, though there is enormous potential available, systematic effort was made to improve their oductivity or to focus on the need to bring any change in the existing land use pattern.

laterials and Methods

eneral description of the area

Salem district with an area of 8.63 lakh is located in the central part of the Kongu adu plateau and lies between 11° and 12° orth latitudes and 77°, 40' and 78°, 50' East ngitudes. It is bounded by Dharmapuri district the north, South Arcot in the east, Tiruchirappalli in the south and Periyar in the west. It is divided into 6 subdivisions, 9 taluks, 35 blocks and 958 villages.

Charnockites, gneisses and granites are the dominant rock formations observed in the district. Charnockites occur in the eastern hill ranges like Mettur, Shervaroy and Kolli hills. Granites and gneisses occur in the rest of the area.

The district can broadly be divided into Eastern Ghats, Tamil Nadu Uplands and Tamil Nadu Plains. The Eastern Ghats occurring in the Northern and Eastern part of the district includes Shervaroy and Kolli hills and part of the Bargur hills near the Mettur dam. The Uplands occur in the central and southern part of the district. The Plains is an extension of the Cauvery canal irrigation system and occur as a narrow stretch along the river.

Climate

The climate is semi-arid tropical in the uplands and semi-arid temperate to humid tropical in the Shervaroy and Kolli hills. More than 50 per cent of the rainfall is received during the Southwest monsoon and the rest during the Northeast monsoon and summer months. There is considerable difference in the amount of rainfall received in the upland region and

hilly areas. The highest rainfall is recorded in Yercaud (1300 mm) and the lowest is recorded in the Tiruchengodu (697 mm) and Sankaridurg regions (772 mm). The mean annual temperature recorded at Salem is 27.9°C. The annual mean maximum temperature is 33.4°C and minimum is 22.5°C. In Yercaud and Kolli hills, the mean annual temperature ranges from 11 to 23°C.

Land use

Out of the total area of 8.63 lakh ha, forests occupy about 1.67 lakh ha (AgroStat, 1989). Yercaud, Rasipuram and Attur taluks have more forest areas. In Namakkal, Omalur and Mettur taluks forest occupy about 20 per cent of the area. The forest area in Tiruchengodu and Sankaridurg, is negligible. Barren and wastelands cover about 0.90 lakh ha, constituting about 10 per cent of the total area of the district.

In the uplands, rainfed crops like groundnut, sorghum, cotton, tapioca, minor millets and pulses are grown. Groundnut is a major oil seed crop grown in large areas, particularly in Tiruchengodu, Namakkal, Sankaridurg, Mettur and Omalur taluks. Tapioca is grown extensively in Rasipuram, Salem and Omalur areas. In the garden lands and canal irrigated areas, paddy, sugarcane, turmeric, coconut and tapioca are cultivated.

Soils

The information pertaining to the soil resources of the district was generated from the Soil Resource Mapping Project of Tamil Nadu (Natarajan *et al.* 1997). Based on the soil resource mapping work, originally 38 soil mapping units were identified in Salem district at 1:250,000 scale. The units were further generalized and soil map of the district at 1:750,000 scale showing 15 soil units were prepared (Map.1). The map shows the dominant soils occurring in the district, which are described in the legend given in the Table 1.

Five soil orders namely Alfisols, Inceptisols, Vertisols, Mollisols and Entisols occur in the district. Alfisols occur in about 48 per cent area, followed by Inceptisols in about 40 per cent and others in much less extent. Generally, shallow to moderately deep, well drained, gravelly loams to gravelly clay soils are observed the gently sloping to undulating uplands, the hills and hill ranges, moderately deep deep, well drained to somewhat excessiv drained loamy and clayey soils are observ In the isolated hillocks, summits and steej sloping side slopes, shallow to very shall loamy to gravelly loam soils are observ Deep, red clay soils with high organic mat occur in the hilltops of Shervaroys. In valleys and in the eastern parts of the distr deep, calcareous, clayey soils are normally se In general, soil erosion, shallow depth, gravellin and available water capacity are the major s related constraints affecting the productivity the land resources in the district.

