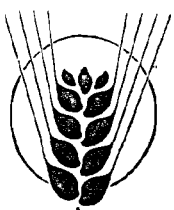
INTEGRATED SURVEY OF NATURAL RESOURCES AND LAND TRANSFORMATION OF CHALLAKERE TALUKA (CHITRADURG DISTRICT) IN MYSORE STATE.

Divisions of
BASIC RESOURCE AND HUMAN FACTOR STUDIES



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PREFACE

At the request of the State Government of Mysore an integrated survey of Challakere taluka in Chitradurg district was carried out by this Institute in April 1970; with the object of assessing the potentialities of the various natural resources and recommending how best these could be utilised for agricultural development of the area. The report brings out how the living standard of the pepole in this arid region could be improved by increasing the crop yield by better management practices and also increasing the milk and other animal products through improved methods of grass and animal husbandry. The recommendations made in the report are those which could be easily implemented by the various departments of the State Government.

Cooperation received from the Government of Mysore during the field work is gratefully acknowledged. Shri V. Hanumanthappa, I.A.S. Joint Secretary to the Government of Mysore, Shri G.V.K. Rao, Development Commissioner and Shri V. Balasubramanian, Deputy Secrerary, State Planning Board, Dr. H.R. Arakeri, Director of Agriculture, Shri P.S. Rajasekharappa, I A.S. Deputy Commissioner, Chitradurg, Shri H.G. Shettar, Joint Director of Agriculture (Soil Conservation) and all their staff deserve our sincere thanks. Help and cooperation received from the President and Chief Executive Officer of Challakere taluka Development Board and their colleagues are also acknowledged.

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INTRODUCTION

An inventory of various natural resources is an essential step in planning for agricultural development of any area. This is done through integrated survey for assessment of the potentialities of such resources as soils, landscape, vegetation, surface and underground water etc.

At the request from the State Government of Mysore such integrated survey of Challakere taluka in Chitradurga district was carried out by the Central Arid Zone Research Institute, Jodhpur in April 1970. The main findings of the survey are given in chapters which follow :

A: BASIC RESOURCE SURVEYS

I. GEOGRAPHICAL POSITION

Challkere taluka is a part of Chitradurga district and extends from latitudes 14°4′ to 14°37′ North and longitudes 76°28′ to 77°2′ East. It has a total area of 2067 sq. km. forming 19.1 per cent of the area for the entire district. It is the biggest taluka in the district and the third biggest in the entire State. It has four revenue circles or *hoblies* and two small towns namely Challakere and Naikenhatty. There are 65 panchayats and twenty Gramsewak circles. 129 villages including 65 panchayats have electric facilities. In the north lies Kudligi taluka af Bellary district and Molakalmuru taluka of Chitradurg district, in the east are Rayadurg taluka of Bellary district. Hiriyur taluka is situated in the south and Chitradurg proper and Jagalur are in the west. The total population of the taluka is 1,52,249 and the density of population is ~~489~~ 74 per sq. km. as compared to ~~671~~ 101 per sq. km. for the entire district. Agriculture is the main occupation of the people. During the decade 1951-61 the population in the district increased by 26 per cent, @ 2.62 per cent every year as compared to 21.51 per cent increase in population of the State i.e. 2.15 per cent every year. The area has a fairly good network of roads connecting most of the villages. Chitradurga district headquarter, Bangalore and Bellary are connected with Challakere town-the taluka headquarter, by good highway.

II. CLIMATE

The southern arid zone of India includes portions of Mysore and Andhra Pradesh. Challakere taluka falls within this zone, covering almost 7 per cent of the area. Thornthwaite's moisture index for this area is -41.

RAIN FALL

The mean annual rainfall of Challackere is 455 mm. Thus this region along with Kanekal (444 mm.), Amarapuram (465 mm.) and Kalyandurg (499 mm) of Anantapur district, Andhra Pradesh, from tha lowest rainfall region of Deccan plateau, receiving less than 500 mm. precipitation. The month-wise distribution of rainfall and number of rainy days (day with rainfall of 2.5 mm. or more) in respect of Challakere town is given in Table 1. Monthly rainfall and number of rainy days for some stations during the last three years are given in Table 2.

Table 1. Monthly rainfall of some stations in Challakere taluka.

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Annual
Normal rainfall (mm.)	3.3	5.8	4.1	19.1	58.7	29.7	33.3	62.2	92.2	100.1	38.1	8.9	455.5
(Av. of normal number of rainy days.	0.3	0.4	0.3	1.3	3.7	2.4	3.5	3.8	5.3	5.0	2.6	0.6	29.2

The rainfall distribution of this region reveals two peaks, one during May in pre-south-west monsoon season and another in October, just after the commencement of north-east monsoon. It is interesting to note that it is not during the onset and progress of south-west monsoon over the peninsula viz. June and July that this region gets good rainfall, but it is during retreating south-west monsoon and the onset of north-east monsoon (September and October) that the region gets maximum rainfall (192.3 mm out of annual total of 455,5 mm). The rainy season is well spread, right from May to November. The Contributions of south-west monsoon (June to September) and north-east monsoon (October to December) work out to be 48 and 32 per cent of the annual rainfall respectively. The mean number of rainy days for hot weather period, south-west monsoon and north-east monsoon season work out to be 5.3, 15.0 and 8.2 respectively.

Table 2. Monthly rainfall of some Stations in Challakere taluka from 1967-1969

Rainfall in mm..

Month	Manikunte						Naikanahalty						Parasurasngpura					
	1967		1968		1969		1967		1968		1969		1967		1968		1969	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	1	1	2
January	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
February	—	—	—	—	—	—	—	—	1	30.5	—	—	—	—	1	13.8	—	—
March	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	10.2	—	—
April	1	6.5	1	24.6	—	—	—	—	1	31.7	1	16.8	2	45.5	2	26.5	—	—
May	3	42.7	5	63.9	3	50.0	—	—	—	—	7	111.2	5	69.9	6	69.8	8	92.0
June	2	9.1	3	28.9	2	8.0	3	20.3	1	15.0	—	—	4	82.1	4	47.0	5	34.9
July	4	59.0	1	4.6	—	—	—	—	—	—	—	—	6	70.5	—	—	6	16.5
August	1	14.0	—	—	8	82.0	—	—	1	32.0	5	120.1	1	10.0	—	—	11	206.6
September	2	36.6	9	133.8	—	—	1	17.8	8	279.0	3	65.0	3	350.0	10	136.5	3	46.0
October	3	68.3	4	54.1	5	59.4	2	76.2	5	184.0	5	135.5	1	28.5	5	64.8	9	121.5
November	—	—	1	45.6	—	—	—	—	2	52.4	—	—	1	5.0	1	4.8	—	—
December	—	—	—	—	—	—	—	—	—	—	—	—	1	8.0	—	—	—	—
Total	16	235.2	24	355.5	18	199.4	6	114.3	19	624.6	21	448.6	24	669.5	30	373.4	42	513.5

1 = Number of rainy days 2 = Rainfall in mm.

Contd.

Contd.

Rainfall in mm.

Month	Challakere						Thalak					
	1967		1968		1969		1967		1968		1969	
	1	2	1	2	1	2	1	2	1	2	1	2
January	—	—	—	—	—	—	—	—	—	—	—	—
February	—	—	2	7.1	—	—	—	—	—	—	—	—
March	—	—	1	4.6	—	—	—	—	—	—	—	—
April	1	16.8	2	18.5	1	3.8	2	16.0	3	71.0	—	—
May	3	50.4	5	45.5	4	58.2	2	12.5	3	51.0	2	45.0
June	3	42.0	5	90.5	2	46.5	3	19.5	1	22.0	2	16.5
July	8	72.8	2	8.4	4	19.0	5	35.5	1	8.0	—	—
August	2	30.0	—	—	8	150.3	2	14.0	Nil	Nil	7	169.4
September	2	22.8	9	199.8	3	30.0	2	41.7	8	197.5	1	39.4
October	7	125.7	6	81.3	9	136.4	3	57.0	4	162.0	4	219.4
November	—	—	1	52.1	—	—	—	—	—	—	—	—
December	—	—	—	—	—	—	—	—	—	—	—	—
Total	26	360.5	33	507.8	31	444.2	19	196.2	19	511.5	16	489.8

1= Number of rainy days 2 = Rainfall in mm.

The mean maximum temperature over Challakere region exceeds 30°C during the period February to June. The hottest month is April with a mean maximum temperature of 36.3°C. The minimum temperature during this period varies between 21° to 23°C except in February when the mean minimum temperature is 19°C.

With the onset of south-west monsoon by the first week of June, the mean maximum temperature suddenly falls to 30.6°C. The region is cool from July onwards right up to January with mean maximum temperatures ranging from 28° to 29.5°C. The coldest month of the year is December with mean maximum and minimum of 28.0° and 16.7°C temprature respectively. But considering only the day temperatures mid monsoon months of July and August are also cold. The month-wise distribution of temperature is given in Table 3.

The highest maximum temperature recorded in the region is 41.7°C (recorded during May) and the lowest minmum temerature in the region is 8 3°C (recorded during December). Individual daily temperature exceeding 40°C is very rare. Extremes recorded during each months are presented in Table 3.

HUMIDITY

The mean daily relative humidity in this region is the least (40 per-cent) during February and March. During all other months it is 50 per cent or more. The mean daily relative humidity is the highest during July and August (77.0 per cent). In fact, it exceeds 70 per cent during entire south-west monsoon period (June to September). The relative humidity and vapour pressure at 0830 hrs I.S.T. and 1730 hrs I.S.T., and also their daily means are presented in Table 3.

Since the relative humidity is affected by prevailing temperature, vapour pressure is probably a better index of the humidity pattern. As per the pattern of vapour pressure (in mb), presented in Table 3, the driest months are January and February. Mean vapour pressure values exceeding 20 mb occur during May to October.

WIND REGIME

The prevailing winds over the region are west to south-west during the period from March to October. From November to February easterly to north-easterly winds predominate. The highest wind speeds (14 to 15 km/ph) are recorded during June and July. The least mean daily wind speed of 6 km./ph. occurs during October and November.

Table 3. Month-wise distribution of climatological parameters at Challakere.

	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct	Nov.	Dec.	Annual
Mean Max. temp. (°C))	28.9	32.0	34.9	36.3	35.1	30.6	28.1	28 1	29.1	29.6	28.4	28.0	30.8
Mean Min. temp. (°C)	17.1	19.2	21.5	22.7	22.3	21.4	20.8	20.5	20.3	20.3	18.4	16.7	20.1
Highest Max. (°C)	33.9	36.1	38 9	39.4	41.7	37.8	32.8	32.8	35.0	33.9	32.8	32.8	41.7
Lowest Min. (°C)	11·1	13.3	16.1	17.2	16.7	17.2	17.8	17.8	15.0	15.6	8.3	8.3	8.3
Relative Humidity (%)													
0830 Hrs. I. S. T.	65	56	55	67	75	79	83	84	83	79	73	71	73
1730 Hrs. I. S. T.	33	24	24	30	39	63	69	69	63	55	50	40	47
Daily Mean	49	40	39	49	57	71	76	77	73	67	61	55	60
Vapour Pressure (mp)													
0830 Hrs. I. S. T.	15.6	15.3	17.1	21.8	23.3	22.9	22.7	22.6	22.1	22.0	19.0	16.8	20.1
1730 Hrs. I. S. T.	12.2	12.0	12.3	15.3	18.6	21.8	22.4	22.3	21.4	19 5	16.6	14.0	17.4
Daily Mean	13.9	13.7	14.7	18.5	20.9	22.3	22.5	22.4	21.7	20.7	17.8	15.4	18.7
Wind Speed (Km. per hour)	7.8	6.9	7.1	7.7	10.6	14.2	14.9	13.1	10.8	6.3	6.2	7.6	9.4

III. GEOLOGY, GEOMORPHOLOGY AND SOILS

A. GEOLOGICAL HISTORY

In general, the geology of the taluka is simple. But the exact mode of origin of different types of schists, granite gneiss, granite and their interrelationship, structural disposition, clasification, correlation etc. is debatable and different views have been expressed by various workers.

The widely accepted view is that the granitic gneissic complex is the oldest rock of the earth's crust on which the *Dharwar* sediments were laid down unconformably and subsequently metamorphosed. The work of the Geological Survey of Mysore State, however, has indicated that the *Dharwar* crystalline rock, originally sedimentary rocks as evidenced by the presence of ripple marks, current bedding, pebbles etc., are the oldest and have been intruded at different types of basic and ultra basic rocks and much later atleast two or three times by granitic rocks.

After the development of these formations this region stood above sea level as no other rock formation between these oldest formations and the Quaternary formations have been encountered. As such, this region has been subjected to weathering agencies for a long time, as a result of which the present day landscape has developed. These processes have given rise to red and black soils *in-situ*. The weathered rocks below the soil cover is generally soft and friable upto a depth over 10 meters.

The stratigraphic sequence of the rock formations of the Challakere taluka area is shown in Table 4 and also in the "Geolithological Map".

Table 4. Geological formation

Era	Age	Lithological formation
Quaternary (Cenozoic)	Recent Sub-Recent	Brick and tile clays 'kankar' sand, gravel, pebbles and shingles.
	Unconformity	
Archaean complex (Azoic)	*Dharwar* system	Crystalline metamorphics.
	Granitic intrusives.	Granite, gneiss etc.

1. Archaean complex

The entire region of the taluka is covered by the rock formations belonging to this group. The granite gneissic complex which is the oldest rock formation of the earth crust covers 75.2 per cent of the total area and the rest i. e., 24.8 per cent is covered by the Dharwar system.

(a) Granitic intrusives : This group froms a huge complex consisting of several types of granitic rocks varying in structure, texture, colour and other characters. These have been classed into four separate epoches of plutonic intrusions-each epoch of intrusion forming a protracted period of differentiation and consolidation. These are champion gneiss, peninsular gneiss, charnockite and closepet granite. Out of these only the formation belonging to Peninsular gneiss and closepet granite are encounteerd in this area.

(b) Dharwar system : Usually called as Dharwar schist, these consist of a complex series of crystalline schists (highly altered sedimentary and volcanic rocks) eg chlorite, schist. hornblende-biotite schist etc. The Dharwars are found now as long and narrow bands of various dimensions running NNW-SSE. The belt of this region is classed as the central belt of Mysore State and has attained 40 km width in Chitradurg district.

2. Quaternary formations

In true sense these formations occur as very shallow and narrow bands about 0.8 to 1.2 kms wide along the courses of River Hagari-Vedavaty, Garanihalla and Dodda Halla and are composed of sand and *alluvia* deposited due to occasional floods in these rivers. The sediments are composed principally of quartz, and subordinate amount of felspar, ferromagnesian minerals, mica, chips of acid and basic rocks etc., which indicates that these have developed from the rocks of this region only. In rest of the area the soil cover has developed *in situ* due to weathering of the granite gneissic complex and schists and are generally very shallow and gravelly.

B. GEOMORPHOLOGY

The erosional, depositional and erosional-depositional processes have resulted in the formation of different landform units in the taluka which are described below.

(a) Erosional land surfaces

1. Hills (area 8.6 sq. km)

These comprise of the rocks of granite, granitic gneiss, schist and dolerite of Archaean group and *Dharwar* system covering 0.4 per cent of the total area under survey. The hills are highly eroded and support little vegetation. The highest hill 783 metres occurs near Naranivala village. The granite and gneisses are more resistant to weathering than schist. The hills of the *Dharwar* schist are highly eroded and their slopes are covered with rock debris and rock fragments of angular to subangular shape. Vertical joints have developed in granites and rain water flowing through them has created channels of 1 to 1.5 meter depth and 2 to 3 meters width.

2. Gently to moderately sloping plain (area 151.3 sq. km)

This unit constituting 7.3 per cent of the total area of taluka has formed due to prolonged weathering and subsequent erosion of the Archaean group and *Dharwar* system. It occurs in the southern and northern parts of Taluka near Gaurasamudra, Mallurahalli, Gorlattu, Chikkanahalli and Belagere villages.

The upper parts of the plain are moderately sloping with 5 to 8 per cent slope and the lower parts are gently sloping with 1.5 to 3 per cent slope. The deposits in the upper part are 20 to 35 cm thick while in the lower part it increases 45 to 100 cm. During the rainy season the weathered material of 2 to 50 mm diameter, mostly quartz grains, are washed away and are deposited at the lower part into heaps. The surface texture varies from red gravelly loamy sand to sandy loam. The drainage patterns are subdendritic and subparallel. The plain is effected by severe to very severe water erosin.

3. Very gently undulating plain (area 207.6 sq. km.)

This unit covering 10.0 per cent of the total area occurs near Mahadevpura, Kolpal, Kaparahalli, Tipparedhalli, Gorlakatte and Bharmasagar Village. The sediments have mostly developed *in situ* and in part deposited by the sheetwash from the adjoining areas. The deposits on the undulating part are shallow and coarse textured while in the lower areas they are deep and of medium texture. Near Kaparahalli the land is highly eroded with soil mantle only 10 to 18 cm thick and the surface covered with quartz rock fragments of 4 to 30 mm diameter. The plain between Challakere and Budanashalli is also covered with similar rock fragments. The sedimants have been developed on dolerite. The red gravelly soil near Kolpal and Mahadevapura is also very shallow to shallow, hardly 5 to 10 cm deep.

4. Gently undulating plain (area 333.5 sq. km)

This unit occurs mostly in the east and west of the Vedavati river near Ullarti, Rangapura, Chikkachelur, Korlakunte, Tippagondanahalli, K. O. Kote, Suranahalli, Chenamanagatihalli villages. Some part in extreme north also belongs to this unit. It comprises 10.1 per cent of the total area of the taluka.

This plain has developed on a slightly higher surface than the very gently undulating plain. The sediments are mostly developed *in situ* and are of red colour. The slope of the plain varies from 2 to 6 per cent. The deposits on the higher surface are shallow, varying from 5 to 10 cm and in the lower surface it ranges from 30 to 50 cm. In pockets the sediments are deep, fine textured and black in colour. The fertility status of the sediments in such pockets is good. The rock outcrops of 3 to 6 meters heights are often exposed to the surface. These are mostly of granite. The shape of the sediments is angular to subangular. The deposits near Suranahalli and K. O. Kote are deep, being 1 to 1.5 m thick. The surface texture varies from coarse gravelly sandy loam to loam. About 63 per cent sediments are of 2 mm diameter and 13 per cent of 1.5 mm size. The diameter of the remaining 24 per cent sediment grains varies from 0.06 to 0.59 mm. The drainage pattern is linear. This unit has been affected by severe water erosion.

5. Nearly level plain (area 112.8 sq. km)

This plain is nearly level and free from erosion and covers 5.5 per cent of the total area of taluka. It occurs near Ramajogihalli, Balenahalli, Hottepppanahalli, Obanahalli and Kakibaranhalli villages. The plain has developed on a higher surface than the surrounding areas. The sediments have developed *in situ* on *Dharwar* schist, granite and granitic gneiss. The sediments formed on the *Dharwar* schist near Ramajogohalli are black, while those near Hottippanahalli are red and more coarse in texture. The depth of the sediments varies from 100 to 150 cm. The surface texture varies from sandy loam to loam.

6. Piedmont plain (area 51.7 sq. km)

This has been formed due to retreat of slope and lateral corrasion and occurs near Nannivalu, Surayanahalli near K. D. Kote, north-east of Chikkachellur, Mullgrahalli and south-east of Derarahalli villages. The plain is situated at the foot of the hills of granite, granitic gneiss, schist and

nolerite and covers 2.5 per cent of total area of the taluka. The slope is not very steep, being 3 to 5 per cent in degradational part and 1-3 per cent in aggradational part. The piedmont plain is composed of heterogenous materials such as sands, gravels, pebbles, cobbles and boulders.

7. Eroded rocky surface (area 301.3 sq. km)

This surface covering 14.6 per cent of total area of taluka occurs near Devarahalli in between Mallaranahalli and Donamandanhalli, Nerlaguate, Chitramalanahalli, Bosaponam and Sanikere villages. The surface consists of weathered mantle and at places solid rocks have been exposed due to subsequent erosion of weathered products. Due to granular disintegration the surface is strewn with quartz rock fragments of 15 to 120 cm diameter. The slope is irregular. The rock outcrops of 2 to 3 m heights are scattered here and there. A vast extensive eroded rocky surface is situated in the extreme western side of the taluka near Devarahalli, Nerlagunte and Khurdapura villages. It is badly eroded and dissected.

(b) Depositional land surfaces

8. Saline alluvial plain (area 231.8 sq. km)

This is a depositional, nearly level plain and occurs near Tallak, Parasurampura, Gouripura, Timmappanahalli, Yadalagatta, Banjagere Sarojannahalli, Nayakanhatti, Khundapura, Vehasi, Timmanahalli, Bhoganahalli and Ghataparti villages. This plain has been formed by the Vedavati river with its tributaries and constitutes 11.2 per cent of the total area of taluka. The major part of the plain lies on either side of both the Garanihallas. The sediments are deep, the general depth varying from 60 cm to 6 meters. The surface texture ranges from sandy loam to clay loam. A number of tanks have been constructed along the courses of the exting streams and faulty irrigation has given rise to salinity in large areas. The upper part of the plain is covered by the coarse alluvium which constitutes 14 per cent grains of 2 mm diameter. The remaining sediment grains are of medium to fine texture, 61 per cent of which have diameter of 0.06 to 0.07 mm. The plain is slightly affected by water erosion.

9. Recent flood plains (area 148.0 sq. km)

These plains have been formed due to overflow of water in the Vedavati river and its two major tributaries. The plains covering 7.2 per cent of total area of taluka lie in narrow strips on either side of the streams. This unit has been further sub-divided into two sub-units.

(a) *Non-saline recent flood plain :* This occurs near Renuka, Vederahalli, Manigarahalli and Torabirrahalli villages. The plain is only confined to the banks of the Vedavati river and has formed by sediments deposited by heavy floods. The deposits of the upper part are coarse textured loamy sand to sandy loam while in the lower part these are of medium to fine texture varying from sandy loam to loam It is affected by moderate water and slight to moderate wind erosion. The water erosion has created channels of 1 to 1.5 m depth and 2 to 3 m width. The plain near Renuka village has been degraded by sand sheeting and sand drifting and the active dunes of very low to low heights have been formed. The sands are fresh, noncalcareous fine grained and of yellowish colour. The diameter of 63 per cent sand grains ranges from 0.25 to 0.52 mm in the top 1 meter depth.

(b) *Saline recent flood plain :* This plain is also depositional but is more extensive than non-saline flood plain. It lies on either side of the Vedavati river and its two major tributaries. The mode of formation of this plain is similar to non-saline plain but salinity has developed in the latter due to capillary rise of saline ground water and subsequent evaporation. This plain is found near Gosikere, Chauler, Herangondanahalli, Jajur Gudehalli, Mylanahalli, Tallak, Bhoganahalli, Ganjugunte, Doden, Kalrehalli, Vidapanakunte villages. The deposits of the plain are deep, varying from 1.5 to 3·5 m deep. The sediments are ungraded, unsorted and non-cohesive. The grains of flood plain associated with the two tributaries are finer than that of the master stream itself. The plain is affected by moderate water erosion and gullies of 4 m depth and 10 to 12 m width have been created.

(c) Erosional depositional land surfaces.

10. Level low lying alluvial plain and valleys (area 297.8 sq. km)

This is a erosional-depositional plain, lying at a lower level than other geomorphic units and constitutes 14.4 per cent of the total area. The plain is nearly level except for a few configuration in the form of mounds. The sediments of the plain have been developed *in situ* due to weathering of the bedrock. The underlying strata here is *Dharwar* schist, granite and granitic gneiss. The surface texture varies from sandy loam to loam and in pockets sandy clay loam. The sediment is deep, and non-calcareous upto 100 cm. below which it becomes calcareous. The diameter of the majority of sediment grains varies from 0.06 to 0.15 mm. The plain is slightly effected by water erosion.

11. Flat alluvial plain (area 129.1 sq. km)

This plain covering 6.2 per cent of total area of Taluka, occurs in between the valleys and on a higher land than the level low lying alluvial plain mentioned above. The texture of the sediments varies from loamy sand to sandy loam and is thus coarser than above. They are often mixed with pebbles and gravels. The size diameter of most of the grains is 0.25 to 2 mm. This plain is situated at a height of 400 to 500 m. It is slightly affected by water erosion.

12. Saline depressions (area 73.9 sq. km)

These depressions are situated on the courses of the existing channels and constitutes 3.6 per cent of the total area of the taluka. Bunding of channel courses to form tanks for collection of water has resulted in formation of these saline depressions.

13. Graded river beds (area 20.1 sq. km)

The beds of the Vedavati river with its tributaries are graded and are covered with coarse deposits. This unit covers 1 per cent of the total area of the taluka.

The sand bars of different dimensions have been formed. The height of the sand bar is 1 to 2 m, length 500 to 600 m and width 300 to 400 m. The longitudinal gradient of the Vedavati river is 1:700 and that of two hallas is 1:500. During torrential rains, the rivers are not capable of accommodating the full flow of the run off water overflows and vertical bank erosion takes place. The banks of the Vedavati river near Mynahalli, Gudehalli villages and of two Garani hallas near Dodderi Bhoganahalli villages have been badly dissected. The amount of dissection varies from 3 to 6 m.

All these geomorphic units have been subjected to soil erosion of different intensities. In piedmont plain and flood plains rills and gullies are also present. Stream bank erosion is common in some areas. Areas under different types of erosion are given in Table 5.

C. SOILS

1. *Red Gravelly Soils :* Red gravelly soils derived from acidic metamorphic rocks, principally granitic schist, are the most prevalent group of soils. Though belonging to the well known ferruginous red soil

Table 5. Type, degree and extent of erosion in Challakere taluka.

S.No.	Geomorphic units	Type	Degree	Extent in sq. km	Percentage
1	Ruged hills	Water erosion	Very severe	8.6	0.4
2	Gently to moderately sloping plain	...	Severe to very severe	151.3	7.3
3	Eroded rocky surface and gently undulating plains	...	Severe	634.8	30.7
4	Piedmont plains and graded river beds.	... ...	Moderate to severe	71.8	3.5
5	Very gently undulating plains	...	Moderate	207.5	10.0
6	Flood plains	...	Slight to moderate	140.3	6.8
7	Saline alluvial plains, level low lying alluvial plains and valleys and alluvial flat plains	..	Slight	658.7	31.9
8	Saline depression and nearly level plains	...	Practically no erosion	186.7	9.0
9	Flood plains	Water and wind	Moderate (water) and slight to moderate (wind)	7.7	0.4
				2067.4	100.0

group of India, these soils distinguish themselves by their neutral reaction and high base saturation apparently ensuing from lower degree of leaching. Within the red soils of the area there is some variation, largely on account of depth of soil and extent of gravelliness. Shallow and very gravelly red soils occur in the Kaval area, in small area east of village Hirehalli and also in patches here and there all over the taluka. Very deep, often slightly gravelly red soils likewise also occupy a small area in the north-western portion of the taluka in village Madapar Kayal, Guhlukalmenhalli, Deverakata. Moderately deep to deep red gravelly soils i. e. soils with a depth ranging from 30 to 70 cm and gravel content from 15 to 35 per cent cover the rest of the area. Slopes range from 1 to 5 per cent.

Dominant soils amongst these have a yellowish red to reddish brown gravelly loamy sand to sandy loam, weakly granular plough layer. The subsoils is invariably dark reddish brown, well aggregated in the form of medium-sized blocks that break into fine granules and is gravelly clay loam i. e. with 28 to 40 per cent clay, 3 to 8 per cent silt, 57 to 65 per cent sand (all on gravel free basis) and 25 to 35 per cent gravel. Sub-soil is followed by a very gravelly strata. The plough layer generally tests low in moisture retaining capacitly (6-8 per cent), low in N (0.31-0.53 per cent org. C_7,) generally low. sometimes medium in available phosphours (12-30 kg. P_2O_5/ha), and medium in available potash (220-320 kg. K_2O/ha). The subsoil is better provided and it is just medium in water retaining capacity (11-17 per cent), medium in N (0.51 to 0.76 per cent ore. C), low to medium in available phosphorus (15-36 kg. P_2O_5/ha) and medium in available potash (174-332 kg. K_2O/ha).

2. *Medium Black Cotton Soils :* These soils occupy a small area in the south-western corner of the taluka. They are quite akin to the well known medium black soil group of India and these owe there existence in this predominantly red soil area to the intrusion of basic rocks, such as hornblende schist. Excepting for a small area, they are 40 to 90 cm deep with a gravelly clay loam, highly calcareous murum underneath. They are heavy clay loam, in texture with 30 to 41 per cent clay and 8 to 12 per cent silt. As expected they have a high water retaining cappacity (22-30 per cent), are medium in N (0.7 per cent Org. C), medium (20-35 kg P_2O_5/ha) in available phosphorus and high in available potash (342 to 578 kg. K_2O/ha).

3. *Soil on Fine Alluvium :* These soils occur in narrow strips along both sides of the Granihalla and Daddahalla. They have a dark greyish brown clay loam to silt clay loam texture, moderately blocky structure in

the surface and a heavier sub-soil. Some free lime is present throughout the profile. They have a high water retaining capacity and test medium in N (0.5-0.7 per cent Org. C), medium in available phosphorus (33-46 kg. P_2O^5/ha) and high in available potassium (275 to 530 kg. K_2O_9/ha). They are as a rule somewhat saiine and alkaline.

4. *Soils on coarse Alluvium :* These soils occur along the course of river Vedavati. They have a sandy surface and a loamy fine sandy loam sub-susface with poor structure. They are low in water retaining capacity, nitrogen, available potash and available phosphorus.

5. *Anthropogenic* (Atchkat) *Soils :* These soils occur as patches and strips of 50 to 500 ha in depressions and valley floors of minor and medium 'nallahs' or drainage lines. These soils have developed under strong influence of their low physiographic position and paddy-ragi cultivation with tank irrigation and contrast strongly with the associated red soils. These soils are generally grey to greyish brown clay loam with 2 to 10 per cent gravel, and a blocky structure, tending to granular in plough layer. They are slightly calcareous, often alkaline tending to be alkali with varying degree of salinity. Some of the areas are water-logged. They generally have high water retaining capacity (20-30 per cent), a high N (1.0-1.7 per cent Org. C) and available potash (380-730 kg. K_2O/hs) status and a medium to high (30-70 kg. P_2O_5/ha) available phosphorus level.