Results and Discussion

Soil depth

Soil depth is a major constraint affect crop production in the district. Shallow moderately shallow soils occupy more than per cent of the area, occurring particula in the hill slopes and gently sloping upla (Table 2). Moderately deep to deep soils oc in almost 27 per cent of the total area, mos in Tiruchengodu and Sankaridurg taluks in some low lands of the district. Very d soils are observed in the valleys in a limi area.

Table 2. Dominant depth classes

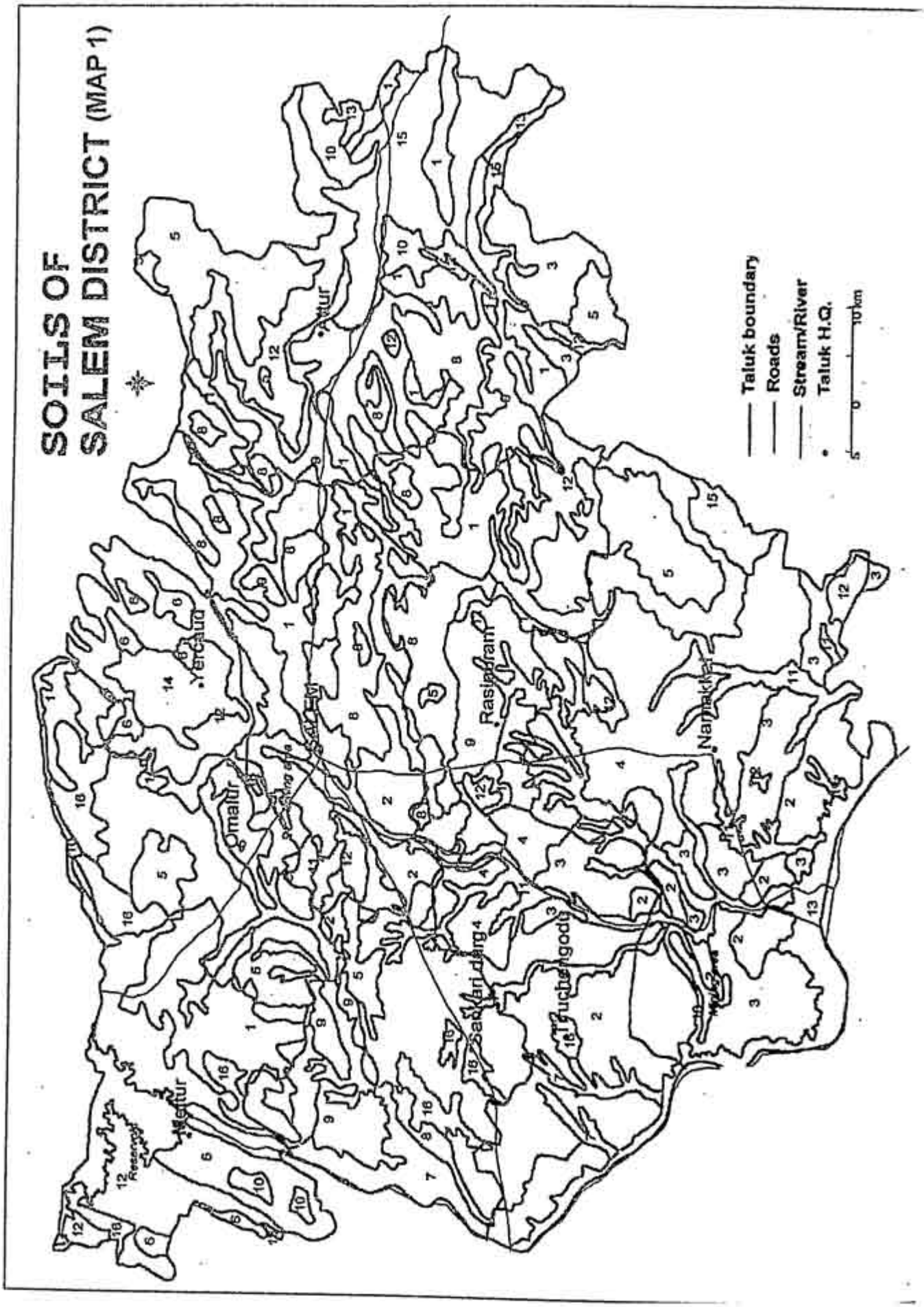
Dominant depth class	Area ha	(9
Very shallow (<25 cm)	25076	2
Shallow (25-50 cm)	229569	26
Moderately shallow (50-75 cm)	249815	29
Moderately deep (75-100 cm)	159009	13
Deep (100-150 cm)	85406	9
Very deep (>150 cm)	58412	6