Besides the above, there are limited occurrences of dark yellowish brown and dark brown, silty clay loam to clay soils derived from chlorite and amphibotite schists.

A brief description of the dominant soils follows and a detailed description of the problematic soils together with recommendations for their improvement are, however, given elsewhere. No effort has however been made to map the location of various soils in this report as the All India Soil and Land Use Survey has already carried out a survey of the region and mapped the soils of the taluka.

PROFILE DESCRIPTION OF SOILS

1a. Red Gravelly Soils

These are most extensive soils and cover a major portion of the taluk. Though mostly moderately deep to deep with gravelly loamy sand

to sandy loam surface and a gravelly clay loam sub-surface, wide variations are seen in depth and gravelliness, which are often associated with slope and parent rock. Thus shallow and very gravelly soils are found on watershed lines and on active denundational areas adjoining rock outcrops with 3-8% slope. Moderately deep to deep gravelly soils occur on most of the peneplains with slopes of 1 to 3%. Besides erosion and slope, high gravelliness in many soils is associated with preponderance of quartz veins in the granitic schist parent rock. Very deep, slightly gravelly soils are invariably found on granitic gneiss. Thus, the following sub-divisions of red gravelly soils can be made.

a) Deep, loam soils on nearly level land

b) Deep, gravelly sandy loam soils on 1-3% slope

c) Moderately deep, gravelly loamy sand soils on 1-3% slope.

d) Shallow, gravelly loamy sand soils on 1-3% slope.

e) Shallow, gravelly loamy sand soils on 3-8 per cent slope, as the rock out-crops.

f) Very deep, loam sand soil on 1 to 3 per cent slope (derived from granitic gneiss).

Profile description of some of the dominant phases is as follows:—

1b *Deep, gravelly sandy loam soils on 1-3 per cent slope*

Location : 0.1 km N. E of village Chatekadasa on a peneplain with 2 per cent slope.

Parent rock - granitic schist

0-20 cm.	Red (2.5 YR 4/6 D); gravelly sandy loam, medium moderately blocky breaking into fine granules, friable slightly sticky and slightly plastic, many roots, changing gradually to.
20-64 cm	Dark reddish brown (2.5 YR 3/4 D); gravelly clay loam; medium, moderate blocky, firm, sticky and plastic. common roots, changing sharply to.
64 + cm	Light red (2 5 YR 6/6 D) very gravelly clay loam weak structure.

ANALYTIC DATA

Depth in cm.	Gravel %	Coarse sand %	Fine sand %	Silt %	Clay %	Ca Co_3 %	pH	EC 1:2 mmhos/cm	Moisture Eqv.	Water holding capacity
0-20	15.8	44.5	32.7	6.5	16.3	nil	7.7	153	8.3	10.3
20-64	28.0	52.0	5.6	11.3	31.5	nil	7.3	138	16.35	50.7

Depth in cm.	Exchangable cations me/100 gms			C. E. C. me/100 gm	Available K_2O kg/ha	Available P_2O_5 kg/ha
	Ca + Mg	Na	K			
0-20	10.18	1.16	0.26	12.0	275.5	20.1
20-64	19.62	0.52	0.204	20.34	174.7	15.0

1c. *Moderately deep, gravelly loamy sand soils on 1 to 3 percent slope*

Location : 3 km. S. E of village Devarahalli on a peneplain with 2 per cent slope.

Parent rock – Granitic schist.

0 10 cm Yellowish red (5 YR 5/6 D), gravelly loamy sand, weakly granular. slightly sticky, non-plastic, common roots, changing gradually to

10-40 cm Reddish brown (2.5 YR 4/4 D), gravelly clay loam, medium moderately blocky, somewhat firm, sticky and plastic, many roots, changing sharply to

40 + cm Red (5 YR 4/6 D); very gravelly. Weathered granitic schist,

Depth in cm	Gravel %	Coarse sand %	Fine sand %	Silt %	Clay %	$CaCO_3$ %	pH	EC 1:2 mmhos/cm	Moisture equivalent	Water holding capacity
0–10	10.2	52.4	36.2	3.0	8.8	nil	7.1	55	5.10	27.7
10–40	3.0	39.4	28.9	4.9	26.8	nil		80	10.90	40 3
40	30.3	55.4	20.2	5.0	19.5	nil		161	8.90	38.0

Depth in cm	Organic carbon	Exchangeable cations me/100 gms			C. E. C me/100 gms	Available K_2O kg/ha	Available P_2O_5 kg/ha
		Ca + Mg	Na	K			
0-10	0.291	4.22	0.26	0.204	4.68	248.64	20.10
10-40	0.623	9.36	0.34	0.204	9.90	228.48	15.10
40	0·490	6.46	0.64	0.204	7.30		

1d. *Shallow, very gravelly loamy sand soil on 1 to 3 per cent slope :* These soils differ from above in their depth which is mostly between 15 to 22 cm. Besides, these are also more gravelly (40-60 per cent gravel) with a mantle of coarse fragments that cover 50 to 70 of the soil surface. But in their other characteristics like colour, structure, clay content the soils are similar to those described above.

1e. *Very deep loamy sand soils on 1 to 3 per cent slope (from granitic gneiss)* : In comparison to soils described above, the presently described soils have negligible gravel, and lower clay content. Their mechanical fractions even in sub-soils are made up mostly of coarse and fine sands.

Description of a profile is as follows :—

Location : 0-2 km N. of Maddapar Kayal on a peneplain with 1 per cent slope.

Parent rock - Cranitic geniss.

0-28 cm Dark red (2.5 YR 3/6 D); loamy sand, coarse weakly blocky, slightly hard; friable; nonsticky and non-plastic, changing gradually to

28-55 cm Dark reddis brown (2.5 YR 3/4 D); coarse sandy loamy, medium, moderately blocky breaking into fine granules, friable, sticky and slightly plastic, common roots, changing gradually to

55-132 cm Same as above, excepting for slightly heavier texture and greater plasticity.

132-200 cm Red (2.5 YR 4/6 D); coarse sandy loam, rest same above.

Depth in cm	Gravel %	Coarse sand %	Fine sand %	Silt %	Clay %	$CaCo_3$ %	pH	EC 1:2 mmhos/cm	Moisture equivalent	Water holding capacity
0-28	11.3	32.6	49.3	3.3	14.8	nil	7.1	83	6.8	31.8
28-55	2.4	53.9	26.8	3.9	15.4	...	7.0	55	6.85	35.0
55-132	—	44.3	25.8	4.6	25.3	...	6.9	82	12.2	40.0
132-200	1.6	33.6	46.	2.4	18.0	...	7.3	91	9.65	32.6
200-250	—					1.51	8.4	119	4.0	36

Depth in cm	Organic carbon %	Exchangeable cations me/100 gms			C E C me/100 gms	Available K_2O kg/hr	Available P_2O_5 kg/hr
		Ca+Mg	Na	K			
0-28	0.371	5.12	0.34	0.26	5.72	288.96	20.10
28-55	0.411	7.28	0.44	0.102	7.82	127.68	
55-132	0.509	11.94	0.44	0.144	12.52		
132-200	0.305	7.28	0.44	0.102	7.82		
200-250	0.133						

2. Medium Black Cotton Soils

These soils, true to the group to which they belong, are uniformly heavy textured, firm and plastic when wet, break into fine granules upon drying with high moisture retention capacity. Like the associated red soils, they also occur on peneplain having mostly 1 to 4 per cent slope. Variation is seen in depth of soil which is mostly between 40 to 90 cm, save for transitional areas, where it is 15-20 cm only and in such situations surface is often littered with rock fragments. Two soil depth phases i. e. moderately deep and deep can be established. Description of a moderately deep soil is as follows:—

Location : 1.5 km NE of village Kammatmarakunte on a peneplain with 2 per cent slope.

Parent rock - Horblende Schist

0-15 cm Very dark grey (10 YR 3/1 D); clay loam with few fine lime concretions, mostly fine granular, sometime blocky, very sticky and plastic.

15-40 cm Very dark grey (10 YR 3/1 D); clay with few fine lime concretions, medium strongly angular blocky, consistence same as above.

40 + cm Greyish brown (10 YR 5/2 M). gravelly clay loam with many lime coated gravels and lime concretions mud powder, slightly sticky but plastic.

Depth in cm	Gravel %	Coarse sand %	Fine sand %	Silt %	Clay %	$CaCo_3$ %	pH	EC. 1:2 mmhos/cm	Moisture equivalent	Water holding capacity
0-15	6.8	24.5	23.2	12.3	38.4	2.56	8.1	139	22.5	51.0
15-40	5.0	16.8	23.0	15.8	41.3	3.05	8.2	142	28.5	60.0
40 +	60.3	34.8	9·4	9.3	23.6	2.39	8.3	184	17.85	—

Depth in cm	Organic carbon %	Exchangeable cations me/100 gms			C E C me/100 gms	Available K_2O kg/ha	Available P_2O_5 kg/ha
		Ca+Mg	Na	K			
0-15	0.624	44.68	0.86	0.36	45.9	342.7	10.0
15-40	0.689	45 36	1.20	0.26	47.82	342.7	5.0
40 +	0.663	21.22	1.56	0.26	23.04	—	—

3. Soils on Fine Alluvium

These soils are generally clay loam on the surface and silty clay in the sub-surface, followed in some cases by gravelly strata between 200 to 250 cm depth. They have a poor internal drainage and are invariably saline alkali: Major areas of these soils are confined to strips along the Daddahalla and Garanihalla. Description of a profile is as follows :

Location : 1 km north of village Devarahalli on a nearly level old alluvial plain.

0-15 cm — Light brownish gray (10 YR 6/2 D); heavy loam· medium blocky, sticky and plastic, strong effervescence with acid.

15-40 cm — Gray (10 YR 6/1 D); clay loam, coarse moderately blocky, sticky and very plastic, strong effervescence with HCl.

40-60 cm — Same as above, save for its silty clay texture.

60-90 cm — Same as above except for presence of few lime concretions.

Depth in cm.	Gravel %	Coarse sand %	Fine sand %	Silt %	Clay %	$CaCo_3$ %	pH	EC 1:2 mmhos/ cm	Moisture Eqv.	Water holding capacity
0-15	12.5	45.6	25.7	5.6	18.4	4.74	9.8	2454	22.45	
15-40	9.0	34.6	21.0	12 4	22.7	9.31	9.8	1557	34.0	
0-60	7.0	28.5	9.3	14.3	38.6	9.26	9.9	2312	46.0	
60-90	5.2	24.5	18.1	19.4	37.7	10.25	9.6	2255	48.4	
90-120	14.1	16.0	10.8	21.8	40.0	11.38	9.3	2077	58.25	

Depth in cm	Organic carbon %	Exchangable cations me/100 gms			C. E. C. me/100 gm	Available K_2O kg/ha	Available P_2O_5 kg/ha
		Ca + Mg	Na	K			
0.15	0.509		5.36	0.45	14.34	530.9	46.5
15-40	0.393		6.32	0.38	17.22	483.8	
40-60	9.371		6.05	0.40	21.04		
60-90	0 305		5.98	0.37	21.04		
90-120	0.265		5.05	0.37	24.86		

4. Soils on Coarse Alluvium

These are soils developed on coarse alluvium. With the construction of dam upstream, they are no longer subjected to inundation along river Vedavati. They have a sandy to loamy sand surface and sandy loamy to loam to loam sub-soil and are invariably non-saline and non-sodic. Description of a auger hole is as follows.

Location : 0.3 km N of village Mylahalli on bank of river Vedavati.

0-15 cm Brown to dark brown (7.5 YR 4/4 D): loamy sand, structureless, friable, non-sticky, non-plastic.

15-60 cm Reddish brown (5 YR 4/4 D); sandy loam, friable, slightly sticky, and slightly plastic.

60-120 cm Yellowish red (5 YR 4/4 D); same as above.

Depth in cm	Gravel %	Coarse sand %	Fine sand %	Silt %	Clay %	$CaCo_3$ %	pH	EC 1:2 mmhos/ cm	Moisture equiva-lent	Water holding capacity
0-15	2.0	62.4	30.6	1.8	5.2	nil	7	105	7.75	25.0
15-60	nil	38.8	42.6	4.8	13.8	nil	6.9	109	7.95	33.8
60-120	nil	35.5	46.0	6.3	12.2	nil	6.7	176	8.4	38.8

Depth in cm	Organic carbon	Exchangeable cations me/100 gms			C. E. C me/100 gms	Available K_2O kg/ha	Available P_2O_5 kg/ha
		Ca + Mg	Na	K			
0-15	0.202	3.06	0.34	0.144	3.64	141.1	10.0
15-60	0.202	8.14	0.52	0.202	8.86	87.4	8.7
60-120	0.134	8.32	0.44	0.102	8.86		

5. Anthropogenic Soils (Atchkat)

These occur in the generally red soil area but they contrast from the latter in most of their physical and chemical characters. They have developed under the strong influence of their low lying physiographic position and paddy-ragi cropping with tank irrigation and heavy doses of farm yard and green manures. These soils differ from the adjoining red gravelly soils by their dark to very dark greyish brown colour that is indicative of wetness as well as of high humus content. They are also heavier, being mostly gravelly clay loam to gravelly clay loam on the surface and somewhat heavier in the the sub-surface. Mostly, the atchkats soils are either alkali or saline alkali and quite a few such as those at Parasurampura, Buddanahalli, Dodderi, Chattparthi, Kurdihalli north of Janenahalli, Obanahalli, Kubdahalli, Viderahalli. water are very saline either as a result of poor quality water, water logging or faulty management. These soils are dealt with in detail in another chapter of this report and only one of the profiles is described here.

Location : 200 m from village Daderi on way to Challakere.

0-15 cm Very dark greyish brown (10 YR 3/2 M); gravelly clay loam, medium moderately blocky, granular, sticky and plastic, slight effervescence with acid, changing gradually to

15-25 cm Dark greyish brown (10 YR 4/2 M) few mottles, rest same as above

25-55 cm Greyish brown (10 YR 5/2 M); coarse moderately blocky, rest same as above.

55-90 cm Same as above, same for its gravelly clay texture.

Depth in cm	Gravel %	Coarse sand %	Fine sand %	Silt %	Clay %	$CaCo^3$ %	pH	EC 1:2 mmhos/cm	Moisture equiv. %	Water holding capacity
0-15	12.6	40.8	25.1	11.7	20.5	2.9	8.6	1316	16.9	58.0
15-25	— Sample not available —									
25-55	25.0	34.5	25.0	10.9	26.8	2.84	9.3	1994	30.1	60.9
55-90	40.0	38.9	9.73	6.3	30.5	14.57	8.8	4822	24.05	54.7
90	25.6					7.97	8.4	6120	10.10	47.2

Depth in cm	Orgain carbon %	Exchangeable cation me/1000 gm			CCE me/100 gm	Available K_2O kg/ha	Available P_2O_5 kg/ha
		Ca + Mg	Na	K			
0-15	1.561	12.9	2.41	0.42	15.12	557.8	93.0
15-25	— Sample not available —						
25-55	0.415	6.6	6·84	0.40	13.56	537.6	50.2
55-90	0.294	13.6	6.90	0.38	20.34		
90	0.308	29.7	5.45	0.38	35.4		

IV. WATER RESOURCES

(a) Surface water resources

In Challakere taluka the main river is the Vedavati or Hagari which flows from south to north along the eastern part of the taluka. Numerous big and small tributaries flow into this river from the west, south and east. The most important of them is the Garani Halla which rises from the uplands in the western boundary of the taluka and flows past Nayakanhatti, Gauripura and Tallak into Vedavati river near Bhoganahalli. Another tributary by the

same name coming from south west flows past Dodderi and Ranikere into Vedavati. Chikka Hagari, which is yet another tributary of the main river, runs for a short distance along the north west boundary of Challakere taluka, but its sub watershed has only a small extent in the taluka.

Vedavati river is more or less perennial and because of the extensive drainage system many of these water courses have been dammed for collection of water for irrigation purposes. There are at least 34 such major and 31 minor irrigation tanks (Appendix). The major tanks have a total irrigation command of 9569 acres and the minor tanks 1273 acres. The total area under tank irrigation is thus 10,842 as compared to 12,162 acres under well irrigation. Paddy is the main crop under tank irrigation, but excessive irrigation has resulted in water logging and increased salinity in the soil. Areas under different irrigated crops in acres in the taluka are paddy 16700, ragi 10,000, sugarcane 20. groundnut 9600, others 4778.

(b) Subsurface water resources

For the sake of simplicity the various granitic type of rock formations of this area have been classed as granite gneiss and the various types of schists as Dharwar schists. The third unit is the dykes. This grouping is based on the hydrogeological similarities of the various lithological formations. The details of the 114 wells examined are given in Appendix I. The number of wells examined constitute only 2 4 per cent of the total wells of the taluk representing roughly one well for every village. It is admitted that for better interpretation more wells should have been examined but this was not possible due to limitations of time.

Physical properties

The physical properties of the various lithological groups, which effect their water potentialities are discussed below :

Dykes : Due to weathering action these massive bodies have been turned into sub-rounded to rounded boulders at the surface and also at depth upto 20 metres b.g.l. Though the rocks are practically impervious for storing any economically exploitable water, the precipitated water which is stored in the joints, interspaces of boulders can be exploited.

Dharwar schists : These schists are generally fine to medium grained, friable due to weathering upto a depth of 10 metre b. g. l, Development of joints, fractures, laminations, foliations etc. are very common and are more effective to act as conduits upto 32 metres b. g. l., as such this is the most favourable zone for ground water accumulation. It has been observed that whereever these schists have been intruded by later granite, pegmatite dykes and veins yield more water. This is due to the fact that during the process of intrusion, fractures are developed in country rock and also various weaker zones are connected with each other and to such major weaker zone i. e. fractures etc. which in turn act as a good conduit for the groundwater movement and accumulation. In its natural form these rock formations are very poor host for groundwater accumulation.

Granitic gneiss : The rock types are very poor host for groundwater accumulation except in the joints, laminations, fractures and weathered zone. The weathered zone extends over 10 metres b. g. l. and the joints etc. upto 30 meters b. g. l., below which these get tightened up. The areas where lit per-lit intrusion have occurred are more water potential due to better development of weaker zones for water movement and storage.

Groundwater potentialities : Taking the number of existing wells as the index of ground water availability it will be seen from Table 6 that the granitic gneiss has more water potential due to higher density of wells per 100 sq. km of area.

Table 6. Ground water potential

S. No.	Lithological fromation	Total sub-surface area (per cent)	Density of wells per 100 sq.kms
1	Dharwar schists	24.76	125
2	Granitic gneisses	75.24	199

The wells have very poor discharge capacity in this region, mainly due to the fact that the rock formations are not very favourable for the development of good aquifer. It is only in the joints, fractures and foliations that water has accumulated. Table 7 gives the various discharge capacities of the wells observed in this region.

Table 7. Discharge potential of wells from various lithological formations (per cent of 89 wells observed)

S.No.	Lithological formations	Dug wells				Dug cum bore wells				Total
		0–500 l. p.h	500–1000 l. p.h	1000–2000 l. p.h	2000–4000 l. p.h.	0–500 l. p.h	500–1000 l. p h	1000–2000 l. p.h	2000–4000 l. p.h	
1	Dykes	1.1					1.1			2.2
2	Dharwar schists	5.6	8.0	1.1	4.5	2.2	5.6	1.1	2.2	30.3
3	Granitic gneisses	12.4	14.7	10.1	11.3	5.6	2.2	6.7	4.5	67.5
	Total	19.1	22.7	11.2	15.8	7.8	8.9	7.8	6.7	100.0

Note—Discharge has been worked out on 24 hours basis.

Only 41.5 per cent of the wells observed have somewhat good discharge i. e. over 1000 l. p. h. All wells from the dyke unit have very poor discharge. 21.4 per cent of the wells have very poor discharge i. e. less than 1000 l. p. h. and 8.8 per cent have good discharge potential, Wells belonging to all discharge ranges are practically equally distributed in granitic gneiss i. e. 34.9 per cent have discharge below 1000 l. p.h and 32.6 per cent wells have good discharge.

Depth of water : Depth to water in this region is practically sub-parallel to the land surface and it also depends upon the nearness to the surface water resources (vide map "Depth to water"). In 1.48, 52.47, 28.62, 16.52 and 0.85 per cent of the total area, the water is found respectively at depth upto one meter, 1–4, 4-7, 7-11 and 11–16 meters b.g.l. Shallow depth zone i.e. upto one meter has most probably developed due to damming of the subterranean channels of river Vedavati due to concealed extension of dolerite dykes. The major portion of the region has ground water at moderate depths i.e. upto 7 meters b.g.l. and occupy more than 81 per cent of the total area. Ground water is deep seated in areas which have hard and compact i.e. with less fractured subsurface formations and is confined only in the S.W. corner of the region.

Table 8. Static water level (in per cent) in different lithological formations (per cent 112 wells observed)

S. No.	Lithological formations	-1 metre	1-4 metres	4-7 metres	7-11 metres	11-16 metres	Total
1	Dykes			1.8			1.8
2	Dharwar schists	1.8	14.3	9.8	2.7	0.9	29.5
3	Granitic gneisses	8.9	28.6	25.8	5.4		68.7
	Total	10.7	42.9	37.4	8.1	0.9	100.0

It will be seen from Table 8 that only 10.7 per cent of the wells observed have water at very shallow depths i,e., upto one meter b.g.l. Such wells are generally situated in or near stream channels and are independent of any lithological characteristics. Due to very undulating topography developed on the Dharwar schist and granite gneiss the irrigated areas of the villages are generally situated in the valley floor and hence 80.3 per cent of the observed wells have water at moderate depths i.e. 1 to 7 meters b.g l. This zone is generally composed of the weathered mantle of granitic gneiss and Dharwar schists. Ground water is found at greater depths i.e. 7-17 meters b.g.l. at higher elevation of the topographical features. These areas are generally on the hard and compact granitic gneiss or dolorite dyke formations. In these areas it is only the joints that yield water; as the weathered mantle is either practically absent or is very thin to contribute any groundwater. Of the total wells observed, 9.0 per cent belongs to this group.

All the wells from dyke have ground water at moderate depths i.e. upto 7 meter b.g.l. Of the 29.5 per cent observed wells from Dharwar schist 16.1 per cent have water at shallow depths i(e. upto 4 metres b.g.l., 8 per cent at moderate depths and 3.6 per cent at deeper depths i.e. upto 16 metres b g.l. Of the 68.7 per cent wells observed from granitic gneiss 37.5 per cent wells have water at shallow depths, 37.4 per cent at moderate depths and 9.0 per cent at deeper depths.

Hydro-geo-chemistry

The discussions are based on 114 water samples collected during the survey, analytical data of which are given in Appendix II.

(i) *Salinity hazards :* The degree of salinity depends upon the quantity of total soluble salts (TSS) in the water. Accordingly, the groundwater has been classified into five groups i.e. Class I (C_1) to Class V (C_5) with T.S.S. ranging upto 7000 p.p.m. as shown in Table 9.

Table 9. Class of water in various lithological formations (per cent of well observed)

S. No.	Lithological units	C_1 180 ppm.	C_2 180-500 ppm.	C_3 500-1500 ppm.	C_4 1500-3200 ppm.	C_5 3200-7000 ppm.	Total
1	Dykes			1.8			1.8
2	Dharwar schists		10.5	21.9			32.4
3	Granitic gneisses		15.8	41.9	7.2	0.2	65.8
	Total		26.3	65.6	7.2	0.9	100.0

C_1 type of water is not found in this region. 26.3 per cent of the total samples from this taluk belongs to good quality of water i.e. C_2 type and could be used for all agricultural purposes. C_3 and C_4 types constitute 72.8 per cent and need to be used with proper management practices. Such type of water are usually associated with granitic gneisses. This is due to the fact that these formations are highly weathered and add salt to the water when it percolates through this strata. C_2 type of water is equally associated with *Dharwar* schist and granitic gneiss. These are found in the region which have good recharge i.e. near stream channels and where the joints are acting as good conduit for water movement. C_5 type of water is associated only with granitic gneiss in very small proportion and could be used only for afforestation and grasslands development. If used for irrigation of crops, extra care will have to be taken in adopting suitable management practices and also keeping the land fallow for 1 or 2 years after every irrigated cropping.

The area covered by each class of water is shown in map "Quality of Water". C_2, C_3, C_4 and C_5 types of water cover 23.8, 71.5, 4.6 and 0.1 per cent, respectively of the total area of the taluka. C_3 is the most widespread type of water which is followed by C_2 type.

(ii) *Chemical quality of water :* The average chemical quality of groundwater from various lithological units of this taluk is shown in Table 10.

More than 13.9, 2.8 and 5.2 meq/lit chloride, carbonate plus bi-carbonate and sulphate are considered hazardous for irrigation, Out of all the samples from dyke 100.0 per cent samples have CO_3+HCO_3 over this limit, from *Dharwar* schists, 97.2 per cent samples cross this limit for CO_3+HCO_3 and 5.4 per cent samples for SO_4. Similarly, out of limits of chloride, 94.9 per cent for CO_3+HCO_3 and 1.3 per cent for SO_4. From all of the lithological units CO_3+HCO_3 type of water is more dominant and are detrimental for agriculture.

(iii) *Alkali hazards :* This hazard is caused by the presence of excess of sodium salts in the dissolved state in proportion of calcium and magnesium. Since the irrigation potential of a region depends to a great extent upon the sodium salts present in water, low sodium contents in water promotes good cultivation while, the yield decreases with the increasing proportion of sodium salts in water.

The sodium hazard is determined by Sodium Absorption Ratio (SAR) which is $\frac{Na}{\sqrt{Ca+Mg/2}}$

Depending upon SAR value, irrigation water may be grouped into the following classes :

Class I	(S_1)	0-10	SAR
Class II	(S_2)	10-18	,,
Class III	(S_3)	18-26	,,
Class IV	(S_4)	26-34	,,
Class V	(S_5)	Above 34	,,

All the samples from dyke i.e. 1.74 per cent belongs to S_1 type and are fit for irrigation of all crops. From *Dharwar* schist 29.8, 1.7 and 0.9 per cent samples belong to S_1, S_2 and S_3 types, respectively. Similarly, out of all the samples from granitic-gneiss 52.7, 6.1, 4.3, 1.7 and 0.9 per cent samples

Table 10. Quality distribution of ground water (per cent of 114 samples observed)

S. No.	Litholo-gical uints	pH	T.S.S. ppm.	Na^+	K^+	Ca^{++}	Mg^{++}	Cl^{--}	CO_3^{--}	HCO_3^{--}	SO_4^{--}	S.A.R.	No. of samples
1	Dykes	8.65 (8.5-8.7)	766 (748-783)	8.48 (7.83-9.14)	0.15 (0.12-0.19)	0.53 (0.19-0.88)	2.78 (2.16-3.41)	6.37 (6.0-6.75)	2.75 (1.75-3.75)	5.68 (3.25-8.12)	0.62 (Tr.-1.24)	6.91 (5.86-8.45)	2
2	*Dharwar* schists	8.4 (7.8-8.8)	675 (303-1496)	6.70 (2.17-17.40)	0.18 (0.05-1.73)	1.22 (0.30-5.37)	2.32 (0.64-8.91)	3.64 (1.00-12.25)	2.39 (0.50-6.29)	4.25 (1.14-10.00)	2.28 (Tr.-8.96)	5.48 (1.69-20.00	37
3	Granitic gneisses	8.4 (7.9-9.0)	909 (301-4377)	10.32 (1.74-43.93)	0.24 (0.04-2.30)	0.99 (0.19-9.12)	2.60 (0.21-15.19)	6.18 (1.00-59.00)	2.76 (0.50-12.67)	4.80 (1.26-14.75)	1.70 (Tr.-7.14)	8.15 (1.26-55.00)	7
													114

Note : Average is shown in numerator and ranges within parenthesis in denominator.

The cations and anions are in M. eqal/liter.

belong respectively to S_1, S_2, S , S_4 and S_5 types.

Out of the total area of the taluk 94.56, 4.54, 0.76, 0.08 and 0.06 per cent areas have, respectively S_1, S_2, S_3 and S_4 types of hazards in ground water, as shown in map-"Quality of water".

(iv) *Ionic composition of groundwater :* Out of the total samples analysed, 0.80 per cent fall in each group $Ca > Na+K > Mg$, $HCO_3+CO_3 > Cl > SO_4$; $Na+K > Mg > Ca$ and $SO_4 > Cl > HCO_3+CO_3$ and $Na+K > Ca$ Mg and $Cl > HCO_3+CO_3 > SO_4$. All of these belong to C_3 type of water and come from *Dharwar* schist; 7.9 per cent falls in the group $Na+K > Ca > Mg$ and $HCO_3+CO_3 > C_1 > SO_4$ of which 44.4 and 55.6 per cent respectively belong to C_2 and C_3 types of water and 77.7 and 22.3 per cent respectively, come from granitic gneiss and *Dharwar* schists; 70.2 per cent samples fall in the group $Na+K > Mg > Ca$ and $HCO_3+CO_3 > Cl > SO_4$ of which 31.2, 63.7 and 5.0 per cent respectively belong to C_2, C_3 and C_4 type of water. 2.6 per cent samples fall in group $Na+K > Mg > Ca$ and $Cl > SO_4 > HCO_3+CO_3$ of which 66.7 and 33.3 per cent respectively belong to C_3 and C_5 type of water and are contributed by *Dharwar* schist and granitic gneiss to the extent of 33.3 and 66.7 per cent respectively. The last group i.e. $Na+K > Mg > Ca$ and $Cl > HCO_3+CO_3 > SO_4$ forms 16.7 per cent of the total samples of which 5.3, 73.7 and 21.0 per cent belongs to C_2, C_3 and C_4 types of water and 5.2, 15.6 and 79.2 per cent respectively, come from dykes, *Dharwar* schist and granitic gneiss.

(v) *Irrigation quality of water :* The irrigation quality of water cannot be judged by considering alone either salinity hazards or the ionic composition of groundwater. For this classification all of the factors have to be considered together. The map-"Quality of water" is based on salinity and alkali hazards present in the ground water of the taluk; which give eleven classes of irrigation water e.g. C_2-S_1, C_2-S_2, C_3-S_1, C_3-S_2, C_3-S_3, C_4-S_1, C_4-S_2, C_4-S_3, C_4-S_4, C_4-S_5 and C_5 S_1 and respectively cover 23.35, 0.48, 3.89, 0.55, 4.09, 0.17, 0.21, 0.08, 0.06 and 0.07 per cent of the total area of the taluk. All these water have separate irrigation values.

Table 11 indicates that the ground waters from the dyke area are of low salinity and low to moderate alkali hazards, water from *Dharwar* schist area are of low to moderate salinity and alkali hazards but more of low alkali hazards as compared to salinity hazards. The water from granite gneiss area has more of moderate to high salinity and alkali hazards.

Table 11. Irrigation quality of water (per cent of 114 sample observed)

S. No.	Lithology	C_2-S_1	C_2-S_2	C_3-S_1	C_3-S_2	C_3-S_3	C_4-S_1	C_4-S_2	C_4-S_3	C_4-S_4	C_4-S_5	C_5-S_1	
1.	Dykes			1.76									1.76
2.	*Dharwar* schists	10.52		19.31	1.75	0.18							
3.	Granitic gneisses	14.92	0.88	35.92	4.40	1.74	0.88	0.88	2.64	1.75	0.88	0.88	65.78
	Total	25.44	0.88	56.99	6.15	2.63	0.88	0.88	2.64	1.75	0.88	0.88	100.00

Salinity of surface water in relation to groundwater :

The location of surface water of which the samples were collected are shown on map "Salinity in surface water" and the results are given in Appendix III. Surface water samples received from seepage tank, canal, stream and tanks were collected. In the map total salt contents of these and that in ground water of that area are shown.

The above analysis shows that at Obnahalli the canal water is much less mineralised as compared to seepage water; at Deverhalli the mineralization of canel water and ground water are of same order while at Guntukalermenahalli the canal water contains more salt than the ground water and in the Naikanhatti area the tank water is highly mineralized as compared with the seepage water and the groundwater, the latter two having salinity of the same order. In Obbenyanahalli area seepage water is highly saline as compared with the groundwater. At Gauripura seepage water has more total soluble salt contents as compared with the ground water of the area; in the canal water as it flows through the region of Garni Halla the mineralization increases and ultimately affects the water quality of river Vedavati. In the Nanniwala area canal water is more mineralized than the ground water and seepage water while in the Kannenahalli area the seepage water is more saline than the groundwater although the salinity on the whole is not very high. In the Dodderi village area canal water is more mineralized than the ground water. River Vedavati water near Mylanahalli and Nagondanahalli is more mineralized as compared with the ground water of the area, and the same river water near Gungargunte has still higher salinity. The tank water in the village Gosikere is more mineralized then the ground water of the area.

This means that the quality of surface water from the tank and canal is much inferior to the ground water of the area. The causes of high salt concentration in the surface water could be due to the fact that all the drainages of this region are practically impeded, so that during rainy season the water flowing through these channels bring much of the salts developed in weathered bed rocks in the catchment areas throughout the year. High evaporation loss is also a contributing factor. As per Department of Mines and Geology of the Mysore State, evaporation losses at the Krishna Rao Dam at Mysore are 244 cm per year. In Challakere taluk area such loss is expected to be higher.

The use of this quality of water for irrigation in shallow and poorly drained soil cover over thick weathered mantle of granitic gneiss and growing of paddy and ragi with high water requirement are the principle causes for the development of salinity in the soil.

Groundwater exploitation and utilisation:

Introduction : Of the total area of the taluk i.e. 2,01,627 hectares, 1,51,848 hectares are cultivable land, of which only 55,565 hectares are cultivated every year and the rest is kept as fallow and cultivable waste. Out of the total cultivated ares 40,760 hectares are under dry cultivation and 14,804 hectares under irrigation. The taluk has 31 major tanks and 34 minor tanks, 720 drinking water wells and 3,615 irrigation wells. Out of the total irrigation wells 2,122 are installed with centrifugal electric pumps and 64 with centrifugal disel pumps and the rest are worked either with Persian wheel or "Kapiles and Yathss".

Of the total irrigated area, 398 hectares is under canal irrigation, 5,158 hectares under tank irrigation, 8,494 hectares under well irrigation and 753 hectares by other sources This shows that 57.5 per cent of the total irrigated area or 4.2 per cent of the total taluk's area is irrigated by well water. Groundwater, therefore plays a major role in the economic development of this taluk, particularly because the region has very low and erratic rainfall and the surface water supply is uncertain and inadequate.

As far as surface water resources are concerned it may be mentioned that there is very little room for new construction since practically all the ephemeral channels have been dammed. This has resulted in drying up of a number of tanks unless the rains are abnormally high. Evaporation and infiltration losses from the tanks are also very high (244 cm/year as recorded for Krishna Rao Dam.) Formulation of any ground water exploitation programme will require a long term planning and recording of various data like hydrological, hydro-meterological and hydro-geo-chemical properties of the aquifer which is essential to delineate areas which need water conservation in relation to recharge, exploitation, utilization and management of water resources. Our observations are based primarily on the data recorded during this survey and the information collected from various sources. Observations on the analysis of water are recorded in appendix I and II.

Present extent of groundwater exploitation : Extent to which the ground water is being at present exploited is shown in map "Density of existing wells". The villages have been classified into various groups and the area covered by these groups is shown in Table 12.

Table 12. Area covered under different density zone.

S. No.	Density zone (Density per 100 sq. km.)	Per cent of total area
1	0 - 50	8.24
2	50 - 100	18.21
3	100 - 200	38.81
4	200 - 300	21.18
5	300 - 500	12.74
6	500 - 700	0.82

The map "Area irrigated per well" shows that in six villages area irrigated per well is less than 1.5 hectares. In 109 villages each well command 1.5 to 2.0 hectares, in 21 villages 2.0 to 4.0 hectares and in six villages 4.0 to 7.0 hectares. Broadly speaking the wells from majority of the villages can irrigate 1.5 to 2.0 hectares of land.

A well constructed with Rs 10,000- to Rs 15,000/- investment could be classed as economic well, if, it could irrigate 4.0 hectares or more of land. This means that the discharge of the wells should be augmented 2-3 times in 136 out of 214 villages of the taluk. This could be achieved in many cases by drilling vertical or radial bores in the well, regulating the optimum spacing and draft per well or changing the cropping pattern and land use according to availability of ground water in existing wells.

Groundwater Budget.

An apprisal of the total water resources available in the taluka is given below :

(a) *Annual increments* :

(i) Total average precipitation 455 mm.

(ii) *Losses by evaporation from the tanks — 244 cms

(iii) *Total average recharge to the aquifer — 10 per cent of precipitation.

(iv) Total area of taluk 2,01,627 hectares

(*Information from Department of Mines and Geology, Mysore State for Krishna Rao Tank area).

(b) *Annual consumption* :

(i) Water consumed for irrigating various crops in different season (Table 13).

Table 13. Water consumption by crops (in M. litre)

S. No.	Crop	Kharif	Rabi
1	Paddy	22,657	19,575
2	Ragi	14,760	492
3	Jawar	782	370
4	Maize	160	200
5	Onion	1083	—
6	Groundnut	—	662
7	Wheat	—	1311
8	Others (Appx)	558	390

(ii) Water consumption for various human requirements — 375.00 M. litre

(iii) Water consumed by livestock :

Cattle	256.00 M. litres
Buffaloes	43.00 ,,
Sheep	23.00 ,,
Goats	8.00 ,,
Other	5.00 ,,
Total	335.00 M. litres

Note : 1961 census figures have been considered for the calculation of human and livestock consumption. Also it has been assumed that the entire water requirements for human and livestock consumption is met from ground water resources.

(iv) Total withdrawals :

Kharif crops	40000.0 M. litres
Rabi crops	23000.0 „
Livestock	335.0 „
Human	375.0 „
Total	63710.0 M. litres

(c) *Balance :*

(i)	Total rain that falls on the region	11880 hactmeter
(ii)	Water recharged to the aquifers	11188 „
(iii)	Water consumed by various sources	688 „
(iv)	Water available for further exploitation	10500 „

This indicates that roughly 6.1 per cent of the total water recharged to the aquifers is only being utilized. The estimate however is very rough, in absence of precise data but it does bring out that there is enough scope for further ground water exploitation in the taluka.

For the purpose of groundwater development plan the area has been classified into three zones i.e. (i) areas not recommended for further ground water exploitation, (ii) areas not very fit for groundwater exploitation and (iii) areas recommended for further ground water exploitation and these zones cover 6.1, 54.2 and 39.7 per cent of the total area of the taluk as shown on map "groundwater exploitation zones".

In the first zone water conservation methods should be adopted to increase the recharge to the aquifer. In the second zone exploitation of ground water could be intensified but within restricted limits after adopting water conservation practices to increase the recharge to the aquifer. But

care should be taken not to exceed the recharge capacity of the aquifer while intensifying the ground water exploitation activities. This area therefore, should be specially studied in details for their storage capacity and ground water budget before planning and development activities. In the third zone ground water exploitation programmes could be carried out without much danger of depleting the resources. It is desirable however, to adopt water conservation practices for long term utilization of the aquifer in these areas.

V. MINERAL RESOURCES.

In this taluk there are no major economic mineral deposits under exploitation. Granite is quarried as building stone. Near Nanniwala village asbestos has been found as thin vein (Map-Geolithology) but its extent of occurrence is not known. In the surface it appears to be of poor quality, but may improve at depth. Detailed prospecting of this mineral will be a worthwhile proposition.

VI. VEGETAL RESOURCES

The existing vegetal resources of the taluka are limited as compared to neighbouring regions. This is partly due to erratic nature of the rainfall and partly on account of severe biotic interference like cutting and lopping of natural tree vegetation for fuel and top feed species and overgrazing of the existing rangelands, which are in a very degraded condition. This directly affects the milk, meat and wool production in the taluka. Degraded vegetation in the catchment areas of many tanks which are solely rainfed, add to the problem of their silting, thus reducing their water storage capacity; wherever irrigation facilities are available the land is cultivated either for food crops like Ragi, barley, paddy, Jowar, Navane *(Setaria glauca)*, wheat and *Bajra* or non-food crops like cotton and tobacco (mainly confined to black soil area), oilseed crops like groundnut, castor and linseed. Pulses like *Dolichos biflorus*, *Cajannus cajan*, *Cicer arietinum* etc. are also taken on a limited scale on rainfed areas only. There are many orchards where coconut, *Areca catechu*, betel vines and banana are the main species favoured in addition to *Achras sapota*, *Magnifera indica*, *Artocarpus integrifolia*, *Annona squamosa*, *Carica papaya*, *Vitis vinifera*, etc. There is however no programme of grass husbandry; the animals graze solely on natural rangelands locally called as *Kaval*s which are very much degraded. Sometime they are stall fed.

Vegetal resources are grouped under two main headings viz. natural vegetation and introduced vegetation.

NATURAL VEGETATION.

Natural vegetation is located mostly on the hills (*Kaval* or *Gomals*) which are managed by the State Forest Department or taluka board. The total area under forest in this district is 2,35,949 acres forming 9% of the total geographical area as compared to 18.1 per cent in the entire State. Some of these are under effective protection while majority of them are degraded reducing the physiognomy to a discontinuous spiny formation or scattered shurbs. Even the recent plantations were noticed to have been hacked and cut for fuel by the local population. The vegetation has been classified as follow :

A. Forest Vegetation

1. Rugged hills : These are low hillocks situated in the taluka near K. D. Kote, Hirehatti, Narlegunte, Gosekero and Kotepal. Most of these are granitic formations while a few include *Dharwar* schist and dolerite characterised with small to big boulders. In the interspaces of these boulders some soil has accumulated where a few vegetation can be observed, otherwise these hillocks are devoid of any cover. Hills of granite support a community of *Euphorbia antiquorum*, *Cassia auriculata* which seems to be a degraded stage of *Albizia amara-Acacia latronum-Cassia auriculata* community observed to grow at Jajjor. Hills of *Dharwar* and dolorite schist are either devoid of any vegetal cover or support a community of *Cassia auriculata* only. It has been noticed that *Euphorbia antiquorum* does not find a place on this rock formations, while on granite formations it is associated with stray plants of *Annona squamosa*, *Ailanthes excelsa*, *Acacia leucophloea*, *Cassia fistula*, *Pongamia glabra*, *Dodonaea viscosa*, *Zizyphus xylopyrus*, *Carissa spinarium*, *Opuntia dillenii* and *Eriodondron anfractuosum*. Ground flora in general is poor consisting of a few species like *Tephrosia falsiformis*, *Boerhavia diffusa*, *Fagonia cretica*, *Cymbopogon jawarancusa*, *Heteropogon contortus*, *Aristida hystrix*, *A. setacea*, *A. adscentionis*, *Tetrapogon tenellus*, *Chrysopogon montanus* and *Eragrostis* sp.

2. Eroded rocky surface, piedmont plain and gently undulating plains are generally occupied as *Kavals* and *Gomals*. On such habitats vegetation is very sparse. Soils on piedmont areas and sloping lands are shallow to moderately deep, red loam where a community of *Cassia auriculata* was recorded. Such sites are Sommagudde, Hallukunte, Hirehatti, Bellakere, Gujjiganahalli,

Meanalahalli, Hollakunte, K. D. Kote and M. S. Hally. Areas which are designated as *Kaval* show *Cassia auriculata-Albizia amara* or *Cassia auriculata Acacia latronum* community and *vice versa*. Stray plants like *Acacia arabica, Albizzia amara, Euphorbia antiquorum* are always associated in these communities with the typical ground plants like *Cissus quadrangrularis, Dodonoea viscosa* and *Barleria prionitis*. The grass vegetation is poor consisting of a few species like *Cymbopogon jawarancusa. Heteropogon contortus, Aristida hystrix, A. setacea, Eragrostis* sp. and *Echinochloa* sp. Some of these lands have been taken up for fuel wood plantation by the taluka board.

3. Alluvial flats and nearly level land and valleys are densely habitated where the land is mainly used for crop cultivation or orchards. Here the soils are deep sandy loam. The tree vegetation on such areas is mainly *Acacia arabica* which is associated here and there with many other species like *Pongamia glabra, Tamarindus indica, Azadirachta indica* and *Acacia leucophloea*. On long fallows *Cassia auriculata* is the most dominant shrub community sometimes associated with *Dodonaea viscosa, Calotropis gigantea, Barleria prionites* and *Paosopis juliflora*. The ground flora has almost been removed by grazing animals and only a few plants of *Aristida adscensionis* and *A. hystrix* could be recorded.

4. Valleys are mostly cultivated with irrigation and orchards are preferred over crop cultivation. The natural vegatation is almost similar as described above, but *Pongamia glabra* was dominant, as at Nagramgera, Ganjugunte, Karikera, Konehally and Redelihally.

Falt uplands with black soils, do not support any natural vegetation except a few weeds like *Aristolochia* sp., *Corchorus* sp., *Calotropis gigantea* and grasses like *Heteropogon controtus* and *Cymbopogon jawarancusa*.

5. Recent flood plains have deep soils (Renukpura and Korekonarahally). The vegetation is almost similar as described above. On areas affected with salinty, a few plants like *Salvadora persica, Prosopis juliflora, Borassus flabellifer* are present in addition to the above species. On the banks of river Vedavati the vegetation is dominated by a community of *Acacia arabica-Prosopis juliflora*. Typical riverine vegetation consisting of *Pandanus tectorius* was recorded at Mylerahally which is associated with species like *Dalbergia sissoo, Azadirachta indica, Lantana camara, Balanites roxburghii, Acacia chundra, Albizzia lebbek* and *Acacia leucophloea*. River bed terraces are either cultivated or put under orchards. Highly saline flood plain recorded a community of *Acacia arabica-Salvadora persica* only, along with a few carpet making

grasses like *Sporobolus tremulus* and chenopodiaceous succulents like *Suaeda fruticosa* and *Salvadora* sp.

6. Saline depressions are not at all suitable for cultivation. A community of *Acacia arabica* was observed on such areas which is usually hacked for fuel and top feed. Catchment areas of the tanks also support this community although this has been extensively disturbed. A few plants associated with the community are *Tribulus terrestris*, *Calotropis gigantea*, *Indigofera oblongifolia* and *Solanum surattense*. A few grasses recorded include *Cymbopogon jawarancusa*, *Sporobolus tremulus* and *Aristida* spp.

7. Graded river bed : In the river beds of Vedavati and its tributaries *Ipomoea biloba* a pretty creeper, was recorded on sand bars along with other plants like *Prosopis juliflora*, *Vitex negundo*, *Acacia leucophloea* and *Gliricidia maculata*. All these species are sparsely distributed and do not form an association. Small rivulets with their dry bed are covered with datepalm '*Phoenix sylvestris*' forming very dense thickets. This is extensively exploited by the local people for many uses.

B. Grassland Vegetation.

The main fodders are Jowar, Ragi and Paddy straw. This is sufficient for about 60 per cent of the cattle in the taluk. The *Gomal* and *Kaval* areas support the fodder requirement of the remaining 40 per cent of the cattle population. Milking and working cattle are obviously fed during peak of milking and heavy work by oil cake of groundnut, horse gram, cotton seeds and ragi.

There are no protected grasslands in the taluka and hence at the time of visit no good stand of grasses was observed. The existing grass communities mostly consist of *Cymbopogen jawarancusa-Heteropogon contortus* and *Aristida hystrix-A. setacea* along the runnels and sloping lands. Hills and upper piedmont areas include species like *Oropetium thomaeum* *Aristida hystrix* and *A. setacea* all indicator of overgrazed situation. The grass cover is almost negligible, hardly ranging from 0.1 to 2.0 per cent. Saline areas including abandoned fields, support *Sporobolus tremulus* community associated with *Cynodon dactylon* at some places.

Irrigated fields on red soil support a number of weeds such as *Aristida funiculata*, *A. hystrix*, *A. adscensionis*, *Brachiaria*, *Tragus speccies*, *Digita longiflora*, *Eragristis* sp., *Alloteropsis cimcins*, *Dactyloctenium aegyptium*, *Cymbopogon jawarancusa*, *C. parkeri* and *Eragrustis ciliaris*.

Irrigated paddy fields support relatively a large number of grass species which are given in the Appendix. The more important of them are *Chloris gavana* and *Dichanthium annulatum*. Other palatable grasses include *Eleusine indica: Paspalidium flavidum, Cynodon dactylon setaria tomentosa Crysopogon fulvus, Panicum fluitans* etc

Grssses on black soils of the regions are relatively few, the two main species recorded being *Cymbopogon parkeri* and *Heteropogon contortus*.

INTRODUCED VEGETATION

A. Forest plantations.

In *Gomal* and *Kaval* areas plantations of forest species have been made by the State Forest Department in trenches dug parallel to the contours especially on *Kavals* situated on piedmont zone, sloping land or rocky surface. Species like, *Hardwickia binata, Albizia lebbek, A. amara, Dalbergia sissoo, Tamarindus indica, Moringa pterygosperma. Azadirachata indica. Acacia sundra, Dichrostachys cineraria. Ailanthes excelsa* and *Pongamis glabra* have been tried. Some of the species are very slow growing, therefore, there is a great need for substituting some very fast growing species in order to fulfil the short term fuel requirements before any afforestation work can succeed in the area. Fast growing species like *Eucalyptus camaldulensis, E. terminalis, Acacia tortilis, Ailanthes excelsa* deserve a fair trial in the region. On the riverbed *Casuarina equisitifolia* may be planted on a large scale for clear felling.

Farm forestry has to be encoureged and a few species which may profitably be tried are *Pongamia glabra, Hardwickia binata Acacia leucophloea, A. arabica, Bauhinia* sp. *Cassia siamia* providing top feed and green manure. On field boundaries *Eucalyptus, Pongamia glabra* and *Agave* sp. may be tried on a large scale. At present *Euphorbia tirucalli, Opuntia dillenii* are the main species tried.

B. Roadside plantation.

Tamarindus indica, Ficus relegioosa, F. glomerata, Albizzia amra and *Mangiferra indica* are the plant species generally found. *Pongamia glabra* on account of its value as green manure is never allowed to flower and fruit. While selecting plants for roadside plantation, their economic use such as for top feed, non-edible oils etc. besides shade has to be kept in view.

C. Fruit plantations.

A number of plants are cultivated in the orchard but the two species most preferred are *Cocos nucifera* and *Areca catechu*. Betel vine is grown to a very limited extent. Cultivation of grapes is getting momentum.

D. Plantations around irrigation tanks.

Usually there is no plantation around these tanks except a few scattered tree species of *Acacia arabica*, *Azadirachta indica* and *Albizzia amara*. There is a good scope of plantations around these tanks which may include indigenous species. Since a number of water birds visit these tanks, such plantations will add to bioaesthetic value.

E. Crops.

Important crops are Jowar, Ragi, paddy, groundnut, coconut, cotton, pulses etc. Paddy is grown in autumn as well as in summer in irrigated areas. Only very small areas are under dry paddy. Jowar is grown in dry areas during *Kharif* and *rabi* seasons. Ragi is grown both as dry and irrigated crop.

B, SOCIO-ECONOMIC SURVEYS

I. METHODS AND TECHNIQUE OF SURVEY.

Detailed socio-economic survey was conducted in four sample villages selecting one village from each of the four *hoblies* or revenue circles in the taluka. In each selected sample village all the households were completely enumerated and a sample of 10 per cent household was selected by simple random sampling method. Schedules were then filled from the heads of households. Some relevant information were also collected through interviews with a representative cross section of the people. All available secondary data were collected from Tehsil office, Taluka office and other concerned official organizations. Extensive use of the data available in District Census hand book, Chittardrug District, has been made in the writing up of this part of the report.

II. TALUKA BOARD ORGANIZATION.

Challakere taluka board came into existence in 1959-60. The Taluka Board has an elected President, a Vice-president and 19 members. All the activities of the taluka board are being executed through the various sub-committees formed for the purpose viz. standing committee for finance and policy making, sub-committees for health and hygiene programmes, for rural indus-

tries, for development of agriculture and one for the amelioration for the welfare of the scheduled castes and scheduled tribes. The budget is approved by the District Development Conucil; the chief source of finance is 50 per cent land revenue and other taxes and cess duties etc., levied by the Taluka Board. Various State Departments also provide funds for the promotion of the works related to their respective departments. The Block Development Officer, Challakere, is the chief executive officer and the funds of the board are operated through him. He is also responsible for preparing budget, maintaining accounts and convening of meetings etc.

At the time of its establishment this block was a double unit block, with headquarters of the main unit at Challakere and of the sub-unit at Thalak. The sub-unit has now been abolished, and the Block Development Officer, Challakere looks to all the works of both the units. For the normal extension work of the Block, the B.D.O. is assisted by various extension officers, village level workers and gramsevikas etc. The applied nutrition programme, which was jointly sponsored by the State Govt. and Central Govt. with the assistance of UNICEF and W. H. O., has been introduced in this Block since February, 1970. This is essentially an educational programme and has been introduced mainly for bringing about a change in the outlook of the people towards food habits etc. Three extension officers one each for promotion of horticulture, fish culture, animal husbandry and one Mukhiya Savika for organizing Mahila Mandals and other social education programmes among the women have been appointed under this programme. Five gramsevikas have been appointed to look after the promotion aspect of this programme, specifically among the women and children. The total staff strength of the C.D. block, Challakere is given in the appendix.

The normal extension activties in the Block pertains to the development of agriculture, animal husbandry, irrigation and reclamation, rural health and sanitation, social education, communication, rural arts and crafts, housing and advancing loans to the people for various purposes. Year-wise expenditure made for the development of various aspects, enlisted above for the period 1961-62 to 1969-70 is given in the appendix.

III. POPULATION CHARACTERSTICS.

The following table gives the number of the villages according to population size.

Table 14. Population and number of villages.

Population.	No. of villages.	Total population.	Average population per village.	Percentage village.
< 200	17	1,096	64	10.56
200-499	31	11,028	355	19.25
500-999	62	47,289	763	38 50
1,000-1,999	40	49,962	1,249	23.84
2,000-4,999	11	29,679	2,698	6.83
Total	161	1,29,064	864	100.00

It is thus observed, that on an average a village in the taluka has a population of only 864. About one-tenth of the villages had on the average a population of 64 only. Only 6.83 per cent villages had a population of 2,000-4,999 persons.

96.90 per cent of the total population inhabiting the Taluka are Hindus, 3.08 percent are Muslims, 0.1 per cent are Jains and 0.1 per cent are Christians. The respective percentages of population having Kanada, Telegu, Banjari, urdu and other mother tongues comes to 56.14, 37.37, 3.18, 2.80 and 0.51. The following table gives the variation of population in the Challakere Taluka from the year 1901-1961.

Table 15. Variation in population during sixty years in Challakere Taluka.

Year	Persons	Decade variation	Percentage decade variation
1901	74,035		
1911	80,240	+ 6,205	+ 8.38
1921	85,556	+ 5,316	+ 6.63
1931	94,605	+ 9,049	+ 10.58
1941	1,07,968	+ 13,363	+ 14.13
1951	1,24,990	+ 17,022	+ 15.77
1961	1,52,249	+ 27,259	+ 21.81

The above data reveal that the rate of growth of population has been quite high in challakere taluka. During the period 1901-1961 the population of Mysore state increased by 80.68 per cent, of Chittardurga district by 114.30 per cent, while in Challakere Taluka it increased by 105.64 per cent. During the peeiod 1951-1961 the population increased by 21.81 per cent i. e, an increase of 2.18 per cent per year (State figures 2.15 per cent). Age, sex and marital status of population are given in the appendix.

The age composition of the population (1961) reveals that the percentage distribution of Children (0-14), young (15-34), middle aged (35-54) and old (55 + above) comes to 41.47, 29.67, 19.36 and 9.50 respectively. The primary data collected from the four villages further reveal that the percentage distribution of population in the above four broad groups comes, respectively to 39.01, 34.71, 17.35 and 8.93. The age pyramid is thus very broadbased in both the cases and is indicative of expansive population growth rate.

The sex ratio in the taluka comes to 932 females for every 1,000 males. There are 4,112 females in reproductive period for every 10,000 females of all ages which number is quite high and of this 84.83 per cent are married. Also about three-fourths of the married females in the reproductive period are in the lower age group i. e., in the age group of 15-21, where the potentialities of future growth of population are quite high. The primary data collected from the four villages during the survey also reveal a smilar trend. All these factors indicate that the population is predisposed to very high future growth rate and it is high-time to strengthen immediately the methods of planned parenthood and family planning.

IV. HOUSEHOLD.

There are in total 7,426 households in 161 villages of the taluka (1961) which means that on the average a village of the taluka has only 46 households. 92.5 per cent households are rural. There are 5.63 members per households- 5.60 in case of rural population and 5.97 in case of urban population. The average number of rooms per household comes to 1.37 so that there are 4.11 members per room. The respective percentage of households having no regular room, 1 room, 2 rooms. 3 rooms, 4 rooms and 5 or more rooms comes to 0.72, 69.62, 24.49, 3.41, 1.05 and 0.71.

The following table gives the nature and size of household in the four surveyed villages. It is observed that the traditional system of joint family is getting weakened, as 40.96 per cent of the households surveyed were found to be nuclear households. The composition of members in the joint families further revealed that mostly fringe members, in addition to the primary relations were

Table 16. Nature and size of household

Size of household/ nature	Natural		Joint		Total	
	Number	per cent	Number	per cent	Number	per cent
1-3	10	76.92 (29.4)	3	23.08 (6.12)	13	100.00 (15.66)
4-6	14	53.85 (41.18)	12	46.15 (24.48)	26	100.00 (31.32)
7-9	9	37.5 (26.47)	15	62.5 (30.61)	24	100.00 (28.91)
10-12	1	6.66 (2.94)	15	93.94 (30.61)	16	100.00 (19.28)
13 + above	nil	0.00 (0.00)	4	100.00 (8.16)	4	100.00 (4.82)
Total	34	40.96 (100.00)	49	49.04 (100.00)	83	100.00 (100.00)

found among the joint households. The percentage distribution of households according to its size, comes respectively to 15.06, 31.32, 28.91, 19.28 and 4.82 among the households having a total number of member 1-3, 4-6, 7-8, 10-12 and 13 and above. Almost four-fifths of the households constituted 4-6 numbers only.

It is observed that on the average one household has 4 54 workers and 2.75 non-workers. (Table 17.) The statistical analysis reveals that there is a positive correlation between the size of household and number of earners in a household.

Table 17. Size of households and number of earners per households, P. S. Challakere.

Earners size	No Earners	1	2	3	4	5	6	7	8	9	10	12	13	20	Total
1		1													1
2			4												4
3	1		4	3											8
4		1	2	1	3										7
5		1	3	2	1										7
6			1	5	2	2	2								12
7			3	2	5		2	1							13
8					2	1	1	2							6
9					2	1	1	1							5
10					1		4	1	2						8
11				1		2	1		2	1					7
12								1							1
16											1				1
18												1			1
22													1		1
28														1	1
Total	1	3	17	14	16	6	11	6	4	1	1	1	1	1	83

The following table gives the age and sex composition of earners and non-earners among the sample population surveyed.

Table 17 (a) Age-sex composition of earners and non-earners in P. S. Challakere.

Age	Sex					
	Male			Female		
	Earner	Non-earner	Total	Earner	Non-earner	Total
0-9	3 (3.70)	78 (96.30)	81 (100.0)	2 (2.60)	75 (97.40)	77 (100.0)
10- 19	64 (69.56)	28 (30.44)	92 (100.0)	33 (67.35)	16 (32.65)	49 (100.0)
20- 29	60 (92.31)	5 (7.69)	65 (100.0)	42 (93.33)	3 (6.67)	45 (100.0)
30- 39	37 (100.0)	—	37 (100.0)	25 (96.15)	1 (3.85)	26 (100.0)
40- 49	24 (100.0)	—	24 (100.0)	24 (88.89)	3 (11.11)	27 (100.0)
50- 59	24 (96.00)	1 (4.00)	25 (100.0)	13 (81.25)	3 (18.75)	16 (100.0)
60+ above	19 (76.00)	6 (24.00)	25 (100.0)	7 (43.75)	9 (56.25)	16 (100.0)
Total	231 (66.19)	118 (34.11)	349 (100.0)	146 (57.03)	110 (42.97)	256 (100.0)

It is observed that more than three-fourths of the earners are males. The remaining female earners mainly are the family workers. The proportion of earners to non-earners between the age group 10—30 year is almost equal among both the male as well the female population. This proportion among the female population is comparatively quite low in the age group above 40 years.