Soil gravelliness

Gravels are present in many soils exc in the lowland and black soil areas. Soils hav more than 35 per cent gravel occur extensiv in Tiruchengodu and Sankaridurg taluks in the hill slopes of Shervaroy hills. N gravelly soils occur in about 30 per cent

Map Unit	Description	Classification*	Area ha
1.	Shallow to moderately shallow, well drained, gravelly clay soils on gently sloping lands	Clayey-skeletal, Rhodic Paleustalfs	111309
2.	Moderately shallow and moderatly deep, well drained, gravelly loam soils on gently sloping lands	Loamy-skeletal, Typic Rhodustalfs	107239
3.	Moderately shallow and moderately deep, well drained, gravelly clay soils on gently sloping lands and hills	Clayey-skeletal, Typic Rhodustalfs	54116
4.	Moderately shallow, well drained, loamy soils on gently sloping lands	Fine-loamy, Typic Rhodustalfs	65568
5.	Moderately deep to deep, well drained, clayey soils on high hills, hill ranges and gently sloping lands	Fine, Typic Rhodustalfs	70228
6.	Very shallow, well drained, loamy soils on gently sloping summits and steeply sloping hills	Loamy, Lithic Ustorthents	17307
7.	Shallow and moderately shallow, well drained, calcareous, gravelly loam and gravelly clay soils on low lands	Loamy-skeletal, Typic Ustropepts	45955
8.	Shallow and moderately shallow, well drained, gravelly loam soils on low hills and gently sloping uplands	Loamy-skeletal, Typic Ustropepts	48718
9.	Moderately deep, well drained, loamy soils on valleys and nearly level low lands	Fine-loamy, Typic Ustropepts	87573
10.	Deep, well drained, clayey soils on gently sloping lands and summits	Fine, Typic Ustropepts	10306
11.	Very deep, moderately well drained, calcareous loamy soils on low lands	Fine-loamy, Fluventic Ustropepts	49482
12.	Very shallow to shallow, well drained to some-what excessively drained, gravelly loam soils on hill slopes, hillocks and gently sloping lands	Loamy-skeletal, Lithic Ustropepts	104986
13.	Deep to very deep, imperfectly drained, cracking clay soils on lowlands	Fine, mont.Vertic Ustropepts	2802
14.	Deep, well drained, clayey soils on high hills and hill ranges	Fine, Typic Argiustolls	10976
15.	Deep, moderately well drained, calcareous, cracking clay soils on gently sloping uplands	Fine mont. Typic Pellusterts	33686
16.	Rock outcrops associated with shallow, well drained gravelly loam soils		40619

*Note : The mineralogy is mixed and temperature regime is isohyperthermic unless stated otherwise


SOILS OF
SALEM DISTRICT (MAP 1)
Taluk boundary
Roads
Stream/River
Taluk H.Q.
0
10 km
Yercaud
Omalur
Salem
Rasipuram
Namakkal
Tiruchengodu
Sankari durg
Mettur
Attur

area, mostly in the eastern and south central parts of the district.

Soil erosion

Soil erosion is very less in the valley and canal-irrigated areas. It is moderate in the upland region lying in the eastern, north western and southeastern parts of the district, affecting about 36 per cent of the area (Table 3). In the hill slopes of Kolli and Shervaroys and in the gently sloping dry tracts of Tiruchengodu and Sankari taluks, soil erosion is severe affecting about 37 per cent of the total area of the district. Very severe erosion is observed in about 6 per cent of the area mostly in the isolated hillocks and low hill ranges, occurring in the central part of the district.