V. LITERACY.

The age, sex and education (1961) in rural area of Challakere Taluka is given in the appendix. 83.3 per cent of the total population are illiterate, 14.8 per cent are literate without any educational level, 1.40 per cent are primarry pass and only 0.50 per cent of the population have achieved matriculation or higher than matric standard.

The percentage of males among the illiterate, literate without educational level, primary pass, matriculation and above, comes respectively to 45.52, 81.38, 87.12 and 97.83. Amongst females, 54.48 per cant are illiterate as against 45.52 per cent males in this category. By and large the males achieve higher educational standard than the primary classes and most of the females do not read higher than the primary classes.

Of the matriculates or those having higher education than matriculation, 95.8 per cent fall in the age group of 15-44. The percentage of matriculates in the higher age groups is comparatively low.

Data collected during the current survey revealed that the percentage of illiterates is only 72.2 as against 83·3 per cent in case of 1961 data. Also the percentage of population having primary standard of education has risen to 10.4 percent and those of matriculates to 3.0 per cent. These factors indicate that the literacy percentage is on the increase and also that there is a gradual rise in the literacy standard.

Data (1961) on the literacy among the scheduled castes of the area reveal that 92.1 percent of them were illiterates. Among the literates 92.0 per cent were males. The educational facilities and other such programmes for scheduled castes need to be strengthened in the Taluka so that they may come up to the level of other non-scheduled caste population in the area.

VI. LAND USE.

The land use data for the years 1960-61 to 1967-68 given in the appendix shows that the area under forests is very low. It was 1.44 percent of the total area in the year 1960-61 and remained constant upto the year 1963-64. While in the year 1964-65, 10,000 acres of area was added to this and the percentage of forests to the total geographical area of the taluka rose to 3.42. Again in the years 1966-68 ,2000 acres of area from the *Kavals* was added and the percentage area under forest increased to 3.82. However, during the year 1967-68 the percentage of the forest to the total geographical area was 3.42 only. The percentage area under barren and uncultivable lands was 6.03 during the years 1960-64, but in 1964 it reduced to 5.73 due to reclamation of some land and then it remained constant. Land put to non agricultural use rose from 4.65 in the years 1960-62 to 4.70 in the years 1962-64 and 5.73 in the years 1964-68. This is natural and may be attributed mainly to the growth of town and rural residing areas. The area under cultivable waste lands had been 9.93 per cent during the years 1960-62, 9.85 per

cent during the years 1962-64 and 7.47 to 7·87 per cenr during the years 1965-68.

Though there is reduction in the area under cultivable waste lands, it may be necessary to take effective steps to bring more such lands under cultivation or any other suitable use. The area under permanent pastures and grazing lands remained as 12.70 percent during the years 1960-65 but it reduced to 10.87 from the years 1965-68. Efforts should be made to convert some of the cultivable wastelands into pastures and grazing lands. The area under miscellaneous tree crops is almost negligible during all the years (1960-1968). It is sad to note that the percentage area under current fallows had been increasing year by year. It was only 3.02 percent of the total area in the year 1960, but rose to 17.87 percent in 1967-68. Over one-fifth of the total lands were under the category of other fallow lands in the year 1960-62 and 1964-67, while in the year 1962-64 the percentage ranged from 16.60 to 16.89. The area under fallow lands has thus increased from 23.31 percent of the totle lands in the year 1960-61 to 39.42 per cent in 1967-68. Ways and means have, therefore, to be worked out for making more intensive use of land. The percentage of net area sown accordingly reduced from 41.93 percent in the year 1960-61 to 27.55 in the year 1967-68. The double cropped area is under 2.0 percent of the total lands for all the years from 1960-61 to 1967-68, except for the years 1966-67 when it was 7.86. There is, therefore, scope for bringing more area under double cropping in the region.

1. Economic Organization.

Of the total population in the taluka 57.4 percent are workers. The maximum concentration (10.21 per cent) of workers lies in the age groups 15-59. In this age group the popu'ation of male workers to total male population is 96.5 while it is 83.2 in case of females. The proportion of female workers heavily drops in the age group 60 and above (41.22 per cent) while in case of male it is 80.27 per cent. The data collected on age and sex composition of workers from the four villages surveyed reveal that 62.3 per cent are workers and the remaining 37.7 per cent are non-workers. About two-thirds of the total males are workers while among the females the percentage of workers is only 57.03.

Data on the sexwise workers and their educational level reveal that the respective percentage of employed persons among the matriculates primary pass, literate and illiterates comes to 19.97, 41.19, 37.66 and 41.47. The percentage of workers who possess matriculation or higher qualifications employed in the occupation of cultivation, agricultural labour, in Mining,

Quarrying, Livestock, Forestry, Fishing, Hunting and Plantations, Orchards and Allied Industries, at household Industry, in manufacuting other than household industry, in construction, in trade and commerce, in transport and in other services comes to respectively 47.08, 1.28, 0.8, 2.55, 1.28, 1.46, 5.29, 0.91 and 41.06. Thus quite a sizeable proportion of the matriculates or those having higher qualifications take to cultivation.

VII. OCCUPATIONAL DISTRIBUTION.

The percentage of workers engaged in various occupations and their educational level are given in the appendix. The data shows that with the increase in education more of the workers are engaged in other services, in transport, in trade and commerce, in manufacturing other than household industry, in construction and in household industry, rather than in cultivation or as agricultural labour.

Of the non-workers in the Taluka (Rural) 16.97 percent are full time students and 13.08 percent are engaged in household duties. The percentage of retired, beggars and those seeking employment for the first time comes respectively to 0.03, 0.24 and 0.11 only. Of the students 76.2 percent are males. Of those engaged in household duties the males are only 3.17 percent, while 96.83 per cent females are engaged in this occupation. Among the small percentage of beggars over three-fourths are male.

The data collected during the survey revealed that the percentages of heads of households following main occupation of cultivation, casual labour, animal husbandry, weaving, leather work, shopekeeping and other miscellaneous occupations comes respectively to 74.70, 12.05, 1.20, 2.41, 3.61 and 3.61 only.

The percentage of workers (1961) engaged in cultivation, agricultural labour, in mining etc., at household industry, in manufacturing, in construction, in transport and in other services comes respectively to 64.32, 16.12, 1.67, 10.22, 0.82, 0.97, 1.91. 0.20 and 3.79. The percentage of male workers engaged in different occupations is higher except in the case of agricultural labourers in which case the percentage of female earners comes to 58.79 as compared to 41.21 per cent for males. The workers engaged in various occupations largely come from the age group 15-59. The workers in the age group 10-14 are less than 10 per cent in all occupations except in the occupations of livestock raising, household industry and agricultural labour where the percentage comes respectively to 57.20, 26.11 and 14.12. This implies that the workers are initiated at comparatively younger ages for these occupations.

VIII. LAND HOLDINGS.

The data on the size of land holding held and number of family workers (males and females) and hired workers engaged in cultivation are presented in the following table:—

Table 18. Sample households engaged in cultivation only— family and hired workers.

Size of land.	Family workers.			Hired	Total	No. of	per cent.
	Males	Females	Total	workers.	workers.	households.	
Less than 1.	51	38	89	nil	89	38	1.28
1.0 - 2.4	416	337	753	48	801	296	9.85
2.5 - 4.9	491	333	874	25	899	324	10.79
5.0 - 7.4	911	716	1627	226	1853	586	19.15
7.5 - 9.9	464	337	801	141	942	255	8.49
10.0-12.4	749	588	1337	158	1495	430	14.31
12.5-14.9	159	128	287	33	320	85	2.83
15.0-29.9	1239	953	2182	354	2536	606	20.17
30.0-49.9	570	414	984	300	1284	242	8.06
50+above	416	273	689	289	978	142	8.05
Total	5466	4197	9663	1594	11257	3004	100.00

It is found that 11 per cent households had less than 5 acres of land, while 4.73 per cent have land of 50 acres and above. On the average one house hold had 14.92 acres of land. Almost half of the households in the Taluka had less than 15 acres of land. The maximum number of households i. e.

38.79 percent held 5-10 acres of land. Of the total workers engaged in cultivation 85.84 per cent are family workers and the rest are hired workers. Among the family workers engaged in cultivation 56.57 per cent are males. The proportion of female workers engaged in this occupation is, therefore, quite substantial.

On the average in a housedhold 3.75 workers are engaged in cultivation, out of which 3.22 are family workers and 0.53 are hired workers. Among the family workers 1.82 are males and 1.40 are females. The size of land holding held and the number of workers engaged per houehold in the occupation are positively correlated. The average number of total workers per household engaged in cultivation only ranges from 2.34, among the household having on the average less than one acre of land, to 6.78 average number of workers among the households having the average land holding size of 50 acres and above. The average number of hired workers per household is also positively correlated with the average size of land holding held by a household. The average number of hired workers per household, engaged in cultivation only ranges from nil among the households having on the average less than one acre of land to 2.04 average number of hired workers among the households having on the average a land holding size of 50 acres and more.

The following table gives the size of landholding and the number of fragments per household held:—

Teble 19. Size of holding and number of fragments per holding, P. S. Challekere.

Size of holding.	N. A.	FRAGMENTS.										
	10	1	2	3	4	5	6	7	8	11	12	Total
Less than 16 acres.		19	20	5	1	1						46
16-32 ,,		1	9	6	2		2	1				21
32-64 ,,			1								1	2
64 & above					1		1		1	1		4
Total.	10	20	30	11	4	1	3	1	1	1	1	83

During the survey it was recorded that on the average a household held 16.02 acres of land and the average number of fragments per household comes to 2.41. Thus, excessive fragmentation of land holding do not appear to be a problem in the region. 12.05 per cent households surveyed did not have any land holdings, 55.42 per cent households had less than 16 acres of land, 25.30 per cent held 16-32 acres, 2.41 percent held 32-64 acres and only 4.82 per cent held 64 or over 64 acres of land.

The two agricultural seasons, namely *kharif* is locally known as *Mungaru* (Rainfed crops) and Rabi as *Hingaru* (Irrigated crops). The lands have been classified in three main categories as Dry (*Khushki*), Wet (*Tari*) and gardens (*Bagal*).

Areas under different crops for the years 1960-61 to 1967-68 are given in the appendix.

It is observed that during the normal years approximately four-fifths of the area is covered by food crops, about one-tenth by oil seeds and the remaining one-tenth under other miscellaneous non-food crops. During bad years i. e., during low rainfall years, the percentage of area under food crops reduces while the area under some non-food crops remains constant because such crops are grown under irrigation. Among food crops, in normal years the pulses (Tur, Horsegram and others) cover about one-fifth of the area.

IX. EXISTING AGRICULTURAL PRACTICES.

Cereals.

Paddy : There are two local varieties taken; the *Halubulu* variety and the *Mulubate* variety which is also known as *Dhappa*. The *Dhappa* variety is the poorest while the *Halubulu* variety is graded by local people as medium of transplanting known locally as *nati*. Only two crops are taken in the taluka viz. winter and summer. Other popular varieties are *Sanna, Bangara Kaddi, Bangara Theega*. In canal irrigated areas S-317, a selection from *Halubulu* and a short duration strain is used as double crop. SRB-26 a, salt resistant variety is recorded to have given good results. *Bangarkaddi (S-1092) or Coimbatore Sanna* is being culdtivated in rainy season. The chief practices followed are :—

Preparation of seedlings.

Approximately, 2 Gunthas of land (Guntha=1/40th of an acre) is

required for preparation of seedlings for an acre of land. This land is very heavily seeded with 15 to 20 kg. of seed by broadcasting after 6-8 ploughings. The ploughing is started in the last week of May or first week of June. Two cart loads of farm yard manure or 10 bundles of green manuring are added at the time of last ploughings. The field is watered twice every third day of the sowing of seeds and then kept under an inch deep of water for about a week. Water is then let off and again the field is kept under 3" deep water till the seedlings are ready for transplanting.

During the period the seeds have been sown, 6-8 ploughings are given alternately changing the direction of ploughing in the field proposed to be sown by paddy. Ploughing is preferably done by the he-buffaloes with the help of traditional wooden plough. Recently, *Gujarasingh* iron bandle plough has been introduced in the area. Generally it takes a day for two pairs of bullocks to give one ploughing to an acre of paddy fields. The subsequent ploughings are given at an interval of 2-3 days each time. Thus, the ploughing operations are completed within 12-18 days time of starting the operations. The manure is generally added before the last ploughing and the mud is smoothened by having a plank drawn over it. In one acre of paddy lands generally either 20 cart loads (800 mds.) of farmyard manure (400 mds.) and 100 bundles of green manuring (generally i. e. *Pogamia glabra* Houge or Tephrosia sp. (T. falceformis T. villosa branches are used) are added. The cost of farmyard manure is Rs. 10/- per cart load while that of a bundle of green manuring is Rs. 2/- per bundle. The green manuring is put by human feet and trampled. This operation requires 12-13 members for a day for 1 acre of paddy land. The seedlings are then transplanted and the field is watered for four times at weekly intervals after which until the crop ripens, the field is constantly inundated. Generally females are engaged for the operation of transplanting and 15 female members are able to transplant seedlings in one acre of paddy land in a day. The operation costs Rs. 15/- @ Rs. 1/- per female labourer per day.

The first weeding or removing of *kale* is then done after 20 days of transplanting of seedlings and 15-20 females are able to do the weeding in an acre in a day. The second weeding is done after another 20 days when the same amount of labour is required. Thus, Rs. 30/-Rs. 40/-are spent on weeding operations in an acre of paddy lands.

After 5 months of transplanting the crop is ready for harvesting. For harvesting an acre of paddy 25 females @Re. 1/-per day and five males @ Rs. 2/- per member are required. The females are engaged in cutting the

crop with sickles, while the male members generally are engaged in making heaps of the cut crop.

Removal of grains form the stocks is done by hitting on the floor. Generally 10 male members are required for the purpose per an acre yield of paddy crop. The average yield per acre is 15-20 quintals and the average market rate per quintal is Rs.65/-only.

The crop is ready by about the end of November. The land is now left fallow for about a month and in the beginning of January the cultivating practices are again commenced. In case of paddy crops the same practices are repeated. The average yield for this crop per acre is 17-22 quintals.

Ragi (*Elensine coracana*) ; *Ragi* is another imortant crop in the region cultivated both as dry and under tank irrigation. It forms the stapple food of the majority of rural population. It is commonly said that "*Ragi Mudey Bhadhekai Bahaji*" meaning that ragi balls eaten with vegetable of brinjals (which are grown as a vegetable crop in the region) give good taste. Generally two varieties of Ragi namely *Gidaragi* and *Doda Ragi* are grown in this area. Other popular seed varieties are ES-11, R0870, RO.09, K-1, R0-863 and H-22. *Giddaragi* is recorded as a good yielder among the irrigated varieties. This crop is also grown through transplanting wherever facilities for well irrigation are available. The *Gida Ragi* ripens in 4 months while the *Dode Ragi* ripens in 4½ months.

The ploughing operations for irrigated *Ragi* crop start by the end of April for preparation of seedlings. One *Guntha* land is required for preparation of seedlings for one acre of *Ragi* crop. Generally, three ploughings are given before the seeds are sown and two cart loads of manure are added before the last ploughing. Green manure is not used for this crop.

In the field where Ragi crop is to be grown 3 ploughings are given. Two pairs of bullocks with two men employed for the purpose take three days to complete one ploughing in the *Ragi* fields. Thus, it takes 8-9 days in all for the complete operations for 2 men and 2 bullocks in an acre of *Ragi* land. After 2 ploughings have been given, 20 cart loads of farmyard manure are added in the fields and then the third ploughing is given, which serves for uniform mixing up the manure in the field. Fifteen females can transplant seedlings in an acre of *Ragi* crop in one day. The transplanting is done in wet lands after ploughing and watering the fields. Subsequent watering is given once a week. First weeding is done after 10-12 days of

sowing and 10-15 females are required for this operation for a day. Two subsequent weedings are done at an interval of 10 days and the same amount of female labour is engaged for the purpose. Harvesting of the crop is done generally after 70 days for which 15 female and 2 male labourers are employed. At first only the *Tane* or grains portion is cut and after about a week the *Halu* or stalks are cut by the same amount of labourers employed for the purpose. Threshing of *Tane* is done by the help of stone roller moved by two bullocks. Generally six labourers can thresh the grains in one day from one acre *Ragi* field. The average yield of the crop is 10-12 quintals per acre and the market rate of sale is Rs. 65/- per quintal.

The crop is also grown under dry condition since it is a hardy and drought resistant crop. Six ploughings-three lengthwise and three crosswise ploughings are given, changing the directions each time. The operations generaly start in the month of May. Ten cart loads of F. Y. M. are added before the last ploughing. The seeds are sown both by broadcasting and by line sowing. The seed rate is 21 lbs. per acre, the ploughing is followed by working with *Dodakunte* by which the weeds are removed. Generally 3—4 weedings are given at fortnightly intervals. Thinning is done with the help of hoes and thus the crops are brouth into lines, the weeds are also removed. Harvesting is done by the sickles. Threshing is generally done by trampling the sheares under the feet of the bullocks or by beating out the grains and sometimes also by the use of stone rollers. The average yield per acre is about 6-8 quintals as compared to 10-12 quintals in case of irrigated crop.

Navane (*Setaria italica*):—

Navanae which is 3½ months crop is suitable for areas receiving an average rainfall of 20 to 30 inches per annum.

As a *Kharif* crop it is also sown after the first rains in the month of April-May. In case of single crop it is followed by *jowar*, cotton or groundnut crops in the succeeding year. The seed rate is 5-7 Lbs. per acre which gives about 2 quintals of yield. The straw serves as a good cattle feed. This is also cultivated as a mixed crop alongwith *Ragi* as well as an irrigated crop.

Wheat (Triticum sativum)

The wheat crop covers a very small area of about 50 acres in the entire Taluka. It is sown during January.

The seeds are sown in well ploughed fields through drills or by broadcast. The harvesting is done in the months of March-April; most of the processes of *Ragi* harvesting are followed. The stalks or husk serves as a good cattle feed.

Pulses.

Tur (*Cajanus caian*):-- Tur or Togri is one of the most imortant pulses. It is taken as a mixed crop both with *Ragi and Jowar.* After harvesting the crop, the stalks are staked and threshing is done by trampling under the cattle feet, threshing stone roller or by hitting out the plants on the threshing floor. The empty pods and chaff serve as a good animal feed. The seeds are sown at the rate of about 2-3 kg. Per acre. The average yield of crop per acre is about 8 quintals.

Horse Gram (Dolichos biflorus).

The Horse Gram locally known as *Hurali* is extensively grown in the area and is popularly known as the poor man's pulse. Under adverse soil conditions this is the most common legume which is cultivated and is a 3-4½ months crop.

After the rains in the month of May, with tillage operations, the fields are sown by seeds @ 8 to 10 kg. per acre. The Muddy coloured variety is commonly cultivated in the area. It is generally grown as a single crop in dry area in which the next crop is proceded by *Jowar* or *Ragi.*

Green Gram : It is also grown like Horse Gram and mainly the dry lands are left for this crop. It takes about 3 months in harvesting. The other processes are similar to those followed in Horse Gram, Black Gram and Lobia etc.

Bengal Gram (Cicer arietinum) :

This is locally known as *Kadla* and grown during *Rabi* season, after the north-east monsoon sets in, on black soils and the dry tank beds. During winter months dew is considered highly beneficial for this crop. It takes about 3 months in ripening and is also eaten green or cooked as vegetable when it is partially ripe. The agricultural practices followed are similar to that followed for Horse Gram.

Oil seeds.

Ground Nuts (Arachis hypogea).

This is one of the most important crop grown in the Taluka and is locally known as *Sainga.*

There are two main local varieties of ground nuts ; (i) The *Netaikai* and (ii) the *Ballikai*, both of which are widely grown in the area. The *Netaikai* variety gives better yield and is more suitable to good and irrigated lands. While the *Ballaikai* ground nut is more suitable for dry lands. The roots of this crop spreads widely and therefore it requires less amount of seeds to be sown than that of the other variety. Recent introduction of the spanish variety HG-8 of 4-5½ months duration, have recorded a favourable response from the farmers. Groundnut seeds are sown @ 18 kg. per acre which gives an yield of about 1½ quintals.

Garden crops.

The chief garden crops in Challakere Taluka are Arechnuts, Co-conuts and Beetle leaves. The gardens are maintained on black soils wherever water is available. With the introduction of I. P. sets them number of gardens in the area is on the increase. In an acre plot of garden the general practice is to plant 400 trees of arecnuts, 400 beetle vines and 50 coconut trees around the boundry of the garden. The coconut trees act as wind break in addition to the yields obtained. These yield crop twice a year, one in August-September and the other, in March-April. On an average a coconut tree gives about 75 nuts in a year which means that the 50 trees grown around an acre of garden plot yield about 3,750 coconuts, the price of which works out Rs. 1150/-. One arecnut tree gives an yield of about ½ kg. in a year, the price of which approximately is Rs. 3.75. Thus four hundred trees grown in an acre of plot gives yield of arecnut worth Rs. 1500/-. The yield obtained from beetle leves in terms of money is the highest. Each plant gives 150 beetle leaves each month except during Decmber and January. The total yield in terms of money work out Rs. 3000/- from one acre of beetle garden. Thus, the total crops from one acre gerden worth Rs. 5650/-. The expenses incurred in a year in the maintenance of one acre garden are as follows.

	Annual expenditure Rs.
1) 40 cart loads of farmyard manure	400
2) Soil loomy once in two years 200 carts	200

3)	*Weeding, mulching and tying of beetle branches* 20 male workers @ Rs. 2/- per day and 10 female workers @ Rs. 1/- per day	600
4)	Two male workers @ Rs. 2/- per twice a week for weekly twice irrigation	384
5)	Electric charges of I. P. sets	360
6)	Crop cutting mainly for beetle leaves	300
7)	Burrying of beetle branches first time in 2 years and later on each year	180
		2424

Thus on the average the net profit from one acre crop works out to Rs. 3200/-. The life of an arecnut plant is said to be 50 years and coconut tree about 70-80 years. It was however, observed that where good irrigation facilities are available. Co-conuts are planted within the field sown by groundnut.

X. ADOPTION OF IMPROVED AGRICULTURAL PRACTICES

The data on adoption of innovations pertaining to agriculture in the region was collected during the survey. Table 20 presents the data on position of adoption of nnovations in the four surveyed villages.

Table 20. Adoption of agricultural innovations in P.S. Challakere.

Agricultural innovations	Awareness		Interest & Evaluation		Trial		Adoption	
	No.	%	No.	%	No.	%	No.	%
i) Improved seeds :								
Hybrid Bajra	9	10.84	3	3.61	1	1.20		
Hybrid Maize	12	14.45	5	6.02	3	3.61		
Hybrid Jawar	21	25.30	6	7.23	4	4.81	1	1.20
Paddy T.N. 18	32	63.85	14	16.87	8	9.64	1	1.20
Paddy T.N. 8	7	8.43	6	7.23	2	2.40		

Continued.

Agricultural innovations	Awareness		Interest & Evaluation		Trial		Adoption	
	No.	%	No.	%	No.	%	No.	%
Fertilizers	50	60.24	32	38.55	7	8.43	6	7.23
Line Sowing	4	4.81	4	4.81				
Use of insecticides and pesticides	40	48.19	23	27.71	1	1.20		
Improved implements								
Tractor	39	46.99	5	6.02				
Mould Board Plough	12	14.45	5	6.02	1	1.20	1	1.20
Threetined cultivator	6	7.23	1	1.20				
Blad Harrow	8	9.64	2	2.40				
Trifali	4	4.81						
Bund Farmer	11	13,25	2	2.40				
Chaff cutter	6	7.23	2	2.40				
Pumping set	41	49.39	24	28.91	1	1.20	1	1.20
Seed Trading Drum	6	7.23	3	3.61	1	1.20	1	1.20
Contour Bunding & Mehr bunding	28	33.73	7	8.43	1	1.20	1	1.20
New Crops								
Soyabeens	3	3.61						
Castor	2	2.40	2	2.40	2	2.40	1	1.20
Maxican wheat	3	3.61	1	1.20	1	1.20		
Rodent Control	7	8.43	5	6.02				

It is observed that although new crops like Soyabeen, Castor, and Mexican Wheat have been introduced, only a few farmers are yet aware of these. The data further reveal that none of the farmers could reach the other stages of adoption (i. e. interest, trial, or adoption) as far as Soyabeen is concerned. In case of Castor, out of those farmers who were aware about the same, all of them could go upto second and third stage of adoption but of the total only 1.20 per cent of the farmers have finally adopted this crop. In case of Mexican Wheat, only 1.20 percent of the farmers have crossed the interest and trial stage but they too have yet to finally decide whether to adopt or reject the crop.

Data pertaining to awareness about improved seeds indicate that Rice T. N. 18 and I. R. I. 8 are known to 63.8 and 8.4 per cent of the farmers but very few have adopted them. Not many farmers, however are aware of Hybrid Jowar, Hybrid Maize and Hybrid Bajra.

The same results are with respect to use of improved implements, insecticides and pesticides and other improved management practices. While some farmers may be aware of them, very few have actually tested and adopted them.

All this shows that the extension work should be taken up more vigorously and on more soundlines so that the adoption process is hastened for obtaining increesed crop yields.

Currently the extension activities in the taluka under agricultural programme pertain to the seed supply and advocation through propogenda and demostrations of improved seeds, fertilizers, improved agricultural implements, plant protection measures etc. has been taken up the progress made during the year 1967-68 to the year 1969-70 is presented in the following table.

Table 21. Extension work done in the Taluka during the last 3 years.

Extension activities.	1967-68	1968-1969	1969-70	Remarks.
1	2	3	4	5
Free Fertiliser Demonstration Programme.				
Hybrid Jowar	2	6	x	
Hybrid Maize	8	6	x	
TNI paddy	6	x	x	

Contd.

Extention activities. 1	1967-68 2	1968-1969 3	1969-70 4	Remarks 5
IR-8 paddy	x	6	x	
Pulses	x	20	x	
Method Demonstration.				
Hybrid Jowar	x	20	80	
Hybrid Bajra	x	x	42	
IR-8	x	x	20	
Maxican Wheat	x	x	20	
Hybrid Maize	x	x	20	
Half field Demonstration.				
IR-8 paddy	2	6	x	
Maxican wheat	2	x	3	
ADT 27 paddy	2	1	x	
IR 5 paddy	x	2	x	
TNI paddy	x	4	x	
Varietal Demonstration.				
Hybrid Jowar	20	20	x	
Hybrid Maize	20	20	x	
Mexican Wheat	x	20	x	
Hybrid Bazra	x	8	x	
Green Manuring seeds Distribution free of cost.				
1. Sanhemp	500 kg	600 kg	100 kg	One each year compost training camp was held in the year 1967-68 & 1968-69 to train the progressive farmers of the Taluka in preparation of farmyard manure.
2. Sesbania	180 kg	x	x	
3. Dioenclia	200 kg	150 kg	x	
4. Glarcidia maculeala	60 kg	x	x	
5. Honge (Pongamia glabra)	—	400 kg	600 kg	
Seed programme ; Soeds distributed to seed growers.				
RO 870 *Ragi*	200 kg	x		
Punia *Ragi*	x	200 kg		
D 340 *Jowar*	200 kg	100 kg		
S 701 paddy	150 kg	x		
S 661 paddy	40 kg	x		
SR 26 B paddy	40 kg	x		
S 317 paddy	x	400 kg		

Plant protection such as various seed treatments as well as control measures against crop pests have also been taken up in the Taluka. Plant protection equipments like Gatar rocking sprayers (40) Moka foot sprayers (50) and Hand rotating dusters were distributed at subsidy rates during the year 1967-1968. Similarly, during the same year improved agricultural implements including Taichug paddy weeder (25), JPC weeder (10), M. B. plough (15) and Druga plough (10), were distributed. Extension work under 'Horticulture scheme' of the Applied Nutrition programme, has been initiated and 19 works are under completion for Gardens, schools and community orchards. Seeds are being supplied for Kitchen garden and about 400 kitchen gardens exist in the villages.

Extension work in the sphere of agriculture is also taken up through co-operative societies, 54 agricultural co-operative credit societies, 10 farming co-operative societies and one agricultural produce marketing society exist in the taluka. The agricultral credit socities under the credit business advance large sums of money to the farmers, though the recovery position had been quite poor as indicated in the following table.

Table 22. Loans advanced by the Agricultuaral Credit Societies and amount outstanding.

Year	Amount	Recovered	Outstanding amount
1967-68	10,33,960	96,28,800	15,66,760
1968-69	20,54,832	20,63,250	12,12,893
1969-70	8,66,000	1,86,960	12,86,300

The agricultural co-operative credit societies had been doing some non-credit business also, such as sale of seeds, fertilizers, pesticides and agricultural implements etc. It is observed that the sale of ferticulizers had been quite high during the last three years while the sale of other items had been almost negligible. On an average an household in the Taluka purchased fertilizers from the agricultural co-operative credit societies worth Rs. 35/-, Rs. 42/-and Rs. 32/-respectively during the years 1967-68, 1968-69 and 1969-70. The agricultural produce co-operative marketing society at Challakere with a membership of 629 persons, a share capital of Rs. 13,215/- and Govt. share of Rs.330,000/- had also been selling goods. The position of last three years is given below in table 23.

Table 28. Value of goods sold during the last three years (in Rs.).

Item/year.	1967-68	1968-69	1969-70
1) Seeds	21,277	29,848	8,800
2) Fertilizer	4,40,534	7,71,419	3,23,851
3) Cement	64,364	7,71,419	22,539
4) Foodgrains	10,58,399	8,76,090	2,82,081
5) Iron	39,615	24,710	17,675
6) Pesticides	14,200	14.051	17,675
7) Porcurement of paddy	5,86,926	2,46,385	26,769

Besides, construction of some Godowns etc. have also beed taken up at a few important places.

XI. ANIMAL HUSBANDRY.

Table 24. gives the livestok population in the Taluka during the census period 1961 and 1966.

Table 24. Livestock and poultry composition in Challakere Taluka in the years 1961 and 1966.

Type of livestock	1961	1966	percentage increase or decrease.
Breeding Bulls.			
Males over 3 years	213 (0.08)	183 (0.06)	— 14.08
Other males over 3 yrs.	39603 (14.73)	38405 (13.23)	— 3.02
Females over 3 years	25335 (9.42)	27972 (0.37)	+ 10.41
Other cows over 3 years	1343 (0.50)	1065 (0.37)	— 20.70
Young stock	15518 (5.77)	19266 (6.64)	+ 24.15
Total cattel	82012 (30.50)	86901 (29.93)	+ 5.96

Contd.