Table 3. Dominant erosion classes

Erosion Class	Area	
	ha	(%)
Slight erosion	136911	15.9
Moderate erosion	306914	35.8
Severe erosion	314274	36.5
Very severe erosion	49188	5.7

Land capability classification

Land capability classification shows the capability of the land resources for arable and non-arable purposes. In the whole district, about 70 per cent of the area is suitable for cultivation. The steeply sloping hills, hill ranges, isolated hillocks and highly dissected and eroded areas, occurring in the Kolli, Shervaroy and Bargur hills are suitable only for forestry, grazing and wild life. Good cultivable lands with slight limitations of erosion and soil depth occur in about 19 per cent of the area in Attur and Rasipuram taluks. Moderately good cultivable lands, with moderate problems of erosion and soil depth occur in about 27 per cent of the area, mostly in Namakkal, Rasipuram, Salem and Omalur taluks. Fairly good lands with severe problems of sheet and hill erosion and soil depth occur in about 25 per cent of the area, mostly in the uplands of Tiruchengodu and Sankari and low hills of Attur, Omalur and Mettur taluks (Table 4).

Land irrigability

According to the irrigability classification, about 30 per cent of the area is not suitable for irrigation due to soil depth and hilly topography. In the remaining 70 per cent of the area, the suitability is restricted by shallow soil depth, texture and poor drainage.

Land evaluation

Land evaluation for rice, groundnut, cotton, mango, tapioca and other major crops grown in the district was carried out to find out the suitability or otherwise of the available land resources (FAO 1976 and Sys *et al.* 1993).

Land suitability for rice

Rice is cultivated in places where assured irrigation is available in the district. In the entire district, about 20 per cent of the area are found suitable for rice cultivation, occurring mostly in the canal and well irrigated areas (Table 5). The productivity of rice is affected by constraints like drainage, calcareousness, poor texture and shallow soil depth. The remaining

Table 4. Land capability subclasses

Capability sub classes	Description (limitations)	Area (ha)	(%)
IIes	Good cultivable lands (erosion and depth)	52731	6.2
IIs	Good cultivable lands (depth)	107805	12.5
IIe	Moderately good cultivable lands (erosion)	74920	8.7
IIs	Moderately good cultivable lands (depth)	11245	1.3
IIIes	Moderately good cultivable lands (erosion and depth)	141472	16.5
IVes	Fairly good cultivable lands (erosion and depth)	216601	25.2
VIes	Well suited for grazing and forestry (erosion and depth)	190919	22.2
VIIes	Suited only for grazing and forestry	11595	1.3
VIII	Suited only for wild life and recreation	39991	4.6

Table 5. Suitability subclasses for rice

Suitability sub class	Description (limitations)	Area (ha)	(%
S2dt	Moderately suitable (drainage and texture)	56601	6.(
S2xt	Moderately suitable (calcareousness and texture)	49840	5.1
S3xt	Marginally suitable (calcareousness and texture)	48199	5.(
S3xs	Marginally suitable (calcareousness and depth)	17861	2.1
NA	Not assessed (Reserve forest and uplands)	687834	79.5

Table 6. Suitability subclasses for cotton

Suitability sub class	Description (limitations)	Area (ha)	(%)
S2s	Moderately suitable (depth)	37097	4.3
S2tx	Moderately suitable (texture and calc.)	97539	11.3
S2ds	Moderately suitable (drainage and depth)	56416	6.6
S2t	Moderately suitable (texture)	19566	2.3
S3ge	Marginally suitable (gravel and erosion)	158436	18.4
S3sg	Marginally suitable (depth and gravel)	192177	22.2
N2	Currently not suitable	52855	6.2
NA	Not assessed (Reserve forest and rainfed areas)	246250	28.6

areas are not suitable for rice due to lack of irrigation or unfavourable topography.