Contd.

Type of livestock	1961		1966		% increase or decrease
Ruffaloes.					
Breeding males	112	(0.04)	72	(0.02)	— 35.71
Other males	3761	(1.48)	2384	(0.82)	— 36.61
Breeding females over 3 years	12325	(4 59)	6284	(2.16)	— 49.01
Others over 3 yrs.	491	(0.18)	7176	(2.48)	+ 136.15
Young stock	9207	(3.42)	9084	(3.13)	— 1.33
Total Buffaloes	25896	(9.63)	25000	(8.61)	— 1.33
Total Bovines	107908	(40.13)	111901	(38.54)	+ 3.70
Sheep	126052	(46.87)	135093	(46.53)	+ 7.17
Goats	32211	(11.98)	40894	(14.08)	+ 26.96
Horses Donkey & Other animals including *pigs*	2749	(1.02)	2456	(0.85)	— 12.0
Total livestock	268916	(100.00)	290344	(100.00)	+ 7.97
Fawls and hens	41512	(99.73)	41964	(99.27)	+ 1.09
Ducks	111	(0.27)	309	(0.73)	+ 178.38
Others	—		1		
Total polutry	41623	(100.00)	42274	(100.00)	+ 1.56

It is observed that there is an increase of 7.97 per cent in the number of total livestock during the year 1966 as compared to 1962 number. There has been 5.96 per cent increase in the total number of cattle, 7.17 per cent increase in sheep and 26.96 per cent increase in goats. There has however, been 3.46 per cent decrease in the number of buffaloes and also about 12 per cent decrease in other livestock. Converting the different livestock into adult livestock units, it is found that there were 1,24,671 adult livestock units in the

Taluka during 1961 and 1,39,514 in 1966. The density of livestock population on permanent pasture and grazing lands, net sown area and on total geo-graphical area for the year 1961 comes respectively 195,59 and 24.73 and for the year 1966 it comes to 254, 77 and 27 respectively. It is thus observed that the density of livestock population is quite high, specificaliy on permanent pasture and grazing lands and these need urgently to be developed in the taluka. The capital value of different types of livestock in the Taluka has been assessed and is presented in the following table.

Table 25. Capital value of livestock. (in Rs.)

Type of livestock	1961		1966	
	No.	Value	No.	Value
Adult cattle (Rs. 200 per cattle)	66494	13298800	67635	13527000
Youngstock (Rs. 75 per cattle)	16518	1163850	19266	1444950
Adult buffaloes (Rs. 200 per buffaloe)	16689	3337800	15916	3183200
Buffaloe youngs (Rs. 75 per buffaloe)	9207	690525	9084	681300
Sheep (Rs. 20 per sheep)	126052	2521040	135093	2701860
Goat (Rs. 20 per goat)	3224	644220	40894	817880
Other livestock (Rs 20 per)	2440	48800	2456	49120
Poultry (Rs. 2.50 per)	41623	10457	42274	10568
Total	281247	21715492	332618	22415878

The increase in capital value of livestock during 1966 over capital value of livestock in 1961 has thus been to the tune of Rs. 7,00,386 which means an increase of 3.22 per cent in terms of money value.

The local cattle found in the area are of poor breed. However, the present composition is local breed 40 percent, Cross breed AM) 45 percent and Amritmahal breed 10-15 percent.

The following table gives the feed etc. required for different types of cattle and the yield etc., they give in return.

Table 26. Feed required and yield from different types of cattle.

Type of feed and fooder	Amritmahal pure	Amritmahal cross	Local	Amritmahal cross cows	Local cows	Remarks
Green fodder of *Sajje or Jdla* (paddy stocks)	1 bundle 50 kg.	50 kg.	50 kg.	50 kg.	50 kg.	
Horsegramme	2 sr. Rs. 1.60	2 sr. Rs, 1.60	1 sr; 0.80	— —	— —	
Groundnut cakes	—	—	—	250 gm to mil king cows (0.19)	250 gms to milking cows (0.19)	
Total daily expenditure	Rs. 3.60	Rs. 3 60	Rs. 1.80	2.19	2.19	So the cross breed cows are mainly kept for better breed bullocks and not for milk purposes
Average milk yield	—	—	—	1 sr. daily	1 sr. daily	
Ploughing capacity per pair for an acre of dry land	1 acre per day 5 kg	1 acre per day 5 kg	½ acre per day 3 kg	— 5 kg	— 3 kg	

The sheep are of poor breed and yield generally black wool which is used for the preparation of rugs only. The sheep are fed on leaves of *jali*, *balla neem* and *mandkali* and little money is spent on the feed. The price of the adult female sheep ranges from Rs. 40/-to Rs. 60/- while that of adult male from Rs. 60/- to Rs. 100/-. The sheep are shorn twice a year and an adult sheep generally yields 1 kg. of wool in a year. The sheep raisers do not sell the wool in the market but generally give it to the traditionally weaving castes-the *kurubas* who are responsible for cutting the wool also. The owner gets in cash and kind about Rs.3/-per sheep annually. Sheep manure is also sold and while the sheep are being migrated, for penning every 100 sheep during the night in the farmer's filed the sheep raiser gets Rs.12/-per day.

XII. OTHER SOURCES OF LIVELIHOOD

Earning from sources of livelihood other than agriculture and animal husbandry are mainly agricultural labour, casual labour and traditional caste occupations. The average earnings per household during the preceding year from other sources of livelihood comes to Rs. 955.66. Further analysis of the data reveal that out of all the other occupations, on an average, major share of income i. e., Rs. 412.95 comes from agricultural and casul labour, Rs. 371. 93 from business, Rs. 39.15 from traditonal caste occupations, Rs. 82.50 from cottage industries and Rs. 52.41 from other miscellaneous sources. With increasing technological changes and monetisation of rural economy, the traditional crafts will not be able to cope with the changing needs and most of the persons are already facing hardship as a result of declining clients etc. It is, therefore, the dire need of the day to develop household industries on more scientific lines and providing necessary training in the advanced techniques. Steps need to be taken for supply of requisite materials and money in the form of subsidy of loans. It is heartening to make a note here that through the Taluka board the work on these lines is alreeady in progress. The following table reveals the position of industrial co-operative societies in the Taluka.

Table 27. Industrial Co-operative Societies and Financial Assistance received by the members.

Name of the society	No. of members	Share capital	Financial Assistance Received			
			Appex society	DDC Bank	Khadi Board	Total
Cotton Handloom Weavers Co-operative Society.	417	4835	35000	—	—	35000
Cobblers Co-operative society.	193	2850	—	—	37720	40570
Woolen Handloom Weavers Co-operative society	686	10629	47143	—	—	47143
Displaced Gold smiths Co-operative society.	78	1750	10000	No information		
Rural Industrial Co-operative Society.	2108	49226	331610	—	14200	345810
Palu Neera by-product Society P-R Pura.	30	620	—	—	1650	1650

Indebtedness.

In Challakeri Taluka, 78.3 per cent of the households were found to be indebted. The extent and causes of indebtedess are given in table 28. On an average a household had a debt of Rs. 1414.15 at the time of survey.

Table 28. Extent and causes of indebtedness, P. S. Challakere. (in Rs.)

Exten cause	Less than 500	500-1000	1000-1500	1500-2000	2000-2500	2500-3000	3000-3500	3500- and above	Total
Inherited	—	8	2					1	3
Took loan for agri. purposes	4	4	4	3	3	1	2	4	25
Took loan for other purposes		1	2	1		1		2	7
Took loan for meeting daily needs	8	10	7	3	3		2	3	35
Took loan for meeting socio-religious ceremonies	2	5	2	1	1	1		3	15
Others	1						1		2
Total	15	20	17	8	6	3	5	13	87

Morethan 60 per cent of the households took loans for unproductive purposes like meeting daily needs (42.2 per cent), to perform socio-religious ceremonies (18.27 per cent), loan inherited (3.6 per cent) and for other various needs for day to day routine works (2.4 per cent). The percentages of households who took loans for agricultural and other productive purposes come to 40.1 and 8.4 respectively.

It is interesting to note that the *Mahajan* is still the chief source of getting loans for the villagers. More than 60 per cent households received loans

from the informal sources like village peoples and relatives etc., including the *Mahajans*. The use of formal agencies like co-operatives, Govt. agencies and Bank, has been made respectively by only 21.7, 8.4 and 4.8 per cent of the households.

LAND USE CAPABILITY CLASSES.

In Challakere taluka the major limiting factors that determine the use capability of land for agriculture are the arid climatic conditions, soil erosion, occasional shallow soil of coarse texture with low moisture retaining capacity, soil salinity and occasional water logging, limited supply of surface and undergroud water, which is also often of moderate to poor quality. On the basis of the magnitude of these limitations, the soils of the taluka have been grouped into various land use capability classes on the standard pattern. Soils falling in any particular class have one or more limitations. The dominant limitation also varies; in some cases it is salinity and in other water-logging or wetness, shallowness of soil etc So, depending upon kind of dominant limitation, the classes have been further divided into sub-classes. Description of each of these is given as follows:

Class II Lands : This includes Coconut and Arecanut plantations areas with limited agriculture under well water irrigation and *paddy-ragi* land with slight or no salinity-alkali hazard under tank irrigation. The former are often on red, deep, gravelly sandy loam soil and the latter on loam to clay loam anthropogenic soils in the shallow valleys. Both the soils have been greatly modified under intensive management associated with these land uses. Red soils receive a very heavy application of a mixture of tank silt, farm yard manure and oil cakes at the time of plantation and regular application of manure mixture every alternate year. Likewise the anthropogenic soils receive heavy doses farm yard and green manures. Under both the uses, soils receive heavy irrigation to offset adverse climatic environment. Returns from the land compare with the best anywhere.

Class III Lands: This class covers the major area of the taluka. It comprises of two sub-classes i. e. III c with climatic limitations for land where irrigation facilities do not exist and III as with salinity-alkali hazard under irrigated conditions. Their description is as follows :

III c : This inculdes moderately deep to deep red, gravelly sand loam soils on gently sloping surface and moderately deep medium black cotton soils on similar slopes. while the red soils have low water retention capacity,

in black soils this is high. Rains are inadeqate and somewhat erratic and yields are often low. Black soils are agriculturally more prized because the crops withstand drought better. Cotton and Sorghum are preferred on these soils and Sorghum, *Bajra* and Horsegram on red soils.

Large scale bunding work on these soils has already been done in order to conserve soil moisture and prevent soil loss. This work should cover the rest of the areas also. Red soils often have a clay loam sub-soil with low permeability. Deep ploughing once in 3-4 years will improve the physical characteristics of the plough layer as also enhance the water intake of sub soil. Application of nitrogen fertiliser should prove profitable and their use be encouraged.

IIIsa : This sub-class comprises of saline-sodic and sodic anthropogenic (atchakat) soils. The saline-sodic soils are often clay loam with pH between 4 to 8 mmhos/cm. High pH and salinity are associated with poor quality of irrigation water for these heavy soils. On these soils during rainy season *ragi* and *paddy* grow with success but in case of summer paddy, yields are moderate to poor. This performance can be considerably improved by application of gypsum @ 2 to 4 tons/ha and 5-7 days of flooding prior to paddy transplantation. Only the more saline soils among them as those at Buddanhalli and Jajur require leaching for 15-20 days before paddy can be grown successfully.

The sodic anthropogenic soils have high pH as above but no salinity. In these soils application of gypsum as above without prior flooding coupled with usual management practices is adequate for good crop growth.

Class IV lands : In this class besides the climate there are other even more limitation in use of the land. In some cases it is shallowness of soil coupled with moderate to strong slopes and severe effects of water erosion and in other very light textures of soils or high salinity hazard and which can not be easily overcome either because of heavy texture of soil as in case of those on fine alluvium or non-availability of irrigation facilities. The description of various sub-classes is as follows :-

IVs : This acomprises of red, gravelly loamy sand soils on 1-3 percent slope. These soils have a depth of 15-22 cm only. They are often gravelly loamy sand in textures with a mantle of coarse fargments which covers 50-70 percent surfaces. These soils are low in moisture retaining capacity and also low in fertility status. Parts of the area of these soils is under arable farming where a crop of *bajra* alone or in mixtures with pulses raised, and the rest

is under a degraded pastures. However, level of management is low and yields are poor. In this sub-class soil limitations are severe enough as to permit only limited cultivation. Satisfactory yields of crops can be obtained only with heavey farm yard manure application together with contour cultivation and proper bunding. Ley farming is also desirable. However, these soils can support a very good pasture under proper seeding and fertilization.

IV se : This sub-class comprises of red shallow, gravelly loamy sand soils i. e. the same soils as described above with the only difference that slope of land is between 3-8 percent is more severe and there are many rills, small gullies and a few rock exposures. Besides, soils are 7.5 to 15 cm deep with surface covered with rock fragments of varying size. These soils support a very degraded pastures (locally called '*Kavel*' and '*gomal*'). However, the pasture can be greatly improved by adopting such soil and water conservation measures as bunding, rill and gully control followed by fertilization, reseeding with improved grasses and controlled grazing. Some cattle watering points can be developed by harvesting water from the rocky areas.

IVsa : Soils with silty clay loam to clay texture are located along the banks of *Daddahalla* and *Garanihalla*. These soils are highly saline with conductivity of saturation extract generally above 8 mmhos/cm and so are suitable only for paddy and that also in years of good ranifall. Permeability of the soils is low and leaching of these soils requires a net work of drains to be followed by application of gypsum and proloneged flooding.

Naturally saline areas are confined either to the immediate vicinity of source of salt or to depositional landforms where run-off waters from these areas accumulate and evaporate. These areas are also saline-sodic with PH generally between 9.2 to 10.0 and Ec 1:2 ranging from 2 to 7 mmhos/cm. There are no irrigation facilities available to reclaim these isolated areas.

Class V : This class (Vw, sa) . comprises of sizeable areas in *Kannenhalli*, *Chaulur*, *Viduhalli*, *Parasurampura*, *Gosikere* etc. along some of the minor streams where because of paddy cultivation or other hydrodynamic factors, groundwater has risen to within one meter depth. This has ultimately given rise to salinity in the soil. Reclamation of these soils is difficult, as it requires laying out of interception and field drains with facilities to pump out water thus collected. This should be followed by application of gypsum and flooding.

Class VII : In this class are included the strongly sloping severely sheet eroded and slightly gullied areas of red, shallow, gravelly soils. The

soils are only 7–10 cm deep with thin surface covered with rock fragments to the extent of 53–75 per cent. There are many rock exposures often in the form of maunds and hillocks. At present these lands support a very thin and degraded pasture comprising of *Aristida*, *Heteropogon* and *Cymbopogon* spp. Considerable improvements can be brought about by fertilization and reseeding with improved grasses like *Dichanthium*. These need to be followed by a rigorous managements requiring controlled and deferred grazing. But even then, return from land would be marginal because of severe soils limitations.

Class VIII . This comprieses of isolated rocky hillocks such as those at *Nannolwali* and a few other places which are almost devoid of any vegetation or soil. These lands can hardly give any economic return from management. In fact these need to be protected from any disturbance so that minimum damage is done to adjoining good lands.

LAND TRANSFORMATION.

Integrated survey of natural reasources in the taluka has brought to the forefront of the following problems for development of land resources in order of priority.

1. Scarcity of underground water and further scope of tapping new sources.

2. Salinity due to poor quality of irrigation water and inadequate drainage facilities.

3. Water conservation and control of losses from evaporation and seepage.

4. Evolution of new cropping pattern in order to reduce the salinity hazards with excessive irrigation to paddy and improvement of crop land resources through the use of high yielding and protein rich varieties.

5. Afforestation and development of short rotational fuel crops.

6. Grassland development for better milk, meat and wool production.

7. Establishment of small scale agro-industries viz. fibre for ropes, mates and cordages, non-edible oils for soap, starch from tamarind seeds, canning and processing of food products such as fruits and fishes etc.

Recommendations for improvement and management of various land resources are as follows :—

I. WATER RESOURCES.

Water resources in the taluka can be improved by the following ways :—

1. Tapping of new sources of underground water and

2. Proper utilisation and conservation of water through minimising evaporation and seepage losses.

For tapping new underground water resources detailed hydro-geological surveys and other hydrological information at least for one hydrologic cycle which may extend to 6-8 years are needed. Emphasis has to be given to such aspects as topographic survey with the help of aerial photographs, giving all the physiographic details, contour at 1 to 1.5 m interval, preparation of detailed geolithological map giving depth of the weathered mantle of all of the formations, major joints, fractures etc., depth to which these joints are effective conduits, their opening, radius of curvature etc., detailed hydro-geochemical maps, depth to water map, maps showing discharge potential, permeability transmissibility, specific capacity, drawdown etc. by actual pump test. With the existing knowledge of the hydraulics of hard rock it may be difficult to work out all the hydrological characteristics of the aquifer, so studies will have to be made for correct assessment of all these properties. It is also essential to carry out detailed hydro-meteorological studies on which the entire hydro-geological and geo-hydrological studies depend. A large number of rain-gauges should be set up in the taluka. A few evaporimeters may be set up; the run-off through the channels recorded, losses through seepage and evapo-transpiration losses by natural vegetation and irrigated crops be worked out. The hydrological boundaries of the various subcatchments need to be determined and the rate and amount of water penetration under various soil conditions should be worked out. Ground water surveys by electrical resistivity and seismic methods to be followed by test drilling and electrical logging would locate new water potential zones. Similarly, records of water level changes, variation in quality, discharge potential of the well should be maintained for avoiding over-utilisation or any hazards that develop due to utilization of subsurface water resources. It is suggested that record of the basic data of investigation carried out by various organisations may be maintained at a central place in the taluka. A rough calculation of ground water budget of this taluka has given us some hope for development of subsurface water resources. The area classified in the map as "recommended for further groundwater exploitation", is based on considerations of lithology, drainage, quality, recharge and yield per well.

Norms for the utilization of various types of ground water available in the area by actual agronomical trials and types of crops, grasses and trees which are of economic value for the development need to be evolved.

The subsurface waters of this taluka have been classified broadly into 3 groups, based on the work done elsewhere viz. Good C_2-S_1, C_2-S_2, C_3-S_1, C_3S_2, Moderate C_2-S_3, C_4-S_1, C_4-S_2 and poor C^4-S_3, C_4-S_4, C_4-S^5, C^5-S_1 for which

the probable utilization is given in the table. However, specific recommendations could be made only on the basis of trials, if done locally.

Exploitation of subsurface water need to be goverened by regulations in view of optimum spacing and regulated draft of wells. These may be introduced. For wells with 3,000-4,000 lph the distance should normally be 300 m but practical difficulties are envisaged on account of smaller land holdings and individual right of underground water exploitation. However, management of wells through Government or on community or co-operative basis may be examined.

Storing of water within the earth's crust, especially below the withered zone, which is less mineralised as compared to the surface water, with less evaporation losses, and no chance of pollution need to be examined. Some of the practices which could be followed are pitting, trenching, weter spreading and construction of small dry stone dams or channels at several places rather than construction of big storage tanks as practised. Seepage from existing dams need to be slopped through proper engineering techniques such as gritting, lining etc. Since the seepage losses are taking place due to petrofabric of the basement rocks, it is resulting in development of saline-alkaline conditions and degradation of irrigated lands for crop production.

Discharge from the existing wells could be improved by either putting a number of 2.50 to 3.75 cm diam and 2.3 m long radial holes through the existing weaker zones. Since it is a hard rock area only the weaker zones i.e. fractures, have water potential. The number of radial holes will depend on the weaker zones exposed on the side of dug well.

Chocking of the pipelines with calcium carbonate and bicarbonate as experienced in the main supply line of Challakere town could be avoided by operating the wells for 20-22 hours a day. Since the water is allowed to stand in the pipe line for a longer duration, say 18-20 hours per day a layer of calcium salts 7.5 cm. out of a total of 15.2 cm on has resulted within a period of five years. Also from the economical point of view, the tube well must run for 20-22 hrs. and if the requirements are less, municipal park or orchard may be developed near the well site which will also be a place of recreation for the population of this town.

Evaporation losses from free water surface, which are more than 60 per cent of the existing water storage capacity need be minimised through the use of monomolecular floating films. Standard water harvesting techniques such as butyl rubber venyl plastic memberanes, poured concrete, as asphalt

emulsion sprays may be tried on a pilot scale so as to work out the cost-benefit ratio.

Desilting of existing reservoirs in taluka must be undertaken along with measures for prevention of silt accumulation and sedimentation control. This is possible by construction of micro-barriers in the catchment area of these tanks. Various species such as *Acacia latronum*, *A. sundra*, *Albizzia amara*, *Acacia planifrons* and grasses like *Dichanthium annulatum*, *Cenchrus ciliaris*, *Sehima nervosum*, *Panicum antidotal* sp. etc. are recommended which may be selected after a pilot trial in the taluka.

Engineering works like river training and control will help to guide and confine the river flow to the channels and regulate the riverbed configuration for effective and safe movement of flood waters. Various types of training work such as guide bank system, Groynes or spurs, cutoffs, bank protection and pitched banks etc. may be examined in detail. However, guide banks and protection by pitched banks are the most suitable types suggested for the region.

Conveyance losses through impervious lining in irrigation channel should be reduced considerably. Studies conducted at *Central Arid Zone Research Institute*, *Jodhpur* have shown 15-20 per cent reduction in losses through the application of Asphalt. Other alternatives such as closed conduits, cut banks, emulsions and burned asphalt membrane in the form of pre-fabricated strips or sprayed hot or plastic and synthetic rubber films need be examined and their cost-benefit ratio worked out for the region. Feasibility of syphon method for distribution of water to cultivated crops need also be examined in detail.

In addition to groutting, as suggested earlier, seepage losses from tanks may be considrably reduced through the use of various sealing agents, some of which like compacted earth blanket, treated with chemicals such as polyphosphate @ 1lb/20 sq. ft, bentonite @ 1 lb/sq. ft, and water borne petroleum soil sealents have shown good promise. The details may be worked out on cost-benefit ratio.

II. SALINITY ALKALINITY PROBELEM.

Salinity and alkalinity coupled with water-logging in some cases, is the major soil problem of the area. According to available statistics, there are some 4,000 acres of such lands in the taluka. This figure does not include area with incipient alkali i.e., those where the problem is present but not felt

because these are put with same success under alkali tolerant crops like *ragi* and paddy under an extraordinary heavy application of *Pongamia glabra* leaves for green manure. Besides, there are many holdings which have been brought under well irrigation during the last 2-3 years where a clear sign of alkali development is noticeable although actual acuteness would perhaps be faced in the next 4-5 years unless, some ameliorative measures are taken in the mean time. Taking the above areas of incipient and potential alkali into account, total area will be considerably more than 4,000 acres.

The principal causes of salinity-alkalinity in the soils of the area are irrigation with poor quality waters and inadequate leaching and drainage facilities. Waters of a large number of tanks and wells, as pointed out elsewhere, are alkaline to different degrees because of the presence of sodium bi-carbonate and carbonate. Use of these waters in raising paddy and *ragi* without due regard to leaching has resulted in alkali development in most cases and to alkalinity and salinity in many. In some cases where natural drainage has been poor as along ill defined nullahs or at the foot of the tanks, besides salinity and alkalinity, there is also water logging. Though the real cause of the problem is primarily irrigation water, the remedial measures vary according to the intensity of alkali, nature of soil and presence or absence of high water table. On this basis various problem areas have been divided into five groups. Given below are descriptions and remedial measures in each case. Examples are given of specific areas actively sampled in course in survey and this does not exhaust the list of similar areas which could not be sampled.

(i) *Anthropogenic (Atchkat) saline-sodic soils :* These are soils with a pH value between 8.5 and 9.5 and conductivity of saturation extract generally between 4 and 8 millimhos/cm. The most common salts in these soils are chloride, bicarbonate and carbonate of sodium. Exchangeable sodium is between 35 to 62 per cent with a cation exchange capacity of 10 to 20 m.e/100 gm. These soils have a loam to clay loam texture with 5-20 per cent gravel throughout the profile. Groudwater table is generally below 1.5 m. Such soils are come across in *Doderi, Timapayanhalli, Chattparthi, Kurdihalli, Buddanhalli* and *Jajur*. Analytical results of three of these soils are as follows :—

Analysis of saturation extract.

Most of these soils are put under paddy with moderate success. Performance of these soils for paddy can be considerably improved by application of gypsum @ 2 to 4 tons/ha. prior to paddy transplantation. Only the more saline amongst these such as those at *Buddanhalli* and *Jajur* require

Constituent.	Villages									
	Buddonhalli				Ghatpanthoi			Dodderi		
	Depth in cm									
	0-5	5-20	20-60	60-100	0-20	20-45	45-85	0-15	15-25	25-55.
PH	9.5	9.8	9.9	9.7	8.9	9.4	8.6	8.6	9.3	8.4
E. Cond. 1:2 mmhos/cm	68,037	22,315	7,202	5,125	6,722	5,090	4,417	5,186	6,578	37,120
Na me/litre	66.6	217.4	72.8	35.9	67.6	43.0	38.3	27.4	66.9	239.1
Ca+Mg mc/litre	3.9	8.3	4.0	10.3	6.9	5.4	2.1	24.0	2.2	81.2
Cl me/litre	4.69	136.0		31.3	40.3	35.0	32.5	23.0	39.0	251.2
CO_3+HCO_3 me/litre	15.6	15.0	2.5	15.6	20.8	15.6	9.4	6.9	8.8	2.9
SAR	47.5	108.2	52.0	16.2	36.6	43.0	38.2	7.8	66.0	37.5
Ex. Na. per cent	41.0	62.0	47.0	18.0	34.0	38.0	35.0	8.5	50.0	35.0
CEC me/100 gm	22.0	26.8	14.3	18.0	17.2	10.5	16.3	15.1	13.6	35.4
Gypsum requirement for paddy	4 Tons/ha gypsum followed by leaching.				2 Tons/ha gypsum				2 Tons/ha gupsum	

leaching before paddly could be grown successfully. In this case soils be kept flooded in rainy seasen for some days after application of gypsum @ 4-6 tons. If these soils are to be made suitable for sensitive crops like maize, groundnut and hybrid jowar etc., application of gypsum @ 8-12 tons and greater leaching, are required.

(ii) *Anthropogenic (Atchkat) sodic soils* : These are soils with PH values ranging between 8.7 and 9.2 but with lower values of conductivity. In other respects these soils are similar to those descrided above. These are found at *Bebkere, Timopayanhalli, Somaguda, Marigunti, Parasurampura* and *Nanneuala.* Analytical data of these soils are as follows:—

Village	Depth cm	PH	T.S S. EC 1:2	Gypsum requirement for Paddy
Somaguda	0-25	9 2	710.0	2 ton/ha.
Bucheri	0-15	8.8	434.0	0.5 ton/ha.
Timopayanhalli	0-20	8.8	887.0	,,
	20-40	8.8	680.0	,,
	40-90	8.8	605 0	
Marigunti	0-15	8.7	811.0	,,
Parsurampura	0–20	8.6	857.0	,,

In these soils, during rainy season paddy grows normally well while summer paddy generally has a poor growth. Its performance can be improved considerably by application of gypsum @ 0.5 to 2 tons/ha prior to paddy transplantation.

(iii) Athropogenic (Antchkat) saline-sodic, water-logged soils : These soils have a PH between 8.0 to 10.5 and a conductivity of saturation extract above 24 mmhos/cm in surface 15-20 cm and between 6 to 12 in the sub-soil Composition of salts varies but predominantly it is sodium chloride along with sodium bicarbonate and sodium carbonate. Exchangeable sodium values vary between wide limits. Besides, these soils have a high water table ranging between 100–150 cm in dry parts of the year. These soils are confined to immediate vicinity of some of the irrigation tanks and natural minor streams.

Impeded drainage condition is apparently the cause of high water table. Occurrence of water within capillary frings and relatively high mineralised nature of underground water has resulted in the salinity built up seen in these soils. Such soils were noticed at *Viderhalli, T. N. Kote, Gosikere, Chaulur, Parasurampura, Kannerhalli.* etc. Analytical data of some of the sites is as follows :

Analysis of saturation extract.

Constituents	Villages		
	Depth in cm		
	Viderhalli		Kinnerhalli
	0-10	10-40	0-25
PH	8.0	8.2	10.3
EC 1:2 mmhos/cm	26,408	8451	17,933
Name/litre	233.7	68.7	171.1
Ca+Mg me/litre	60.3	6.2	0.3
Cl me/litre	441.3	65.0	30.0
CO_3+HC_3me/litre	2.4	18.8	20.8
SAR	42.5	39.5	—
CEC me/100 gm	31.6	37.3	38.6
Ex. Na per cent	38	36	90
Gypsum requirement for Paddy.	Drainage, 6 Tons/ha gypsum flooding.		Drainage, 10 ton/ha gypsum, flooding.

For efficient utilisation of these soils, first essential step is to provide a drainage system. This may be simply providing a channel to drain out the water but in some cases a more elaborate system is required. This is to be followed by application of gypsum @ 4-6 tons/ha for soils containing sodium chloride as salts and 8-12 tons for those having carbonates and bicarbonates.

(iv) *Saline-sodic soils along Daddahalli and Garanihalli :* These are developed on fine alluvium along the above named two 'hallias'. The soils

have pH value between 8.2 to 9.9. Besides, these soils often also contain high amount of soluble salts with conductivity of saturation extract between 13 to 22 mmhos/cm in surface and widely varying values in the sub-soil. *The salts are mainly chloride.*

Analytical results of a typical profile are as follows : Analysis of saturation extract.

Constituents	Villages					
	Divarhalli					Confluence of Garanihalli with Velvate.
	.....Depth in cm.....					
	0–15	15–40	40–60	60–90	90–120	0–30
pH	9-8	9.8	9.9	9.6	9.3	8.2
EC 1:2 mmhos/cm	13060	5159	5882	4800	3121	22807
Na me/litre	131.5	43.5	48.1	39.1	24:4	202.4
Ca+Mg me/litre	7 2	10.2	10.3	5.2	5.2	54.60
Cl me/litre	70 0	20.0	17.5	37.5	22.5	195.0
CO_3+HCO_3 me/litre	34.9	28.2	28.2	9.4	15.6	3.9
SAR	69 0	19.1	21.2	24.4	15.3	39.5
Ex. Na per cent	50	21	22	25.5	17.5	36.0
CEC me/100 gm	14.3	17.2	21.0	21.0	24.9	22.4
Gypsum recommendation for paddy.	Laying out drainage system Gypsum @ 8 tons/ha and flooding					Laying out drainage system, gypsum @ 4 tons/ha.