Land suitability for cotton

The evaluation showed about 65 per cent of the area suitable for cotton with various degrees of limitations like soil depth, texture, calcareousness, gravel, erosion and drainage (Table 6). The heavy clay soils occurring in eastern part of Attur taluk and in the narrow valley areas are moderately suited for cotton.

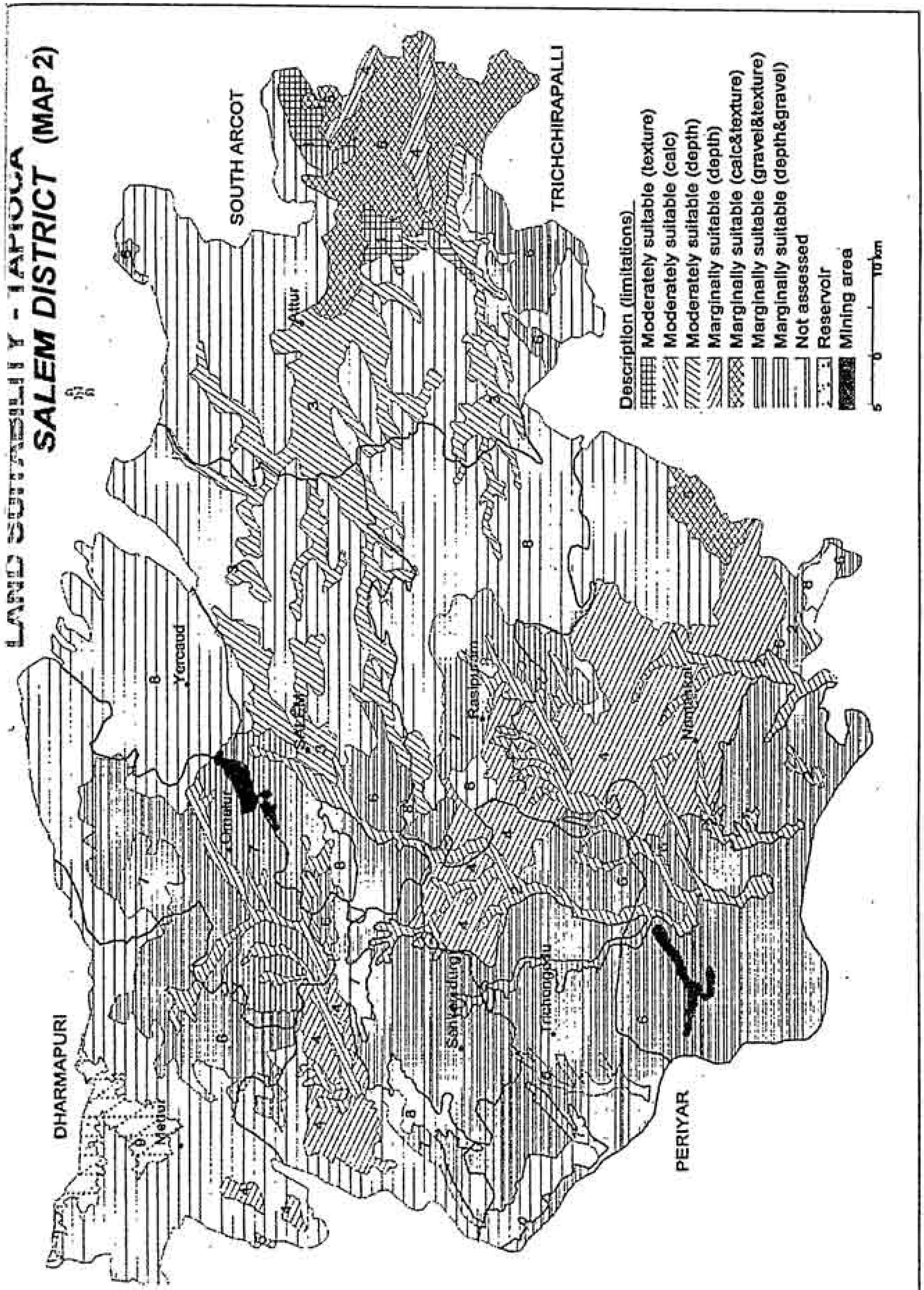
Land suitability for groundnut

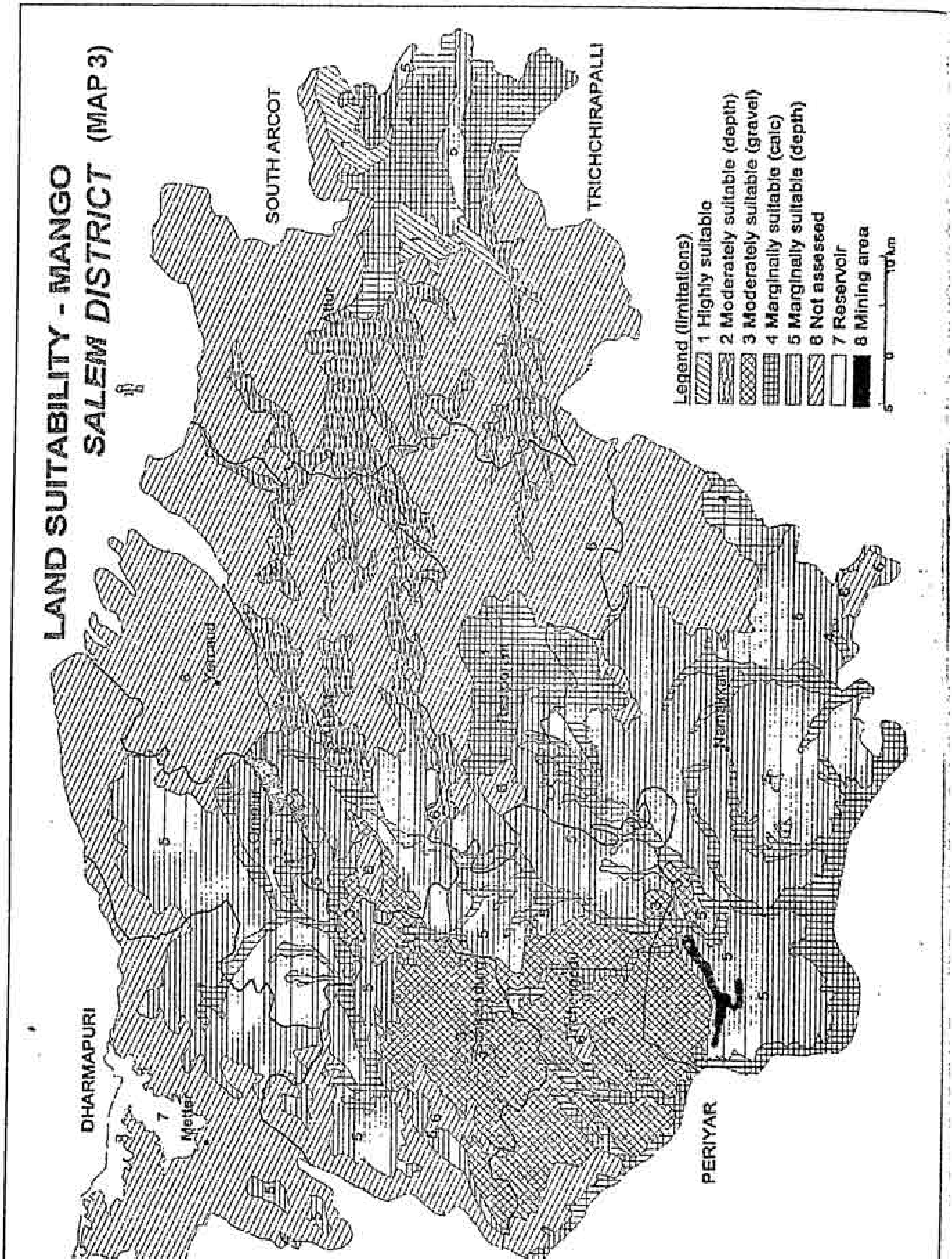
Groundnut is the major revenue-earning crop grown extensively in almost all parts of the district except in the hilly Yercaud taluk. The assessment showed that only 5.5 per cent of the area is highly suitable for groundnut without any limitation. About 47 per cent of the area is moderately suitable with gravelliness, erosion, texture and calcareousness as major limitations and about 16 per cent of the area is marginally suitable with serious limitations of depth, calcareousness and gravel. The remaining 30 per cent of the area are not suitable for groundnut (Table 7).

Land suitability for tapioca

The cultivation of tapioca is mostly confined to Rasipuram, Namakkal, Salem and Omalur taluks. At present, Rasipuram has the largest area under tapioca. It is a hardy drought resistant crop well suited to the rainfed areas of the district. Though it is cultivated only in few taluks at present, it is a promising crop and can be extended to other parts of the district. The evaluation showed that except in the hilly areas it can be cultivated in almost all parts of the district.

According to the assessment, the area found suitable for tapioca cultivation is about 59 per cent in the entire district (Map 2). Out of this, moderately suitable areas having problems like texture, calcareousness and soil depth constitute about 13 per cent of the total area. They occur in the lowlands, valleys and well-irrigated areas. Marginally suitable lands, constituting about 45 per cent of the area occur in the gently sloping to moderately sloping uplands of the district. Shallow depth, gravel, soil texture and calcareousness are the limiting factors for tapioca cultivation in marginally suited areas.


LAND SUITABILITY - TAPIOCA
SALEM DISTRICT (MAP 2)
DHARMAPURI
SOUTH ARCOT
TRICHCHIRAPALLI
PERIYAR
Mettur
Omalur
Yercaud
SALEM
Attur
Rasipuram
Sankagiri
Tiruchengodu
Namakkal
Description (limitations)
Moderately suitable (texture)
Moderately suitable (calc)
Moderately suitable (depth)
Marginally suitable (depth)
Marginally suitable (calc&texture)
Marginally suitable (gravel&texture)
Marginally suitable (depth&gravel)
Not assessed
Reservoir
Mining area
5 0 10 km


LAND SUITABILITY - MANGO
SALEM DISTRICT (MAP 3)
DHARMAPURI
SOUTH ARCOT
TRICHCHIRAPALLI
PERIYAR
Mettur
Yercaud
Attur
Namakkal
Legend (limitations)
1 Highly suitable
2 Moderately suitable (depth)
3 Moderately suitable (gravel)
4 Marginally suitable (calc)
5 Marginally suitable (depth)
6 Not assessed
7 Reservoir
8 Mining area
10 km

able 7. Dominant suitability subclasses for groundnut

uitability sb class	Description (limitations)	Area (ha)	(%)
1	Highly suitable	47696	5.5
2g	Moderately suitable (gravel)	78974	9.2
2eg	Moderately suitable (erosion and gravel)	79438	9.2
2ex	Moderately suitable (erosion and calc.)	24412	2.8
2xs	Moderately suitable (calc. and depth)	54247	6.3
2gt	Moderately suitable (gravel and texture)	148661	17.3
2xt	Moderately suitable (calc. and texture)	19566	2.3
3xs	Marginally suitable (calc. and depth)	51027	5.9
3sg	Marginally suitable (depth and gravel)	88969	10.3
A	Reserve forest and rainfed areas	267346	31.1

nd suitability for mango

Though Salem district was well known its mango varieties, it is not a major crop present and grown only in a limited area. he prevailing climate and land resources are ally suited for mango and it can be cultivated all areas of the district except in the hills, II ranges and isolated hillocks.