These soils are used for growing paddy in years of favourable rainfall but most of the time they are left fallow on account of severe salinity-alkali problem. For reclamation, first step is laying out a system of field drains to permit leaching of salts. This is to be followed by application of gypsum @ 2-4 tons/ha for soil containing predominantly sodium chloride and 6 to 8 tons for those containing chloride with carbonates in split doses intervened by heavy flooding to be followed by green manuring.

If these soils are to be made suitable for sensitive crops, much higher dose of gypsum should be applied.

(V) Red gravelly soils turned sodic under well irrigation

Irrigation with saline well water, even for a few years, has brought in a tendency towards alkali development in the original, nearly neutral red gravelly soils. In some cases as at *Mirasabihalli*, the alkalinity has developed to such an extent that farmers had to give up groundnut and *jowar* and took to paddy cultivation. Paddy cultivation, however, is not a solution of the problem but rather living with it and an improvement of these soils is necessary.

These soils have PH value between 8.7 to 9.0 but with a low salinity level. They are generally gravelly sandy loam in the surface and gravelly clay loam below. Analytical results of some of the soils are as follows:—

Village	Depth in cm	pH	EC 1:2 mmhos/cm	Gypsum paddy in tons	Requirement for groundnut tons/ha.
Madure	0-10	9.0	547	0.5	4
Buddanhalli	0-15	8.8	425	—	2
Aseruhalli	0-20	8.7	507	0.5	2
	20-45	8.7	485	0.5	2
	45-70	8.8	487	0.5	2
	70.90	8.8	429	0.5	2
Mirasabihalli	0.15	9.0	556	0.5	4
	0-15	8.8	894	—	2

These soils can be improved for general cropping by application of gypsum @ 1 to 4 to tons/ha. Besides, to prevent build up of the problem again a regular application of gypsum @ 0.5 to 2 tons/ha/annum is necessary.

Reclamation of these problem lands thus involves application of such amendments as gypsum and/or green manure and flooding with water. It is necessary however as a long-term measure to improve drainage of paddy lands, by digging the various natural drainage lines and minor streams in the atchkat deeper and canalising.

Gypsum is a costly material for Challakere on account of huge transportation involved. Fortunately, Chitradurg has large deposits which is a well established raw material for sulphur and iron sulphate. A project has already been envisaged to process these deposits and this project be given due priority in light of the acute need of an acid amendment material for the area. Use of this, when avilable, can reduce requirements in gypsum by 70-80 per cent and make possible a larger area under irrigated groundnut, *jowar* and maize. A trial may be made in the first instance with this iron purities in a few fields to see the efficiency of reclamation.

The dominant red soils have a gravelly loamy sand to sandy loam droughtly top-soil of 15-25 on depth followed by a gravelly clay loam subsoil having a moderately high water retaining capacity but a relatively slow infiltration. Under the circumstances, deep ploughing of soil once in 3 to 4 years is likely to prove very beneficial in dry land farming.

There are a number of recommended practices in the Mysore State with regard to dry land farming. Of these bunding has been tried and implemented on a commendable scale. But recommendations with regard to use of fertilizer, choice of crops, their varieties and rotation have not been given trial under conditions such as those prevailing in Challakers area. This should be done so that a complete package of practices for the area could be evoloved.

Proper drainage can considerably improve saline sodic soil conditions and water logging experienced in some areas in the region of *Gasakere* and Parsurampura. Common method of drainage recommended is bedding, where the land is divided into a series of strips 65-100 ft. wide, bounded by dead furrows in the direction of the field slope on erosion ground and outletting in a natural channel. The drainage system on the region, where combind surface and subsurface drainage is required, is based either on an open ditch or a large tile drain located along the natural drainage ways. Lands too flat for natural drainage may also be dealt as suggested.

III. EVOLUTION OF FEW CROPING PATTERNS AND IMPROVEMENT OF CROP LAND RESOURCES THROUGH THE USE OF HIGH YIELDING AND PROTIN RICH VAREITS AND FERTILIZERS.

The common agricultural practice is to take paddy after paddy or paddy after *ragi* in irrigated areas. Both the crops have high water requirement, and since the soil is shallow over the weathered mantle of schist and granite gneiss, water logging and salinity in the soil develop easily. More-

over since the water need of the crop is high, the net area sown under irrigation is limited. It is suggested, therefore, that new croping patterns may be evolved, introducting such crops as wheat, barley etc, Agriculture Department may be able to help in this respect, and if so, needed suitable pilot experiments could be arranged.

Particulars of the crops with high yielding strains, recommended dose of fertilizers, seed rate per acre and plant protection measures are given in the appendix. Protein rich strains of wheat and other crops evolved at Indian Agricultural Research Institute be tried on a large scale so as to improve the nutritional status of the food crops. With the introduction of the Applied Nutrition programme in the Taluka, poultry is gradually becoming popular. Out of a total of 12 poultry units sanctioned at the time of survey, 9 building were ready and birds were supplied to 5 units. This will go a long way in meeting the protein requirements of the people.

IV. SOURCES OF WOOD REQUIREMENT AND AFFORESTATION AND SHORT ROTATIONAL FUEL CROPS.

Normally the demands of wood of the rural population for different uses i. e., for preparing or repairing of various agricultural implements, construction of house and for fuel are met from the locally available sources. Table 29 gives the sources of wood required for different purposes.

Table 29. Purpose and source of wood requirement.

Purpose.	Sources							
	Own field		Other field		Wasteland		Purchased	
	No.	%	No.	%	No.	%	No.	%
Fuel	64	77.12	24	28.91	6	7.23	19	22.90
Agricultural implements	49	59.03	5	6.02	2	2.41	39	46 98
Housing	49	59.03	8	9.64	6	7.23	51	61.44

(This is a multi-response table.)

This table shows that about three-fourth of respondents have met the fuel requirement from their own field, while only 22.9 per cent have purchased the fuel wood from the market.

In case of agricultural implements, 59 per cent of the households obtained wood from their respective agricultural fields, whereas 47 per cent had purchased it from the market. For housing purposes, 61.4 per cent of the households have purchased the wood from the market and only 59.0 per cent of households obtained from own fields. Dependence on waste land for procuring of wood for different purposes is quite low.

Shortage of fuel is experienced by more than one-half of the households in the area. 45.8 per cent of the households experienced no shortage in fuel wood. A little over one-third of the total households surveyed are burning cowdung cakes. Even 28.4 per cent of those households who experienced no shortage in fuel wood also burnt dung cakes. This practice apparently, needs to be discouraged and the dung so used can be better utillised as manure.

Species planted : Realising the importance of trees in meeting the farmers need of fuel, wood for timber, and feed for animals, sample respondents were asked about extent of planting trees by them during the last three years. It was observed that only one-fourth of the heads of households had planted the trees in the area. Table 30 gives the extent of species planted and those survived.

Table 30. Extent of species planted and their survival, P.S. Challakere.

Species		Number planted	Number survived	Per cent survived
Fruit plant				
Mango	(Mangifera indica)	312	162	51.9
Imli	(Tamarindus indica)	5	5	100.0
Jamun	(Syzgium cumini)	1	1	100.0
Coconut	(Cocos nucifera)	13	11	84.6
Kathal	(Artocarpus heterophyllus)	1	1	100 0
Mosami	(Citrus sp.)	500	—	—
Oshers				
Pongamia glabra		2040	1665	81.6
Jalimara		20	20	100.0
Others		385	335	87.0

(A multi-response table.)

It is thus observed that survival percentage among the non-fruit trees ranges from 81.6 to 100.0 per cent. In case of fruit trees except for Mosami the percentage survival had been quite good-ranging from 51.9 to 100 per cent. In case of Mosami trees, which werer planted by one household only, the mortality may be due to various reasons. Those desirous of planting trees stated the different purposes for which they would primarily like to plant trees and the data are presented in the following table :

Table 31. Primary purpose to plant tree as desired by the farmers of P. S. Challakere.

Purpose	Number	Per cent
Wood for agricultural implements	4	4.8
Fuel	9	10.8
Food	43	51.8
Animal feed	6	7.2
Shade	8	9.6
Checking wind erosion	8	9.6
Fencing	16	19.3
Religious purposes	2	2.4
Green manuring	17	20.5

(A multi-response table.)

About there-fourth of the households expressed desire to plant the tree if suitable facilities are made available to them. The remaining one-fourth cannot plant the trees due to the non-availability of good land, no land of his own, lack of interest and no time to look after those. The survey also showed that 89 per cent of households like to plant trees along the boundaries of their rcspective fields,, 9 per cent like to plant trees along the irrigation wells, and only 2 per cent like to plant the trees in their own home compound.

There is an urgent need to meet the fuel requirements on a short term plan basis for which introduction and trial of fast growing species should be taken up in wood lots. Such plantations may be clear felled after 4-5 or 10 years of rotation. Based on our experiences in Rajasthan *Acacia tortilis* and *A. victoriae* are recommended but other species may be tried for performance trials. *Eucalyptus camaldulensis*, a fast growing species with relatively less water requirements may be tried instead of hybrid Eucalyptus which has high moisture requirements. Such afforestation work may be extended to all *Kavals* with effective protection. Afforestation with long duration management can only be successful if the fuel requirement of the location population are effectively met. The method of plantation and management can be worked out by the local forest department.

V. ANIMAL HUSBANDRY AND DEVELOPMENT.

In the taluka, livestock puplation as per 1966 census is 86,901 cattle and 25,000 buffaloes which is concentrated in the Kavals situated at places like Doadularthy, Kudapura, Varavu, Hirekere, Thalak and Naykanhatti hublies. Amrithmahal and Hallikar breeds are the dominant, the former being maintained by individuals at Ullarthy Kaval, Khudapura Kaval and Hirekera Kaval. The trade of the cattle is mainly with the border states like Andhra Pradesh and Maharashtra. Special Hallikar breed is sold in the border area of Andhra Pradesh.

There are found professional cattle breeders in the Taluka at Doddullarthy, Hirekere, Khudapur, and Gowripura *Kavals*. Due to fodder scarcity during summer, the animals migrate to places like Hassan and return after rainy seasons. The Amrithmahal breed is rather poor milk yielder and needs improvement. Only one artificial insemination centre is located at Challakre. This needs strengthening along with improvement of pasture resources.

Veterinary facilities should be improved. During the past cases of Black quarter, Haemorragic septicaemia, Sheep pox, parasitic diseases like Liver-fluke, Enteroloxamea and Ranikhet diseases have been reported from this taluka. The existing breed of cattle is low milk producer and 'ryots' keep only work-type animals for agricultural purposes. The average yield per cow or buffalow is about 2 lit per diem. Though much advance has been made at Bangalore and other places in the State, in introducing high milk yielding animals, this taluka has not yet received the benefits of research in this direction. It requires special attention of the State Government.

Sheep farming in the taluka has also not received much attention. Though the sheep population is quite high, there is a great scope for improving the breed for better wool production. The existing breeds are *Hassan* and *Bellary* type. A sheep breeding farm is proposed to be started on *Challakere-Jagalur road* in *Kudapur* and *Vavoo Kavals*. Under the existing conditions most of the sheep migrate to *Shimoga* and *Hassan* districts during summer months because of insufficient fodder and return after seasonal rains during June and July.

The goats generally act as poor man's cow. Some of the sheep raisers said that about 10 per cent of the goats in the flock of sheep are essential since they act as foster mother when the sheep mother's do not have milk after giving births to young one. The goats also provide lead to the sheep and while the two types of animals are being grazed together, the grazier has to take much less care, as the sheep alone are too docile. Also when they are panned together, it is the goat which is going to give a cry in the event of attack by any wild animal or in case of theft. Sheep will not give any cry (which may act as warning) and the owner might lose much.

There is also some scope for the development of piggery in the Taluka. This area is suited for *Saddle Back* breed. Since the local inhabitants are not interested in taking up pig-rearing on a commercial scale, this may be taken up as a public undertaking.

Poultry development during the last few years has been taken up and a few farmers are recorded to have been trained. A co-operative undertaking will probably help to a great extent in developing this industry.

Rangeland improvement and management : There is a pressing need to improve the existing rangelands with improvement in grass and animal husbandary practcies. Vast areas unfit for crop cultivation exist which may be taken up for rangelands improvement. This shall inculde the practices like, (1) Enclosure (2) Soil and water conservation techniques (3) Seeding and reseeding with nutritive and palatable grass-legume mixtures and (4) Deferred compartmental grazing.

Various grass species which may be suggested includes, *Dichanthium, annulation Cenchrus ciliaris, C. setigerus, Panicum antidotale, Chloris guavana.* Small pilot demonstration plots of 5 acres in each circle may be established so as to make the local villagers interested in this programme. A sheep breeding farm, which is being established with Austalian Government Collaboration, is a right step, provided the programme is followed up with proper grass and dairy husbandry practices.

VI. ESTABLISHMENT OF SMALL SCALE AGRO-INDUSTRIES.

(a) *Fibre and coir industry :* Though there are extensive co-conut plantation in the Taluka, no organised attempt has been made to exploit this resource. Other firbe yielding plants likc *Agave* sps are cultivated on field bunds and exploited for local use of the farmer. Plantation of this species may be taken up on a large scale along the field boundaries. Some co-operative societies could take up the marketing ofthis commodity, which is in high demand.

Other resources for mat and basket industry may be exploited in the taluka, such as *Borassus flabellifer, phoenix sylvestris, Cocos nucifera* etc. and if necessary, large scale plantations should be made so as to feed the industry on a commercial basis.

(b) *Non-edibte oils :* Non-edible oils are in great demand in the country. *Pongamia glabra, Azadirachta indica, Recinus communis* etc. are some of the sources from which it is obtained. *Pongamia glabra,* a fast growing species, although planted on an extensive scale in the tâluka, is used primaily for green manuring. These species can suitably be grown on a wide variety of soils in the Taluka for the seeds yielding non-edible oils. On medium heavy to heavy soils *Salvadora oleoides* and *Salvadora oersica* may be tried, the latter species a was found to grow in the taluka as a hedge plant. *Azadirachta indica* during the recent past has been tried extensively and proved very sucessful along the roadsides. Roadside plantations of this species and other top feeds like *Acacia nilotica* sp. *indica, Tamarindus indica, Acacia senegal, Bauhimia racemosa,* may be tride so as to provide fodder during lean periods of the year.

(c) *Starch manufacture from Tamarind seed :* Tamarind seeds are available in plenty in this taluka and the neighbouring talukas of *Chitradurg* and *Halakera.* The seeds may be converted into powder used mostly in textile mills. There are mills at *Chitradurg* and *Dananagre* where the strach can be supplied. The cultivation of this tree needs encouragement.

(d) *Processing of food products :* A meat processing and caning unit can be started in the taluka. As the taluka is situated on *Bellary-Bangaione* high way, transportation of finished product will not cost much and the products have a ready market in *Bangalore.* The existing leather tannin unit is almost defunct and may be revitalised. A cattle feed plant can be established since there are four oil mills and a portion of the by-products can be utilized in the manufacture of cattle feed.

These are some of the suggestions which need to be examined by the local authoritites but there may be many more which the local authorities may examine in detail about their prospects and possibilities.

Some of the other general recommendations, considered worth of mention in this report, are as follows :

1. Though certain soil conservation measures like field bunding etc are being practised on an extensive scale in cultivated areas, other measures like strip cropping, mulching, deep ploughing in black soil areas as suggested in agricultural transformation on scientific line may be taken up for better soil and water conservation.

2. Uncropped areas should also be taken up for soil and water conservation, so as to make these more productive for pasture development.

Micro-catchments for water harvesting should be developed and plantation of fruit trees like *Emblica officininalis. Tamarindus indica. Azadirachta indica* etc. may be taken up on a large scale. Plantation of topfeed species, non-edible oil yeilding species, fibre plants and *Tamarindus indica* for starch industry should be particularly encouraged.

4. Micro-barriers in catchment areas of the various tanks may be raised for checking the silt which deposites in the tanks. Such catchment areas should

be afforested with natural vegetation which should be suitably protected from biotic interference.

5. Improved methods of cultivation on saline-sodic lands should be taken up after proper amendments have been made. Cultivation of paddy, after paddy with irrigation, causes silting of drainage channels and turning the land saline after some years of reclamation. After paddy, a crop requiring less water such as wheat, should be taken up.

The existing methods of land reclamation are very costly and not within the reach of an average farmer. Therefore, incentive to farmer in the form of some subsidy may be provided for reclamation and improvement of such lands.

RECOMMENDATIONS

1. Data on the population characteristics reveal that the rate of growth of population has been quite high during the past and also that the potentialities of the further growth rate of population are very expensive. Due to concentration of high population in the lower age groups a substantial proportion of population to the tune of 42.62 per cent is economically inactive. It is, therefore, high time that the methods of planned parenthood and family planning are strengthened in the region for checking this high growth rate of population.

2. The average number of members in a household in the taluka comes to 5.63 while the average number of rooms per household is only 1.37. Thus, on the average one room is shared by 4.11 members. Approximately seven-tenths of the household have only one living room. This naturally has an adverse effect on the health and sanitation of the people in the region. It is strongly recommended, therefore, to explore ways and means to make improvements on this aspect.

3. Approximately seven-tenth of the population in the Taluka was found to be illiterate as against 83.3 per cent illiterate population in 1961. The percentage literacy among the female population and the scheduled caste population in the taluka was found to be still lower. Effective steps should, therefore, be taken up to educate people by providing due facilities. This progarmme need to be udertaken more vigorously for the scheduled caste population so that they may gradually come up to the level of other non-scheduled caste population with respect to literacy.

4. The land use data reveal that the percentage area under forests had been very low all through from the years 1960-61 to 1967-68. 7.87 per cent of the land in the taluka is cultivable waste land. It is recommended that ways and means should be explored to make use of the findings of the *Central Arid Zone Research Institute, Jodhpar* and introduce drought resistant species of grasses for improvement of pasture and grazing lands. It is sad to note that area under current fallows had been increasing year after year. It was only 3.03 per cent of the total area in the year 1960 while it rose to 17.87 per cent in the year 1967-68. The percentage of net area sown accordingly reduced to 27.55 in the year 1967-68 as against 41.93 per

cent in the year 1960-61. It needs to be explored, therefore, how more intensive use of land could be made. The survey brought out that there exists a good scope to bring more area under double cropping in the region. The existing agricultural practices were found to be traditional and labour intensive. Adoption of innovations pertaining to improved agricultural implements, improved seeds, use of fertilizers, introduction of new crops etc. was found to be very low. It is, therefore, recommended that extensoin work should be taken up vigorously on more sound lines so that the adoption process pertaining to the agricultural innovations is hastened for obtaining higher yields and bringing more area under cultivation.

5. During the last normal year of the third plan i. e. 1964-65 the population of Challakere taluka has been estimated at 1,95,576. Similarly the population for the year 1971 and 1976 has been estimated at 1,87,785 and 2,08,288, assuming the annual growith rate of population in the Taluka same as during 1951-1961 (which means the estimation is on the lower scale). Converting this population (86 percent of the total) and working out the production for the year 1964-65 (the average production per acre being taken as same as for the district) the balance sheet has been worked out and is presented in the table below:—

Balance sheet of staple food (food grains in total)

Year	Adult population.	Food requirements (tonnes)	Food productions (tonnes)	Deficit (tonnes)
1964-65	1,42,395	26115.07	21211.20	5275.27
1971	1,61,495	29604.19	21211.20	8393.99
1976	1,79,128	32386.57	21211.20	11175.37

It is observed that during the year 1964-65 there was a total deficit of food grains to the tune of 5275.27 tonnes. With the present growth rate of population the food requirements in the taluka will further increase in the year 1971, for which year if the production is taken to be the same as for the year 1964-65 there will be net deficit in food grains to the tune of 39.57 per cent. In 1976, such shortage under similar conditions will rise to 52.68 per cent. This deficit dose not include the additional food grains required for the live—

stock in the Taluka. High yielding, protein rich food crops may be introduced in the region based on pilot studies to be conducted. Effort may also be fruitful to bring some waste and fallow lands also under regular cultivation. The position regarding provision of electric pump sets for irrigation is encouraging and it is hoped that if such facilities are extended further to more cultivators, higher yields will be ensured.

6. The density of livestock specifically on the permanent pasture and grazing lands is very high. The pastures available in the taluka are poor and need development through introduction of drought resistant varieties of grasses already developed at *Central Arid Zone Research Institute, Jodhpur.* However, pilot demonstration plots in each *Hubblies* are suggested so as to popularise the benefits of grass husbandry in the region.

The cattle and buffaloes are all of poor breed, which needs improvement. For this purpose greater number of good breed bulls have to be supplied in the villages and more number of artificial insemination centres should be opened in the Taluka. Better veterinary facilities should be made available.

The sheep available are all of poor breed and yield generally black wool which is used for preparation of rugs only. The need for the development of the sheep breed in the taluka has already been envisaged and it is proposed to set up a large sheep development farm in the region.

7. The earnings from the other sources of livelihood are meagre. It is essential to develop the household industries on more scientific lines, providing necessary training to the traditional craftsmen in the advanced techniques. Steps also should be taken up for supply of necessary materials and money. Several cottage industries as suggested earlier, based on plants, need to be encouraged and effort should be directed to give a better return to the producer.

8. More than there-fourths of the households are indebted. For the majority of the people the main source of getting loans are still traditional. It is therefore suggested that propoganda about the use of formal agencies like co-operatives, government agencies and banks may carried out more vigorously.

9. Shortage of fuel is experienced by more than half of the households in the taluka. A large number of households also burn cowdung cakes. This practice should be discouraged so that the dung can be better utilised for manure purposes.

Fuel wood lots with fast growing tree species need to be established so as to reduce pressure on reserve forest. Experiment on fast growing species such as *Eucalyptus camaldulensis*, *Acacia tortilis* need be followed with due modifications required locally. Though *Cassia auriculated* is the chief minor forest product in the region, possibilities of grassland reserves and other minor forest products may be examined in detail.

10. Hydrological data should be collected in the region so that a sound basis for the utilization, management and conservation of water resources could be evolved. This will also help in the survey of subsurface water resources.

11. Conservation and management of existing water resources may be considered as discussed.

12. Improvement of the saline-sodic soils through various amendment practices and drainage as suggested will bring more areas under production. Besides these, new cropping patterns and the use of fertilizers may be made as suggested in the report.

13. Land not suitable for crop production should be put under range and managed on scientific lines, as suggested.

Appendix II

Chemical analysis of water from the wells examined

CHALLAKERE—HUBLI

S.No.*	pH	T.S.S.	Na^+	K	Ca	Mg	Cl	CO_3	HCO_3	SO_4	S.R.R.	Class
1	2	3	4	5	6	7	8	9	10	11	12	13
1	8.8	826	11.09	0.27	0.39	1.15	3.50	4.25	5.87	Trace	12.60	C3-S2
2	8.0	623	6.74	0.17	1.67	1.15	3.50	2.00	3.00	1.23	5.67	C3-S1
3	8.4	479	4.90	0.15	0.72	1.71	7.50	1.52	3.94	Trace	4.45	C2-S1
4	8.7	1137	14.20	0.19	0.51	2.87	5.50	4.30	7.25	1	10.92	C3-S2
5	8.5	394	1.83	0.14	1.32	2.86	2.50	1.26	2.41	Trace	1.27	C2-S1
6	8.5	1167	12.68	0.08	1.37	4.10	9.00	3.25	4.50	1.48	7.68	C3-S1
7	8.4	897	10.87	0.10	0.88	2.17	5.50	1.75	5.00	1.77	8.83	C3-S1
8	8.1	479	5.54	0.08	0.99	0.87	5.25	2.25	3.87	Trace	5.77	C2-S1
9	8.4	490	5.11	0.09	0.49	1.97	2.50	2.25	4.00	Trace	4.60	C1-S1
10	8.6	1401	18.27	0.20	0.60	2.82	8.75	5.00	6.87	1.27	13.94	C3-S2
11	8.7	1268	17.82	0.14	0.29	1.55	7.50	4.25	8.75	2.32	18.56	C3-S3
12	8.3	815	8.15	0.06	0.39	4.00	6.25	2.00	4.25	Trace	5.50	C3-S1
13	8.5	676	7.60	0.05	0.88	2.04	3.75	2.00	4.00	1	6.28	C3-S1
14	8.1	303	1.74	0.05	1.18	1.76	1.00	1.50	2.25	Trace	1.43	C2-S1
15	8 8	1316	12.29	0.18	2.17	5.89	12.50	1.25	3.37	3.44	6.14	C3-S1
16	8.2	2323	28.17	0.92	1.08	6.12	19.75	3.00	5.75	5.75	14.90	C4-S2
17	8.7	2151	28.26	1.15	0.68	2.79	15.25	5.06	8.37	4.93	21.57	C4-S3

* Serial numbers refer to locations given in appendix I

Contd.

1	2	3	4	5	6	7	8	9	10	11	12	13
18	8.1	754	7.70	0.09	1.37	2.62	5.00	2.00	3.12	1.66	5.70	C3-S1
19	8.7	670	7.17	0.08	1.08	2.14	3.75	2.00	4.62	Trace	5.60	C3-S1
20	8.4	595	4.90	0.12	0.80	3.48	2.25	2.53	5.06	Trace	3.35	C3-S1
21	8.0	1226	8.60	1.73	3.50	5.32	6.00	1.78	2.02	8.96	4.09	C3-S1
22	8.1	817	6.50	0.05	1.42	4.80	4.00	1.78	3.56	3.43	3.69	C3-S1
23	8.2	303	2.50	0.05	1.06	1.02	1.00	1.52	2.50	Trace	2.47	C2-S1
24	8.6	1227	17 40	0.25	0.39	1.13	4.25	6.25	10.00	Trace	20.00	C3-S2
25	9.0	1978	29.70	0.59	0.29	0.32	5.25	7.75	14.50	3.40	55.00	C4-S5
26	8.5	1007	11.48	0.18	0.98	3.10	6.00	3.50	4.12	2.12	8.02	C3-S1
27	8.2	408	3.50	0.19	1.60	2.08	1.25	1.52	2.65	1	2.59	C3-S1
28	8.5	790	9.35	0.05	1.08	1.84	3.00	2.75	4.87	1.72	7.72	C3-S1
29	8.5	479	5.00	0.05	0.88	1.55	1.25	1.75	4.00	1	4.54	C2-S1
30	8.6	682	7.60	0.10	0.98	1.98	2.00	2.00	6.00	1	6.23	C3-S1
31	8.7	784	9.14	0.19	0.19	2.16	6.75	3.75	8.12	Trace	8.45	C3-S1
32	8.8	771	11.30	0.05	0.49	0.21	2.25	3.50	7.06	Trace	19.15	C3-S3
33	8.8	301	10.87	0.09	0.49	0.25	2.50	3.50	5.50	Trace	17.82	C2-S2
34	8.7	570	7.82	0.05	0.39	0.64	1.50	3.25	5.25	Trace	11.01	C3-S2
35	8.3	377	3.25	0.08	0.98	1.58	1.50	1.25	2.75	1	2.87	C2-S1
36	8.3	666	7.93	0.24	1.10	1.13	3.00	3.04	5.69	1	8.77	C3-S1
37	8.2	614	4.80	0.17	1.28	3.09	5.50	3.50	1.26	1	3.26	C3-S1
38	8.3	1199	12.50	0.04	0.99	5.20	9 00	2.78	4.43	2.52	7.01	C3-S1
39	8.7	341	3.80	0.06	0.59	0.88	1.25	2.50	2.12	Trace	4.47	C2-S1
40	8.5	473	6.09	0.06	0.39	0.85	1.00	2.50	4.37	Trace	7.80	C2-S1
41	8.7	455	5.76	0.05	0.49	0.81	1.50	2.50	3.87	Trace	7.20	C2-S1

Contd.

1	2	3	4	5	6	7	8	9	10	11	12	13
42	8.6	395	5.00	0.13	0.39	0.65	1.50	1.75	3.50	Trace	6.88	C2-S1
43	8.7	622	5.22	0.09	1.37	3.04	3.00	1.50	3.37	1.85	3.52	C3-S1
44	8.0	1496	9.79	0.13	4.55	8.91	11.75	0.75	1.25	5.97	3.77	C3-S1
45	8.7	512	7.28	0.05	0.59	0.63	1.50	2 75	4.87	Trace	9.33	C2-S1
46	8.4	1050	9.41	0.38	5.37	2.09	7.00	2.02	4.30	3.09	4.77	C3-S1
47	8.1	782	8.50	0.05	0.90	2.77	3.00	3.04	5.69	1	6.29	C3-S1
48	8.4	380	3.83	0.19	0.90	1.01	2.25	2.53	5.06	Trace	3.91	C2-S1
49	8.7	1254	14.10	0.60	0.30	4.60	6.00	3.56	5.04	4.27	9.04	C3-S1
50	7.9	946	7.82	0.06	0.78	0.80	2.25	2.25	5.50	Trace	8.88	C3-S1
					NAIKANAHATTI HUBLI							
51	8.3	564	5.44	0.25	0.78	1.84	2.25	2.00	4.00	Trace	4.77	C3-S1
52	8.4	479	4.50	0.17	0.68	2.14	2.00	2.02	2.53	1	3.78	C2-S1
53	8.5	860	10.21	0.14	0.78	2.31	2.50	4.00	3.87	Trace	8.23	C3-S1
54	8.7	2611	34.21	0.50	0.59	5.50	22.50	7.00	10.87	Trace	19.66	C4-S3
55	9.0	2801	40.80	0.73	0.20	2.04	15.00	12.67	17.25	1	26.66	C4-S4
56	8 3	1526	21.48	0.87	0.29	0.63	5.00	2.00	14.75	2.00	31.59	C4-S4
57	8.7	588	7.27	0.08	0.19	1.18	2.50	2.75	4.50	Trace	8.86	C3-S1
58	8.7	611	5.76	0.13	0.98	2.67	2.50	4.00	3.87	Trace	4.27	C3-S1
59	8.6	516	5.90	0.09	0.41	1.67	2.00	2.53	3.69	Trace	5.78	C3-S1
60	8.7	652	5 90	0.12	1.42	3.74	8.75	2.02	4.04	1.37	3.68	C3-S1

Contd.