The suitability assessment showed that ango can be cultivated in about 57 per cent the area in the district. Highly suitable nds occur in very less area in the eastern rt of the district. Moderately suitable lands ith problems of depth and gravelliness occur about 7 per cent of the area of the district nd marginally suitable lands with problems ke calcareousness and shallow soil depth occur about 41 per cent of the district (Map 3).

elevance of the present land use and suggestions r change

In most part of the district, the erratic nd uneven distribution of the rainfall has led crop failures in many areas, particularly the drought-prone Tiruchengodu, Sankaridurg, ettur and Omalur taluks. The average total mount of rainfall received in a taluk did not ive the true picture of rainfall distribution ver the years. The variation is very glaring many of the taluks. For example in Tiruchengodu luk, the lowest rainfall reported was as low 440 mm in 1983 and highest was 1038 m in 1977. Further, out of 17 years rainfall cord of Tiruchengodu, 8 years received far less than 700 mm of rainfall and qualified to be considered as drought years. The situation is similar in other taluks also. Only in Yercaud, Salem and Rasipuram taluks, the rainfall was more than 700 mm in all the years.

Further, the analysis of weekly and monthly rainfall distribution showed clearly the erratic nature of the rainfall distribution and occurrence of prolonged drought periods in many taluks. It is clear from the data that the amount of rainfall and its distribution is mainly responsible for the failure of annual crops in most parts of the district. If frequent crop failures are to be avoided, there is no alternative, except to modify or change the existing cropping pattern, which is in tune with the prevailing rainfall pattern of the district.

The assessment showed that the total amount of rainfall is quite sufficient for cultivating mango, tapioca and many cereal crops in most parts of the district. In these rainfed areas, crop yields, particularly of groundnut, which is the dominant crop at present, is drastically reduced in most of the years either due to scanty or excessive rainfall received during the growth period. Further, in these dry tracts, the crop season lasts hardly for 4 to 5 months and in the rest of the year the soil is devoid of any vegetative cover. So any rainfall received during the fallow period induces severe sheet and hill erosion, removing the precious topsoil and leaving large amount of gravels and pebbles on the surface.

The cropping pattern practiced at present is not only uneconomical to the farmer because of the frequent crop failures but also severely reduces the productivity of these soils in the long run. If the present cropping pattern is continued, severe loss of top soil, reduction in soil depth, silting of the tanks, reduction in the water table and yield of the crops will continue without any check in the large rainfed areas of the district. The indirect effect will be poor capital generation, which in turn will lead to less investment in agriculture, very few job opportunities and migration of labour to the urban centres. The cumulative and long term effect will be disastrous to the fragile rural economy of the district.

The problems can be overcome, to a great extent, by adopting suitable changes in the existing cropping pattern. All the available evidences indicate that there is no justifiable reason to continue with the existing cropping pattern. As per the records, in the 1960's, bajra and sorghum, which are drought tolerant crops, occupied large areas in the drought prone Tiruchengodu, Sankaridurg, Namakkal and Omalur taluks (Murthy and Naga Bhushana 1963 and Taluk RSS reports). Today it is difficult to see any plot under bajra in these areas. During the last 40 years, the hardy, drought- tolerant bajra was slowly replaced by groundnut. Though groundnut is the only major cash crop of this area, it is not an ideal substitution and is highly susceptible to drought, which is a recurrent feature of this dry tract.

So there is an urgent need to change the existing cropping pattern, particularly in the rainfed areas, if we want to effect any real change in the agricultural scenario of the district. Mango is the ideal crop that can be promoted in the drought-prone southern and western parts of the district, where groundnut is the major crop at present. In these areas, the erractic and uneven distribution of rainfall is not favourable for annual crops like groundnut and cereals. The evaluation of the natural resources of the area has shown clearly that the area is suitable for mango and its cultivation will reduce greatly the frequent crop failures encountered in groundnut production in this belt.

Next to mango there is enormous potential to encourage tapioca, particularly in Rasipuram, Namakkal, Attur, Salem and Omalur taluks. These areas are comparatively less drought prone than the southern dry taluks. Further, the ground water potential is high in these taluks and large areas are under well irrigation. In these taluks, tapioca cultivation can be taken up, both under rainfed and well-irrigated areas. Besides the possibility of encouraging mango and tapioca cultivation in the district, there is lot of scope for introducing new crops in the existing cropping pattern in many areas of the district in the future.

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