1	2	3	4	5	6	7	8	9	10	11	12	13
61	8.6	490	5.77	0.07	0.51	1.11	2.50	2.53	3.30	Trace	6.41	C2-S1
62	8.4	629	5.97	0.05	0.98	2.83	4.00	1.25	2.75	1.83	4.36	C3-S1
63	8.4	983	11.40	0.72	0.92	2.32	5.50	3.04	6.47	1	7.81	C3-S1
64	8.5	783	7.83	0.12	0.88	3.41	6.00	1.75	3.25	1.24	5.35	C3-S1
65	8.7	461	5.55	0.14	0.49	1.02	2.25	2.28	3.94	Trace	6.38	C2-S1
66	8.2	1313	11.90	0.18	3.74	4.70	11.75	2.28	3.56	2.93	5.80	C3-S1
					THALAK HUBLI							
67	8.1	421	4.13	0.13	0.78	1.54	1.75	2.25	3.50	Trace	3.20	C2-S1
68	8.2	724	6.74	0.12	0.68	3.67	4.50	2.25	4.25	1	4.58	C3-S1
69	8.2	782	6.52	0.15	1.08	4.47	5.50	1.75	3.00	1.17	3.92	C3-S1
70	8.4	659	6.74	0.16	0.68	2.72	3.50	2.00	4.25	1	5.18	C3-S1
71	8.7	320	3.35	0.17	0.59	0.89	1.50	1.75	3 25	Trace	3.89	C2-S1
72	8.6	817	10.90	0.12	0.50	1.25	5.00	3.04	4.04	1	11.29	C3-S2
73	8.3	940	9.30	0.40	0.78	4.21	6.00	2.02	4.56	1	5.88	C3-S1
74	8.9	1444	19.36	0.23	0.51	2.47	9.00	4.81	8.85	Trace	15.86	C3-S2
75	8.3	467	3.80	0.13	0.98	2.39	2.25	1.25	3.62	Trace	2.92	C2.S1
76	8.2	572	5.98	0.08	0.68	1.20	2.75	3.00	4.62	Trace	6.17	C3-S1
77	8.4	560	5.98	0.14	0.65	1.95	2.50	1.75	3.50	1	5.23	C3-S1
78	8.3	344	3.80	0.14	0.49	0.95	2.50	1.25	3.00	Traee	4.47	C2-S1
79	8.6	787	6.90	0.09	2.73	2.57	3.50	3.50	5.56	Trace	4.23	C3-S1

Contd.

1	2	3	4	5	6	7	8	9	10	11	12	13
80	7.9	4377	43.93	0.15	9.12	15.19	59.00	0.50	1.75	7.14	1.26	C5-S1
81	8.4	423	3.25	0.14	1.08	2.14	1.00	1.50	4.00	Trace	2.56	C2-S1
82	8.4	659	6.74	0.14	0.59	2.83	2.75	3.00	4 87	Trace	5.14	C3-S1
83	8.0	796	5.98	0.46	2.94	3.18	8.00	0.50	1.37	2.50	3.42	C3-S1
84	8.6	354	3.48	0.06	0.49	1.50	1.50	1.75	3.50	Trace	3.51	C2-S1
85	8.5	380	3.80	0.12	0.68	1.67	1.50	2.00	2 50	Trace	3.52	C2-S1
86	8.6	629	6.31	0.10	0.59	2.83	3.75	1.75	3·50	Trace	4.81	C3-S1
87	8.6	645	8.15	0.10	0.49	1.84	3.00	3.25	5.37	Trace	7.54	C3-S1
88	8.3	810	7.83	0.25	0.98	3.59	5.00	1.75	3.62	2.28	5.18	C3-S1
89	8.6	570	7.27	0.08	0.49	1.06	3.25	3.00	3.75	Trace	8.26	C3-S1
90	8.3	996	9.02	0.29	1.18	5.08	8.25	1.75	4.00	1.57	5.13	C3-S1
98	8.3	666	9.41	0.15	1.32	0.31	4.50	2.53	4.82	Trace	0.09	C3-S1
92	8.3	482	5.33	0.06	0.68	1.77	3.50	2.00	3.12	Trace	4.84	C2-S1
93	8.6	713	7.04	0.23	1.01	2.86	3.50	2.78	5.56	Trace	5.07	C3-S1
94	8.6	568	5.50	0.06	0.41	2.90	2.00	2.53	4.43	Trace	4.29	C3-S1
95	8·3	713	7.06	0.13	0.29	3.66	3.50	2.50	4.87	1	5.04	C2-S1
96	8.5	735	7.83	0.09	0.78	2.79	5.25	2.00	3.37	1	5.88	C3-S1
						PARASHRAMPURA HUBLI						
97	8.5	409	3.35	0.09	0.88	2.07	1.50	1.75	3.00	Trace	2.78	C2-S1
98	8.5	822	7.82	0.16	0.78	4.08	5.25	2.75	5.50	Trace	5.01	C3-S1

Contd.

1	2	3	4	5	6	7	8	9	10	11	12	13
99	8.5	520	6.20	0.09	0.39	1.43	4.00	1.50	3.50	Trace	6.52	C3-S1
100	8 4	356	2.17	0.10	1.87	1.43	1.25	4.04	1.14	Trace	1.69	C3-S1
101	8.5	812	8.00	0.09	0.88	3.71	4.75	2.78	3.30	1.85	5.29	C3-S1
102	8.6	794	10.96	0.22	0.78	0.44	4.00	2.25	4.37	1.78	10.05	C3-S2
103	8.7	2069	26.00	2.30	0.98	3.05	17.50	4.25	6.37	4.21	18.28	C4-S3
104	8.5	549	4.65	0.13	1.08	2.72	2.00	2.28	4.82	Trace	3.37	C3-S1
105	8.1	675	4.57	0.37	1.96	3.14	5.00	0.50	2.37	2.67	2.81	C3-S1
106	8.4	532	4.13	0.18	0.28	3.72	3.00	1.75	3.62	Trace	2.93	C3-S1
107	8.4	573	5.11	0.18	0.98	2.68	2.25	2.00	5.50	Trace	3.78	C3-S1
108	8.7	1660	24.13	0.17	0.41	1.22	11.50	5.96	6.00	Trace	2.68	C4-S1
109	8.5	326	2.93	0.06	0.68	1.43	2.00	1.00	2.75	Trace	2.87	C2-S1
110	8.0	1268	14.09	0.14	1.47	4.12	15.25	1.50	3.25	Trace	8.43	C3-S1
111	8.5	653	3.36	0.08	3.92	2.84	12.25	4.00	9.87	Trace	1.82	C3-S1
112	7.8	473	5.40	0.13	0.88	0,98	3.00	2.02	3.69	Trace	5.62	C2-S1
113	8.4	652	7.38	0.16	0.59	2.06	6.25	2.00	3.87	Trace	5.61	C3-S1
114	8.4	732	6.31	0.11	0.59	4.43	4.75	2.50	3.60	1	3.99	C3-S1

Appendix III

Quality of seepage, canal, tanks water in relation to ground water.

S.No.	pH	T.S.S.	Na	K	Ca	Mg	Cl	CO_3	HCO_3	SO_4	SAR	Class	Location
						1. CHALLAKERE HUBLI							
1	8.6	1752	21.92	0.25	1.28	3.92	12.25	4.00	9.87	Trace	13.61	C_4-S_2	Canal water near Doddere village.
2	8.4	575	6.74	0.09	0.59	1.56	1.50	3.50	4.00	,,	6.54	C_3-S_1	Seepage water near Kannena halli village
3	9.0	1197	18.14	0.34	0.29	0.63	2.00	8.50	7.87	,,	26.67	C_3-S_4	Canal water near Nanniwala village.
4	8.4	473	4.68	0.21	0.78	1.72	1.50	1.75	3.50	,,	4.18	C_2-S_1	Seepage water near Nanniwala village.
						2. NAIKANA HATTI HUBLI							
5	8.6	966	12 61	0.19	0.59	1.71	6.75	3.75	8.12	Trace	11.78	C_3-S_2	Seepage water Gawripura village.
6	8.1	738	8.05	0·09	0.92	2.47	3.25	0.25	7.12	,,	6.19	C_3-S_1	Seepage water near Naikanahatti village.
7	8.5	2255	32.61	0.28	0.29	1.24	14.00	6.25	13.42	1.57	37.48	C_4-S_5	Tank water near Naikanahatti village
8	8.7	902	10.77	0.14	1.08	2.29	7.00	2.75	5.25	Trace	26.83	C_3-S_3	Canal water near Guntukala menahalli,

S.No.	pH	T.S.S.	Na	K	Ca	Mg	Cl	CO_3	HCO_3	SO	SAR	Class	Location
9	8.6	1873	22.57	0.26	0.98	5.45	15.00	4.00	8.50	1.76	12.61	C_4-S_2	Seepage water near Obbayanahalli.
						3. THALAK HUBLI							
10	8.7	13.43	16.25	0.40	0.59	4.74	7.50	5.25	7.83	1	9.97	C_3-S_1	Canal water near Devarhalli.
11	8.5	15.76	20.43	0.18	0.70	3.31	13.75	5.31	6.21	Trace	15.19	C_4-S_2	Canal water near Chata Parthi from Garnihalli.
12	8.5	9.83	12.50	0.23	0.49	2.14	4.75	3.00	4.62	Trace	10.96	C_3-S_2	Stream water near Mylanahalli.
13	8.7	7.47	8.70	0.14	0.78	2.05	6.50	2.53	5.43	1.90	7.31	C_3-S_1	Channel water near Obnahalli
						4. PARASHRAMPURA HUBLI							
14	8.6	1076	13.16	0.28	0.49	2.88	8.00	3.25	7.37	Trace	10.80	C_3-S_1	Tank water of Gosikere village
15	8.8	1229	15.90	0.22	0.41	2.68	9.00	3.81	6.86	Trace	12.82	C_3-S_2	Canal water of river Vedawati near Gangargunte.
16	8.6	903	9.30	0.17	0.69	3.95	6.25	2.28	5.50	Trace	6.12	C_3-S_1	Canal water of river Vedawati of Nalondanahalli.

Appendix IV

Major tanks of Challakere taluka

S.No.	Name of tanks	C. A. in sq. miles	Atchkat in acres	Capacity in units*	Water spread acres	Depth in% ft.
	KASABA					
1.	Marikute tank	8.76	115	153	210	8.75
2.	Sanikere tank	14.15	249	612	527	14
3.	Dodderi (Doddakere)	28.49	813	720	691	12.5
4.	Duggammarekere	—	150	129	135	11.5
5.	Karekalukere	—	132	197	236	10
6.	Bomma Sumudra tank	4.67	93	106	182	12
7.	Durgakere tank	3.91	90	93	160	7
8.	Ranikere tank	61.48	1570	2062	1348	22.25
9.	Nagarangere tank	10.14	191	286	358	10
10.	Chikkamadhure Tank	36.7	500	445	344	15.5
	TALAK HUBLI					
11.	Obdapura tank	10.70	273	323	620	6.25
12.	Ullararthy tank	10.87	192	145	193	9
13.	Yadalagatta tank	7.04	194	130	156	10
14.	Talak tank	11.43	188	333	400	10
15.	Mannekote Kodihalli tank	11.72	376	641	481	16
16.	Hirehally tank	6.39	130	86	90	11.5
17.	Banjagena tank	9.89	109	166	235	8.5
18.	Hirebolli Palanaykere Kote	7.28	168	63	152	5
19.	Gowra Samudra tank	28.96	362	370	306	14.5
20.	Timmalapura tank	1.38	64	32	63	6
21.	Mazalazuni tank		93	102	120	12
22.	Varav tank	9.37	79	106	182	7
23.	Bukkambude tank	6.85	129	150	185	9.25

S.No.	Name of tanks	C. A. in sq. miles	Atchkat in acres	Capacity in units*	Water spread acres	Depth in% ft.
	PARASURAMPURA HUBLI					
24.	Pillahalli Bhuba Panakere	2.13	105	73	103	8.5
25.	Jajur tank		512	503	572	10.75
26.	Pagadatabude-Vrinda-vandlikere		76	32	63	6
27.	Korta Kemter tank	6.45	126	110	165	8
28.	Siddeswarana denga tank	15.12	346	335	502	8
29.	Kyadigumte Pattopparekere	—	143	85	97	10.5
30.	Kadehacle Hachavalikere	—	166	99	169	7
31.	Mahadevapura Chikkere	5.80	119	211	241	10.5
32.	Mahadevapura Doddakere	4.30	146	201	241	10
33.	Dodda Chellurkere	3.96	113	146	201	
34.	Parush Ram Pura old tank	17.20	512	585	520	13.5
35.	Parush Ram Pura New tank	—	995	993	666	23
36.	Chikka Cheillur kodi Mallaihakere	2.99	90	61	121	6
37.	Chellur tank	4.47	155	86	109	9.5
38.	Thimmanna Naikay Kote tank	6.81	153	218	262	10
39.	Belagere tank	16.68	203	213	320	
40.	Chinnamma Nagattihalli tank	—	179	173		
41.	Gosikere tank	5.34	86	133	160	10
	NAYAKANATTI HOBLI					
42.	Naya Kanatti Hirekere	63.21	1503	1247	809	18.5
43.	Nayakanatti Chikkere	17.66	253	332	387	12.5
44.	Thippain Kote tank	34.23	294	513	342	18
45.	Guntkolamanhalli tank	1.72	81	16	40	16
46.	Rekagere tank	6.10	174	62	82	9
47.	Rama Sagar tank	17.19	258	336	293	15
48.	Namni Vala tank	13.39	97	122	154	9.5
49.	Bhimanakere tank	5.94	90	203	243	10

*1 unit capacity = 6 acres ft.
% 1 ft = 30.48 cm.

Appendix V

Minor tanks in Challakere Taluka

S.No.	Name of tank	C. A. in sq. mile	Atchkat in acres	Capacity in units*	Water spread	Depth in* ft.
	CHALLAKERE HUBLI					
1.	Budnahatti tank	2.42	46	139	209	8
	TALAH HUBLI					
2.	Done halli tank	3.0	63	33	65	6
3.	Katam devanakote tank	3.22	74	146	175	6.25
4.	Nykana halli Hosakere	7.07	6	51	77	8
5.	Valase tank	4.69	23	87	116	9
6.	Gataparthy tank	6.22	75	60	90	—
7.	Bhoganhalli tank	—	61	23	46	6
	PARASURAMPURA HUBLI					
8.	Bommana Kunete tank		62	55	94	7
9.	Gowripura tank	1.70	50	161	30	11
10.	Pillahalli Bommade-varakere	2.88	47	13	46	3.5
11.	Thappagondonahalli tank		48			
12.	Kaparhalli tank	0.80	28	14	28	6
13.	Junjaragunte tank		58	17	36	5.5
	NAYAKANATTI HUBLI					
14.	Jamana halli tank	1.99	55	34	31	13
15.	Gudehalli tank	2.31	15	17	68	3
16.	Nerlakunte tank	5.33	24	120	134	12
17.	Naikanatti Hosakere	5.48	38	77	153	6

*1 unit capacity = 6 acre ft.

* 1 ft. = 30.48 cm

Appendix VI

High yielding strains, recommended dose of fertilizers, seed rate per acre and plant protection measures.

Strain	Seed rate per acre	Fertilizer NPK/acre in kg	Yield	Plant protection measures
1	2	3	4	5
Jowar local Rainfed	5 kg/ac.	8:4	3 q/acre	Dusting Melathion 5% Swin 10% or BHC 10% at 12 kg/acre thrice, once after 20 days of sowing, second after 20 days of first operation and third after 30 days of second operation.
Hybrid Jowar Irrigated	4.5 kg	50:30:15	20-25	1. Application of 7 kg of Thimet sowing. 2. Spraying Endrin or Parathio once in 15 days till the crop comes to earhead.
Rainfed	3-4 kg	25:15:10		3. Wettable sulphur to be mixed for 3rd or 4th spraying. 4. Dusting Melathion 5% or Swin 10% dust on earheads.
Hybrid maize Irrigated	6½ kg	60:30:15	25-30	Application of 12 kg of Heplachlor 6% to soil before sowing. Dusting Melathion 5% after 15 days of sowing.

Contd.

1	2	3	4	5
				Spraying Endrin or Parathion after 30 days, 50 days and 70 days of sowing. Zineb to be mixed during last two sprayings. Dust Melathion 5% at 8 kg/ac. on cobs during milk stage.
Hybrid bajra Rainfed	2 kg	20:10	8–10	Spraying Endrin or Parathion twice after 25 days of sowing with gap of 1 month. Dusting Melathion 5% or Swin 10% @ 10 kg/ac at milk stage.
Paddy local Irrigated	20 kg	25:10:10	10-16	Spraying Endrin or Parathion twice to the nursery with a fungicide. Spraying 3–4 times to the transplanted crop with a gap of 20 days after 15 days of tansplanting.
Paddy 1R–8 Irrigated or Taichung native.	15 kg	60:30:30	30–35	1. Seed treatment. 2. Spraying Parathion or Endrin twice to Nursery with a fungicide. 3. Spraying 4 times with these chemicals from 20 days of transplanting with a gap of 20 days. Include zineb and streptocycline.

Contd.

1		2	3	4	5
Wheat mexican	Irrigated	60 kg	60:40:30	12-16	Seed treatment. Application of 12 kg Heptachlor 6% to soil. Spraying Endrin or Parathion with zineb every 20 days after sowing till boot stage. Dusting melathion 5% or Swin 10% at 10 kg/acre at milk stage.
Ragi (Purna)	Irrigated	2-3 kg	30:15:10	15-20	1. Seed treatment. 2. Spraying Endrin or Parathion with Zineb once to nursery after 15 days of sowing in case of irrigated crop.
Purna	Rainfed	2-3 kg	15:10	8-10	3. Spraying Endrin or Parathion with Zineb thrice with a gap of 20 days after transplanting or sowing.
Groundnut	Irrigated	40-45 kg	10:20:10	500-700 kg of pods.	1. Seed treatment
	Rainfed	40-50 kg	10:15:10	350-500	2. Dusting Malathion 5% or Swin 10% four time at 12 kg/ acre at 20 days interval commencing from 20 days after sowing.
Cotton	Rainfed	3 kg	15:10:15	307-400 kg	Seed treatment. Dusting Swin 10% thrice at 10 kg/acre and 2 kg Sulphur at interval of 20 days staring from 3 weeks of sowing.

Contd.

1	2	3	4	5
	Irrigated	3 kg	30:15:15	400-600 kg	Two spraying with Endrin or Parathion + wettable sulphur at the time of boll formation at an interval of 3 weeks.
Onion	Irrigated	2 kg	50:25:50	800-1000 kg	Spray to nursery once with Parathion or Endrin with Zineb 20 days after sowing. Spraying Parathion or Endrin with Zineb 4 times at an interval of 20 days commencing from 20 days after transplanting.

Appendix VII

Statement showing the sanctioned strength of the posts of C. D. Block Challakere

S. No.	Category of post	Sanctioned Posts	working
1.	Block Development Officer	1	1
2.	Agricultural Extension Officers	2	2
3.	Cooperative Extension Officers	2	2
4.	Supervisors	2	2
5.	Social Education Organisors	2	1
6.	Mukyasevikas	2	1
7.	Animal Husbandry Extension Officer	1	1
8.	Extension Officer for Panchayat	1	1
9.	Extension Officers for Industries	1	—
10.	Gramasevkas	20	18
11.	Gramasevikas	2	2
12.	Accountant	1	1
13.	Distt. Division Clerks	2	2
14.	Second Division Clerks	3	3
15.	Second Grade Typists	2	2
16.	Progress Assistant	1	—
17.	Jeep Driver	1	1
18.	Class IVth servants	5	5
	Applied Nutrition Programme Staff		
19.	Horticultural Extension Officer	1	1
20.	Fisheries Extension Officer	1	1
21.	Fisherman	1	1
22.	Gramasevikas	5	5
23.	Jeep Driver	1	1
	Social Welfare Section		
24.	Social Welfare Inspector	1	1

S. No.	Category of post	Sanctioned Posts	working
25.	Class IVth servant	1	1
26.	Boys Hostel : 1) Superintendent	1	1
	2) Cooks	2	2
	3) Kitchen servant	1	1
27.	Girls Hostel : 1) Superintendent	1	1
	2) Cooks	1	1
	3) Kitchen servant	1	1
	4) Waterman	1	1
28.	Ashram School : 1) Teacher	1	1
	2) Cook	1	1
	3) Kitchen servant	1	1
29.	Women welfare centres ; 1) Organisers	3	3
	2) Conductors	3	3
30.	Tailoring Instructor	1	1

Appendix VII (a)

AGE SEX MARITAL STATUS (CHALLAKERE)

Age Group	MALE				FEMALE				TOTAL			
	Unmarried	'Married'	'Other'	Total	Unmarried	'Married'	'Others'	Total	Unmarried	'Married'	'Others'	Total
0-14	28685 (99.96)	10 (0.04)	3 (neg)	28698 (100.00)	28400 (98.13)	534 (1.85)	8 (0.02)	2894 (100.00)	57085 (99.04)	544 (0.94)	11 (0.02)	57640 (100.00)
15-34	11966 (57.45)	8598 (41.28)	265 (1.27)	20829 (100.00)	1435 (7.03)	1776 (87.11)	1196 (5.86)	20407 (100.00)	13401 (32.50)	26374 (63.96)	1461 (3.54)	41236 (100.00)
35-54	615 (4.19)	12849 (87.48)	1224 (8.33)	14688 (100.00)	42 (0.34)	8524 (70.15)	3586 (29.51)	12152 (100.00)	657 (2.45))	21373 (79.63)	4810 (17.92)	26840 (100.00)
55-70	178 (2.34)	5518 (72.38)	1927 (25.28)	7623 (100.00)	18 (0.36)	1491 (29.65)	3519 (69.99)	5028 (100.00)	196 (1.55)	7009 (55.40)	5446 (43.05)	12651 (100.00)
Age not stated	54 (90.00)	5 (8.33)	1 (1.67)	60 (100.00)	31 (77.50)	6 (15.00)	3 (7.50)	40 (100.00)	85 (85.00)	11 (11.00)	4 (4.00)	100 (100.00)
TOTAL	41498 (57.72)	26980 (37.52)	3420 (4.76)	71898 (100.00)	29926 (44.95)	28331 (42.56)	8312 (12.49)	56569 (100.00)	71424 (51.58)	55311 (39.95)	11732 (8.47)	138467 (100.00)

APPENDIX VIII

Age, sex and education in rural areas of Challakere Taluka

Age group	Illiterate			Literates without educational level			Educational levels			Matriculation & above			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0- 4	9586	9499	19085	—	—	—	—	—	—	—	—	—	9586	9499	19085
5- 9	8413	10271	18684 (84.90)	2248	940	3188 (14.49)	96	38	134	—	—	—	10757	11249	22006 (100.0)
10-14	4985	7091	12076 (72.97)	3087	1023	4110 (24.84)	282	80	362 (2.19)	1	—	1	8355	8194	16549 (100.0)
15-19	3683	4535	8218 (76.74)	1575	498	2073 (19.36)	290	40	339 (3.17)	73	5	78 (0.73)	5621	5087	10708 (100.0)
20-24	3310	5037	8347 (76.69)	1635	431	2066 (18.98)	241	37	278 (2.55)	185	8	193 (1.77)	5371	5513	10884 (100.0)
25-29	3427	4964	8391 (78.22)	1558	344	1902 (17.73)	195	24	219 (2.04)	214	2	216 (2.01)	5394	5334	10728 (100.0)
30-34	2877	4257	7134 (80.01)	1325	207	1532 (17.18)	126	9	135 (1.51)	115	—	115 (1.29)	4443	4473	8916 (100.0)
35-44	5696	6967	12663 (81.93)	2270	241	2511 (16.25)	211	11	222 (1.44)	60	—	60 (0.39)	8237	7219	15456 (100.0)
45-59	6087	6133	12220 (83.43)	2078	119	2197 (15.00)	202	2	204 (1.39)	25	—	25 (0.17)	8392	6254	14646 (100.0)
60 & above	4616	4286	8902 (88.97)	1010	38	1048 (10.47)	54	—	54 (0.54)	2	—	2 (0.02)	5682	4324	10006 (100.0)
Age not	37	40	77 (96.25)	2	—	2 (2.50)	—	—	—	1	—	1 (1.25)	40	40	80 (100.0)
Total	52717	63080	115797	16788	3841	20629	1697	250	1947	676	15	691	71878	67186	139064

Appendix VIII (a)

Expenditure made on various items in N. E. S. Block Challakere

Head	1961–62 Amount	% age	1962–63 Amount	% age	1963–64 Amount	% age	1964–65 Amount	% age	1965–66 Amount	% age	1966–67 Amount	% age	1967–68 Amount	% age	1968–69 Amount	% age	1969–70 Amount	% age	Total Amount	% age
Block Headquarter	64116 (45.81)	10.80	89381 (40.08)	15.06	121247 (47.25)	20.43	5227 (45.85)	8.81	57467 (38.81)	9.86	103794 (40.88)	17.49	57783 (37.62)	9.74	28372 (19.44)	4.78	18963 (38.13)	3.20	593401 (39.97)	100.0
Agriculture & Animal Husbandry	14497 (10.36)	6.63	12963 (5.81)	5.92	21139 (8.24)	9.66	22822 (20.02)	10.43	43791 (29.58)	20.1	47622 (18.76)	21.77	33234 (21.64)	15.19	19428 (13.31)	8.88	3300 (6.64)	1 51	218795 (14.74)	100.0
Irrigation & Reclamation	–		4980 (2.23)	7.57	56320 (21.95)	85.59	–	–	–	–	1000 (0.39)	1.52	500 (0.33)	0.76	3000 (2.06)	4.56	–	–	65800 (4.43)	100.0
Rural Health & Senitation	10830 (7.74)	6.30	27555 (12.36)	16.04	19628 (7.65)	11.42	22559 (19.79)	13.13	22281 (15.05)	12.97	42329 (16.67)	24.64	262 (0.17)	0.15	18866 (12.93)	10.98	7500 (15.08)	9.37	171810 (11.57)	100.0
Education	1835 (1.31)	2.32	19052 (8.54)	24.11	5777 (2.25)	7.31	2108 (1.85)	2.67	2500 (1.69)	3.16	22816 (8.99)	28.88	17737 (11.55)	22.45	7188 (4.93)	9.10	–	–	79013 (5.32)	100.0
Social Education	13360 (9.55)	15.24	16965 (7.61)	19.36	6938 (2.70)	7.92	5820 (5.10)	6.64	8592 (5.80)	9.80	10958 (4.32)	12.50	13551 (8.82)	15.46	11466 (7.86)	13.98	–	–	87650 (5.90)	100.0
Communication	5972 (4.27)	6.49	10042 (4.50)	10.91	1166 (0.45)	1.26	–	–	–	–	–	–	11804 (7.69)	12.83	43334 (29.70)	47.08	19719 (39.65)	21.43	92037 (6.20)	100.0
Rural Arts & Crafts	9256 (6.61)	10.86	12369 (5.55)	14.52	7235 (2.82)	8.49	6965 (6.11)	8.18	13430 (9.07)	15.76	19721 (7.77)	23.15	7712 (5.02)	9.05	82529 (5.66)	9.69	250 (0.50)	0.30	85197 (5.74)	100.0
Housing	20095 (14.35)	22.06	29701 (13.32)	32.61	17179 (6.69)	18.86	1465 (1.28)	1.61	–	–	5641 (2.22)	6.19	11000 (7.16)	12.08	6000 (4.11)	6.59	–	–	91081 (6.13)	100.0
Total	139961 (100.0)	9.43	223008 (100.0)	15.02	256629 (100.0)	17.28	114016 (100.0)	7.68	148061 (100.0)	9.97	253881 (100.0)	17.10	153583 (100.00)	10.34	145913 (100.0)	9.83	49732 (100.0)	3.35	1484784 (100.0)	100.0

Appendix IX

LAND UTILIZATION CHALLAKERE

	1960–1961	1961–1962	1962–1963	1963–1964	1964–1965	1965–1966	1966–1967	1967–1968
	1	2	3	4	5	6	7	8
Forests	7242 (1.44)	7242 (1.44)	7242 (1.44)	7243 (1.44)	17243 (3.42)	19243 (3.82)	19243 (3.82)	17243 (3.42)
Barren and uncultivable land	30412 (6.03)	30412 (6,03)	30412 (6.03)	30413 (6.03)	28901 (5.75)	28901 (5.73)	28901 (5.73)	28901 (5.73)
Land put to non agricultural land	23469 (4.65)	23469 (4.65)	23681 (4,70)	23701 (4.70)	23701 (4.70)	25701 (5.10)	25701 (5.10)	25701 (5.10)
Total	53882 (10.68)	53882 (10.68)	54094 (10.73)	54114 (10.73)	52062 (10.43)	54602 (10.83)	54602 (10.83)	54602 (10.83)
Cultivable waste	50069 (9.93)	50069 (9.93)	49670 (9.85)	49671 (9.85)	37671 (7.47)	38671 (7.67)	37671 (7.47)	39671 (7.87)
Permanent pasture and grazing lands	63998 (12·70)	63998 (12.70)	63998 (12.70)	63999 (12.70)	63999 (12.70)	54897 (10.89)	54897 (10.89)	54897 (10.89)
Land under misc. tree crops	27 neg	27 neg	29 neg	29 neg	29 neg	29 neg	29 neg	29 neg
Total	114095	114095	113698	113699	101699	93597	92597	94597

Contd.

	1	2	3	4	5	6	7	8
Current fallow	15250 (3.02)	25948 (5.15)	23862 (4.73)	23682 (4.70)	23948 (4.75)	48547 (9.63)	48547 (9.63)	90062 (17.87)
Other fallow	102257 (20.29)	108645 (21.55)	85121 (16.89)	83678 (16.60)	108645 (21.55)	108645 (21.55)	108645 (21.55)	108645 (21.55)
Total fallow land	117507 (23.31)	134593 (26.70)	108984 (21.62)	107360 (21.29)	132598 (26.30)	157192 (31.18)	157192 (31.18)	198707 (39.42)
Net sown area	211339 (41.93)	194253 (38.54)	220037 (43.65)	227163 (45.07)	19930 (39.66)	180433 (35.79)	180433 (35.79)	138907 (27.55)
Total cropped area	213349 (42.33)	196313 (38.94)	228202 (45.27)	232979 (46.22)	220530 (43.75)	180433 (35.79)	220035 (43.65)	141242 (28.02)
Area sown more than once	2010 (0.40)	2060 (0.40)	8165 (1.62)	5816 (1.15)	20600 (4.09)	nil (nil)	39602 (7.86)	2325 (0.46)
Total Geographical area	504067 (100.0)	504067 (100.0)	504067 (100.0)	504067 (100.0)	504067 (100.0)	504067 (100.0)	504067 (100.0)	504067 (100.0)

Appendix X

Age and sex composition of workers and nonworkers

Age group	MALES						FEMALES					
	Workers		Nonworkers		Total		Workers		Nonworkers		Total	
10-14	5181 (16.44)	10.41	26318 (83,56)	90.80	31499 (100.00)	40.00	4954 (15.56)	13.19	26890 (84.44)	75.05	31844 (100.00)	43.39
15-34	21788 (94.73)	43.76	1212 (5.27)	4.18	23000 (100.00)	29.20	18433 (82.27)	49.08	3972 (17.73)	11.08	22405 (100.00)	30.53
35-59	17815 (98.76)	35.79	224 (1.24)	0.77	18039 (100.00)	22.90	12251 (84.57)	32.61	2218 (15.33)	6.19	14469 (100.00)	19.72
60	4997 (80.27)	10.04	1229 (19.73)	4.24	6226 (100.00)	7.90	1920 (41.22)	5.11	2749 (58.78)	7.69	4669 (100.00)	6.36
Total	49781	100.00	28983	100.00	78764	100.00	37558	100.00	35829	100.00	73387	100.00

Appendix XI

Age, sex compsition and occupation followed.

Age Group	Cultivators			Agricultural labours			In mining, quarrying, livestock, forestry fishing, hunting, plantation, orchards and allied activties			At household		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
10–14	2060 (45.39)	2478 (54.61)	4538 (100.0) (8.08)	764	1224	1988 (14.12)	574	260	834 (57.20)	1553	778	2331 (26.11)
15–34	13977 (53.31)	12243 (46.69)	26220 (100.0) (46.67)	2939	4052	6991 (49.64)	282	30	312 (21.40)	2215	1301	3516 (39.36)
35–59	12507 (60.84)	8049 (39.16)	20556 (36.59) (100.0)	1765	2620	4385 (13.14)	171	39	210 (14.40)	1454	870	2324 (26.03)
60+	3711 (76.42)	1145 (23.58)	4856 (8.64) (100.0)	333	381	714 (5.07)	76	25	101 (6.93)	511	244	755 (8.46)
Age not stated	2		9 (0.02)	3	2	5 (0.03)	1	—	1 (0.07)	2	—	2 (0.02)
Total	32257 (57.4)	23922 (42.6)	56179 (64.32) (100.0)	5804 (41.21)	8279 (58.79)	14083 (16.12) (100.0)	1104 (75.72)	354 (24.28)	1458 (1.67) (100.0)	5735 (64.24)	3193 (35.76)	8928 (10.22) (100 0)

Appendix XII

Age, sex composition and occupation followed

In manufacturing other than household industry			In construction			In trade & commerce			In transport, storage and communication			In other services			Total		
Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
36	30	66 (9.18)	38	47	85 (9.99)	13	18	31 (1.86)	2	—	2 (1.16)	141	119	260 (7.86)	5181	4954	10135 (11.60)
315	68	383 (53.27)	339	111	450 (52.88)	489	159	648 (38.92)	102	—	102 (59.30)	1130	469	1599 (48.35)	21788	18433	40221 (46.03)
180	34	214 (29.76)	213	69	282 (33.14)	495	279	774 (46.49)	64	—	64 (37.21)	966	291	1257 (38.01)	17815	12251	30066 (34.42)
47	8	55 (7.65)	30	4	34 (3.99)	142	70	212 (12.73)	4	—	4 (2.33)	143	43	186 (5.62)	4997	1920	6917 (7.92)
1	—	1 (0.14)			—							5	—	5 (0.15)	14	9	23 (0.03)
759	140	719 (0.82)	620	231	851 (0.97)	1139	526	1665 (1.91)	172	—	172 (0.20)	2385	932	3307 (3.79)	49795	37567	87362 (100.0)
(80.53)	(19.47)	(100.0)	(72.85)	(27.15)	(100.0)	(68.41)	(31.59)	(100.0)	(100.0)		(100.0)	(72.12)	(27.88)	(100.0)	(58.78)	(41.22)	(100.0)

Appendix XIII

Crops grown (Challakere) 1960–1968

Name of the crop/average	1960–1961	1961–1962	1962–1963	1963–1964	1964–1965	1965–1966	1966–1967	1967–1968
Rice	4125 (1.93)	9875 (3.99)	10015 (4.36)	10041 (4.30)	10041 (4.55)	5112 (33.28)	16200 (10.88)	16200 (11.66)
Jowar	3000 (14.06)	31200 (12.64)	40185 (17.52)	41299 (17.75)	38902 (17.65)	410 (2.66)	15222 (10.20)	10200 (7.34)
Bajra	32000 (15.00)	32610 (13.20)	38615 (16.85)	40218 (17.27)	20 (neg)	—	15400 (10.33)	15400 (11.10)
Maize	—	—	—	—	—	—	—	—
Ragi	12500 (5.86)	12800 (5.17)	13468 (5.88)	13515 (5.80)	10112 (4.59)	2420 (15.74)	15200 (10.19)	10000 (7.20)
Wheat	58 (0.03)	62 (0.02)	73 (0.03)	76 (0.03)	40 (0.01)	— (—)	50 (0.03)	50 (0.03)
Barley	—	—	—	—	—	—	—	—
Other cereals & small millets	25500 (11.95)	22150 (8.96)	29464 (12.85)	29621 (12.71)	34517 (15.66)	— (—)	17450 (11.70)	17450 (12.56)
Total cereals & small millets	104183 (48.83)	108697 (43.98)	131820 (57.49)	134770 (57.86)	93632 (42.45)	7942 (51.68)	79522 (53.31)	69300 (49.89)

Contd.

Name of the crop/average	1960-1961	1961-1962	1962-1963	1963-1964	1964-1965	1965-1966	1966-1967	1967-1968
Pulses Gram	268 (0.12)	262 (0.10)	278 (0.12)	285 (0.12)	153 (0.07)	—	120 (0.08)	120 (0.08)
Tur	8200 (3.84)	652 (2.64)	5893 (2.57)	6785 (2.91)	5885 (2.63)	—	4221 (2.84)	4221 (3.04)
Other pulses	48540 (22.75)	39577 (16.11)	39315 (17.15)	41932 (18.00)	32900 (14.92)	40 (0.68)	250 (0.17)	42810 (30.82)
Total pulses	57008 (26.72)	46364 (18.75)	45486 (19.84)	49002 (21.03)	38238 (17.60)	40 (0.68)	4591 (3.09)	47152 (30.82)
Total food grains	161191 (75.55)	155061 (62.73)	177306 (77.33)	183772 78.89)	132570 (60.11)	7982 (51.94)	84113 (56·40)	116452 (83.83)

Appendix XIV

Other sources of livelihood in P.S. Chalakerc (Itemwise)

Earnings/ Other sources	Less than Rs. 100	100-200	200-300	300-400	400-500	500-600	600-700	700-800	800-900	900-1000	1000-1200	1200-1400	1400-1600	1800-2000	2000-2200	2400-2600	3000-3200	
Agricultural labour	3	2	3	4	2	11	1	2	4	1	4	2	1	1	1	1		43
Casual labour	3			1					2	1								7
Lether work			1	1														2
Net making				1														1
Coconut selling				1														1
Money landing				1														1
Clothing selling			1															1
Tailoring			1			1							1					3
Business		1				1		1	1								1	5
Remittance from relatives									1		1				1			3
Household Industries																		
Blanket making											1					1	1	3
Shoe making			2	2	1													5
Others		1		1														2
Total	6	4	8	12	3	13	1	3	8	2	6	2	2	1	2	2	2	77

Appendix XV

Plants of Challakere

Name of plant	Vern, name	Habitat	Remark
Trees, shrubs and Climbers			
Acacia ferruginea	Banni	—	Gomal
A. latornum	Parjalli	Rocky, piedmont	Gomal, Kaval
A. leucophloea	Bella	-do-	-do- -do-
A. nilotica sspindica	Jalli	Plain	Cultivated
Aegle marmalos	Bilva, Bellapatra	-do-	-do-
Agave americana	Senabu	—	Field boundries
A. wightii	-do-	—	-do-
Ailanthus excelsa	Doddahamani	Plain	Cultivated
Albizzia lebbeck	Bege	-do-	-do-
A. amara	Tuggali	Upland, piedmont	Gomal, Kaval
A. odoratissima	Bege	—	Cultivated
Annona reticulata	Ramphala	Plain, valley	Cultivated fruit plant
A. squamosa	Sitaphal, Mallava Raphala	-do-	-do-
Areca catechu	Adike	Valley, Plain	Orchard Plantation
Artocarpus heterophyllus	Halasu	-do-	Fruit Plant, cultivated
Averrhoa carambola	Kamarakh mara, Pannapuli	-do-	-do- -do-

Contd.

Name of plant	Vern, name	Habit	Remark
Azadirachta indica	Bemu, Bevu, Bavina	—	Planted Roadside
Balanites roxburghii	Inglaragida	Younger alluvium	Riverbank
Borassus fabellifer	Tali	Valley	Cultivated
Boswellia serrata	Labana, Dapa, Guggala	Rocky	Forest plantation
Butea monosperma	Mutthuga	-do-	-do-
Caesalpinnea bonduc	Gajjika	-do-	Cultivated. field and orchard boundary.
C. Pulcherima	Sinkesri	-do-	-do-
Cassia auriculata	Tungri, Avare Avarekka	Rocky, gravelly piedmont, upland	Gomal, Kaval.
Cassia siamea	—	—	Cultivated
C. fistula	Kakke	Upland, Rocky	Forest plantation Kaval.
Calotropis procera	Akegidda	Valley, plain	Waste lands.
C. gigantea	Akagida	-do-	-do-
Capparis decidua	Cippuri, Karira	Gravelly plain	Kaval
C. spinosa	Mallukattari	-do-	-do-
Casuarina equisetifolia	Kesarike	Younger alluvium	River bank plantation.
Carrica papaya	Parange	Plain	Orchard plantation
Carrisa spinarum	Bare hammu Kasekeys	Rocky, Hilly	Gomal, Kaval
Caryota urens	Panemara	Plains	Orchard plantation
Cocculus hirsutus	Sugadigida	Rocky, Gravelly	Gomal, Kaval
Cocos nucifera	Tengu	Valley	Orchard plantation

Contd.

Name of plant	Vern, name	Habit	Remark
Chloroxylon swietenia	Murali, Hurihulla	-do- plain	Orchard boundary plantation.
Clerodendrum fragrans	—	Cultivated	Hedge plant
Cordia dichotoma	Ala	Valley, plain	Orchard plantation.
Crotalaria juncea	Henna, Sanabu	-do-	Cultivated
Citrus aurantium	Kanoi/Kithale	-do-	Orchard cultivation.
C. aurantifolia	Limbe, Nimbe	-do-	-do-
C. media	Dodda nimbu	-do-	-do-
C. mexima	Sakotti	-do-	-do-
Cissus quadrangularis	Mangarabatti	Red soils	Gomal, Kaval.
Dalbergia sissoo	Sisam, Agara	Rocky	Forest plantation in Gomal, Kaval and other places.
Delonix regia	Doddaratnagandhi	Plain	Ornamental
Dichrostachys cinerea	Bellakulle	Rocky, gravelly	Gomal, Kaval.
Dodonaea viscosa	Bandare, Hangaru	-do-	-do-
Emblica garardiana	Hulligira	Valley, plain	Orchard field
E. officinalis	Nallikai	-do-	Orchard plantation
Eriodendron anfractuosum	Apurani. Basaga	-do-	Orchard field boundaries.
Erythrina variegata var. orientalis	Parivana	—	Cultivated in orchards for betal vines.
Eucalyptus (hybrid)	—	—	Forest plantation
Euphorbia antiquorum	Mundukalli	Rocky, Gravelly	Gomal, Kaval.

Contd.

Name of plant	Vern, name	Habit	Remark
E. tirucalli	Turcalli/Bottugalli	—	Field boundaries, Hedges.
Feronia limonia	Bela, Dadhiphala	Plain	Cultivated.
Ficus glomerata	Atchannu	—	Near well, cultivated.
F. virens	Bassuri	—	Near well, cultivated.
F. religiosa	Aroli/Ashwatha	—	Near irrigation well, cultivated.
F. benghalensis	Alada	—	Near well, cultivated.
Fluegea microcarpa	Hoolegida	Rocky situation	Gomal, Kaval
Glaricidia maculeata	—	—	Cultivated (Green manure).
Gossypium herbaceum	Hatti	On black soil	Cultivated.
Grewia tenax	—	Rocky surfaces	Gomal, Kaval.
Hardwickia binata	Kamra, Atha	Rocky	Forest plantation
Indigofera aregentea	Nili	Rocky, Gravelly	Reserved forest
I. oblongifolia	Karuntli	Heavy soils	Tank bed.
I. tinctoria	Agare	Rocky surfaces	Gomal, Reforest.
Jatropha glandulifera	Totta	—	—
Lantana camara	Lantana	Plain	Cultivated, roadside
Leptadenia reticulata	Doodi	Roeky, piedmont plain	Climber
Leptadenia reticulata	Doodi	Rocky, piedmont plain	Climber
Mangifera indica	Ambe, Balli, Mau	Plain	Orchard plantation
Maytenus emarginata	Tandrasi, Kanka	Rocky, Gravelly	Kaval, Gomal.
Moringa oleifera	Gnggala, Nugga	Plain	Planted
Murraya Koeniigii	Gandhaberu, Kariberu	-do-	-do-

Contd.

Name of plant	Vern, name	Habit	Remark
Melia azadhrach	Arbe, Areberu	-do-	-do-
Musa paradisiaca	Bale		Cultivated, orchard plantation
Opuntia dillenii	Papaskalli	—	Field boundary hedge
Pandanus fascicularis	Kaicla, Mundige	Younger alluvium	River bank
Parkinsonia aculeata	Kodanchi	—	Hedge plant
Phoenix sylvestris	Echallu	Low lying lands	Runnels
Pithecllobium dulce	Simehunise	—	Hedge plant
Pongamia pinnata	Honge	On most of the Habitat	Field boundries Road side
Porsopis cineraria	Kabanni, Banni	Plain	Rase on fields
P. Juliflora	—	-do-	Waste land
Psidium guajava	Jemaphalla, Sebekai	—	Orchard plantation
Randia dumetorum	maggare	Rocky, Gravelly.	Gomal, Kaval
Salvadora oleoides	—	Saline land	—
S. persica	Gonimara	-do-	—
Sapindus emrginatus	Aralakin, pucha kotte	—	Cultivated tree
Sesbania grandiflora	Nayinerella	—	Orchard plantation
Spondias pinnata	Amte, Ambte	—	Orchard field boundries
Syzygium cumini	Naerale	—	Cultivated, Road side plantation
Tamarindus indica	Hunase	—	-do-

Contd.

Name of plant	Vern, name	Habit	Remark
Tamarix aphylla	—	Younger alluvium	River Bank
Terminalia bellirica	Thare	River,Bank	Forest plantation
Tinospora cordifolia	Anaytaballi	Semi rocky	Forest climber
Typha angustata	Jampu	Marshy	flowing rivulet site
Vitex negundo	Nokke	Low lying areas	Runnel
Vitis vinifera	Argura, Draksha	—	Cultivated
Zizyphus nummularia	Baregidda Mulluhannu	Plain, rocky & gravelly soils	Gomal, Kaval
Z. mauritiana	Badari, Bogari	—	Cultivated
Z. xylopyrus	Kotte mullu-Docidakatte	Semi rocy to Plain	Gomal, Kaval, Field boundries.
Under shrubs, Herbs and Grasses			
Abutilon indicum	Gidutiggi, Hettakisa	Irrigated field	Rice field Canal.
Acantho-spermum hispidum	—	-do-	
Acalypha indica	Kuppigida	-do-	Waste places, cultivated rice fields.
Aerva lanata	—	-do-	Groundnut fields
Achyran-thes aspera	Uttarani	-do-	—
Alternanthera echinata	—	Irrigated fieid	Canal banks, rice
Amaranthus gracilis	—	-do-	Rice field and waste places
A. spinosus	Keeraisoppu	-do-	-do-

Contd.

Name of plant	Vern, name	Habitat	Remark
Ammannia baccifera	—	-do-	Rice field
Anisomeles indica	Adveera	-do-	Irrigated walls
Andropogon pumilus	—	Semi rocky	Gomal, Kaval
Aleuropus lagopoides	—	Saline soils	Tank bed
Alloteropsis cimicina	—	—	—
Apluda aristata	—	—	—
Aristida adscensionis	Karisanahullu	Rocky, semi rocky to plan	Gomal, Kaval, Forest and cultivated fields
A. funiculata	—	-do-	-do-
A. hystrix	Billu vunagadahullu	-do-	-do-
A. setacea	Doddu kanchihullu	-do-	-do-
Aristolochia bracteata	—	Irrigated field	Canal Bank
Argemone mexicana	Dhadhurl	-do-	Waste places
Arundo donax	—	Low lying area	Water logged
Arachis hypognea	—	—	Cultivated as crop
Allium cepa	—	-do-	-do-
Astera-cantha longifolia	—	Irrigated field	Rice field
Bergia ammanioides	—	-do-	-do-
Bidens biternata	—	Irrigated fields	Near well, rice field
Blepharis molluginifolia	—	Gravelly	Road side
Blain-villea latifolia	—	Irrigated field	Rice field
Boerhavia diffusa	—	Do and Uniragated	Rice field boundries
Cassia occidentalis	Urmikaddi, Avārikka	-do-	Do and waste places

Contd.

Name of plant	Vern, name	Habit	Remark
C. obtusa	—	Semi-rocky	-do-
Celosia argentea	—	Palin	Groundnut field
Centella asiatica	—	Irrigated fields	Rice field
Chenopodium album	—	-do-	G. nut field
Cleome chelidonii	—	-do-	Rice field
C. gynandra	—	-do-	Do, waste places
C. viscosa	—	-do-	Do and G. nut field
Chloris barbata	—	-do-	Saline rice fields
C. gayana	—	-do-	-do-
C. virgata	—	-do-	-do-
Citrullus colocynthis	—	Sandy plains	Gomal, Kaval
Convolvulus arvensis	—	Irrigated field	Rice fields
Chrysopogon fulvus	—	Semi-rocky	Gomal, Kaval
Chrozophora rottleri	—	Low lying areas	Tank bed
Corchorus depressus	—	U land	Dry black soils
Coccinia lordifolia	—	Cultivated field	On field hedge
C. trilocularis	—	Irrigated fields	Rice and G. nut field
C. iridens	—	-do-	-do-
Croton bonplandianum	—	Rudral	Roadside
Cyanotis cucullata	—	Irrigated fields	Rice fields
Cymbopogon jawarancusa	—	Seml rocky and gravelly situations.	—

Contd.

Name of plant	Vern, name	Habitat	Remark
C. parkeri	—	-do-	-do-
C. martinii	—	-do-	-do-
Cynodon dactylon	Karke	Irrigation bund	Rice and Groundnut field
Cyperus bulbosus	Muljabblu	-do-	-do-
C. rotundus	—	-do-	-do-
C. exaltatus	—	-do-	-do-
C. compressus	—	-do-	-do-
Dactyloctenium aegyptium	—	Irrigated field	Rice and Groundnut field
Dactylandra sp.	—	—	—
Datura metel	—	Field boundaries	Waste places
Digitaria adscendens	—	Irrigated field	Rice and Groundnut field
Digera muricata	—	-do-	Groundnut field
Dichanthium annulatum	—	-do-	Rice fields
D. caricosum	—	-do-	-do-
Desmostachya bipinnata	—	Lowlying irrigated field	-do-
Dinebra arabica	—	-do-	-do-
Dipteracanthus patulus	—	Irrigated field	G. nut field
D. prostratus	—	Irrigated field	Paddy field
Dolichos biflorus	—	Semi rocky	Cultivated
Echinops echinatus	—	Irrigated field	G. nut field
Eclipta prostrata	—	-do-	Rice field
Echinochloa colonum	—	-do-	-do-

Contd.

Name of plant	Vern, name	Habitat	Remark
E. crusgalli	Udrahulli	-do-	-do-
Eleusine coracana	—	-do-	-do- & cultivated
Eragrostis poaeoides	—	-do-	G. nut fields
E. tremula	—	-do-	-do-
Euphorbia hirta	—	-do-	Rice, G. nut & other fallow fields.
E. prostrata	—	-do-	-do-
Evolvulus alsinoides	—	-do-	Rice field
Eleocharis atropurpurea	—	Lowlying areas	Water logged areas
Fagonia cretica	—	Gravelly situation	Gomal, Kaval
Fimbrystylis miliacea	—	Lowlying area	Rice field
Flaveria australasica	—	Irrigated field	-do-
Gossypium indicum	Harllarham Ambara	Black soils	Cultivated crops
Heliotropium ovalifolium	—	Irrigated field	Black cotton soil
H. supinum	—	-do-	G. nut field
Hibiscus micranthus	—	-do-	Rice field
Heteropogon contortus	Parkehalli	Rocky, semi-rocky	Gomal, Kaval
Indigofera linnaei	—	Plain	On red soil, G. nut field
I. hirsuta	—	-do-	Gomal, waste places
I. glandulosa	—	-do-	On red soils
Ipomoea blioba	—	River bed	River bed's island creeper
Justicia prostrata		Irrigated field	G. nut field

Contd.

Name of plant	Vern, name	Habitat	Remark
Lactuca runcinata	—	–do–	Field boundries and canal bunds.
Lagasca mollis	—	Irrigated fields	On red soils, G. nut field
Leucas aspera	—	Irrigated fields	G. nut field
L. urticaefolia	—	–do–	–do–
Mollugo lotoides	—	Lowlying areas	Tank bed.
Malvastrum coromandelianum	—	Gravelly soils	Field boundaries, road side & hedges.
Merremia emarginata	—	Moist damp soil	Rice fields, Canal banks
Oldenlandia umbellata	—	Irrigated red soils	G. nut fields
Ocimum americanum	—	Plain, valley	Waste places fallow field
Oropetium thomaeum	—	Rocky	Gomal, Kaval
Oryza sativa	—	—	Cultivated crop
Panicum ripens	—	Irrigated field	Rice fields and water courses.
P. antidotale	—	—	Cultivated
Paspalidium flavidum	—	Moist places	Paddy fields
P. geminatum	—	–do–	–do–
Pavonia procumbens	Antutogari	Bunds & field boundries	Between hedges of irrigated fields.
Polygala chinensis	—	Red soils	Pgddy & G. nut field
Polypogon monspeliensis	—	Irrigated fields	Paddy fields
Portulaca oleracea	—	–do–	Saline paddy field
Polygonum plebejum	—	Marshy places	–do– & canal banks

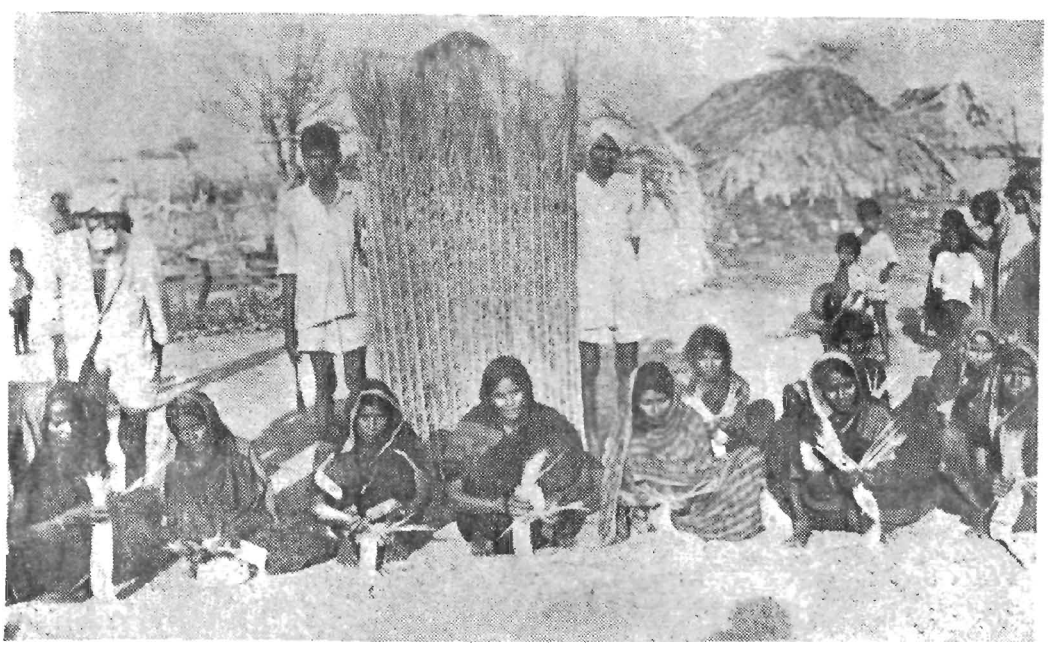
Contd.

Name of plant	Vern, name	Habitat	Remark
Phyllanthus madraspatensis	—	Moist fields	G. nut field
P. fraternus	—	Rocky, semi-rocky & sandy plain	Gomal & Kaval
Peristrophe bicalyculata	—	Plain	Below tree shades
Physalis minima	—	-do-	Canal bunds of paddy fields
Rungia repens	—	Irrigated fields	-do-
Saccharum spontaneum	—	Moist sandy places	Canal banks
Sida acuta	Bhiman kaaddi	Semi rocky & gravelly plain	Gomal, Kaval & waste places.
S. rhombifolia	Kallen gadale	-do-	-do-
Solanum surattense	—	Moist plains	Paddy field boundries
S. nigrum	—	-do-	-do-
Sonchus oleraceus	—	-do-	-do-
S. arvensis	—	-do-	-do-
Sehima nervosum	—	Semi rocky, rocky & gravelly plain	Gomal & Kaval (Rare)
Setaria glauca	—	Irrigated fields	Paddy field
S. tomentosa	—	-do-	-do-
Scripus roylei	—	Marshy place	Saline paddy fields
Sporobolus coromandelianus	—	Gravelly soils	Gomal & Kaval
S. tremulus	—	Saline soils	Tank catchment and tank bed
Stemodia viscosa	—	Irrigated fields	Paddy fields
Striga lutea	—	Black soils	Parasite on Cholam

Contd.

Name of plant	Vern, name	Habitat	Remark
Tragus biflorus	—	Rudral, gravelly soils	Roadside, Gomal & Kaval
Tephrosia falciformis	—	Gravelly soils	Gomal & Kaval, Black soil
T. villosa	—	-do-	-do-
Trianthema portulacastrum	—	Moist situation	Waste places, paddy field boundaries
T. triquetra	—	-do-	-do-
Trichodesma indicum	—	Irrigated fields	Paddy & G. nut field
T. amphlicaulis	—	-do-	-do-
Tridax procumbens	Adikesapeante	Moist situations	Waste places, G. nut field
Triumfetta rhomboides	—	-do-	-do- -do-
Tribulus terrestris	—	-do-	-do- -do-
Vernnia cinerea	—	Irrigated field	Paddy field bunds
Vinca rosea	—	—	Cultivated
Xanthium strumarium	—	Water logged & marshy places	Canal bunds and bank

MIXED CROP OF COCONUTS AND GROUND NUTS.

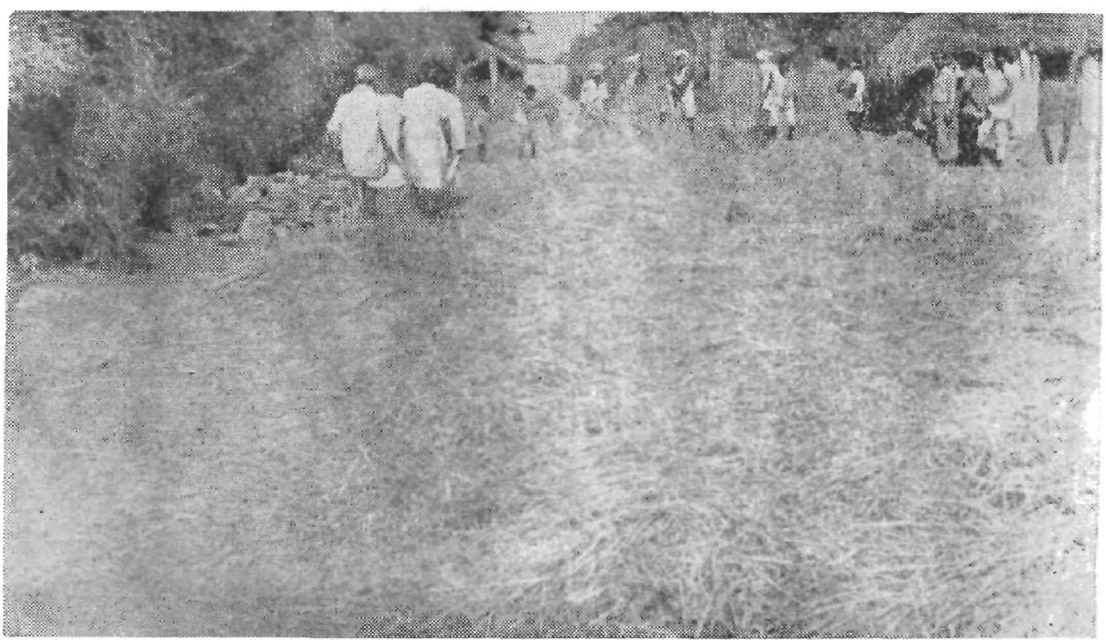


A COMMON COTTAGE INDUSTRY AMONG THE
AK'S MAT & BASKET MAKING FROM PALM LEAVES.

ARECNUTS, BEETLE LEAVES AND COCONUT GARDEN WITH THE OWNERS.

FEMALE LABOURERS AT WORK IN THE GARDEN.

THRSHED RAGI GRAINS HEAP.



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