DYNAMICS OF LAND USE IN DHARWAD DISTRICT, KARNATAKA

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CERTIFICATE

This is to certify that the thesis entitled **"DYNAMICS OF LAND USE IN DHARWAD DISTRICT, KARNATAKA,** submitted by **Mr.NAGABHUSHANA C.A.,** for the degree of **MASTER OF SCIENCE IN AGRICULTURAL ECONOMICS,** to the University of Agricultural Sciences, Dharwad, is a record of research work done by him during the period of his study in this University, under my guidance and supervision and the thesis has not previously formed the basis for the award of any degree, diploma, associateship, fellowship or other similar titles.

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Affectionately Dedicated to

My Beloved Parents

and

Akka (Atte)

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I do not think one can effectively put one's heartfelt emotions into words. It becomes all the more difficult for a person like me who is not endowed with this art. Whatever, I write here can only be a deceptive reflection of the humult of feelings that is in my heart at this moment.

When I write this, I am afraid, if these words make only mode and no substance. As formal as it is essential, I thank all those gentlemen who were directly or indirectly concerned with my studies, for what all it were worth.

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I. INTRODUCTION

Indian economy still displays overt features typical of the most of the under developed countries of the world. It is still steered by agricultural sector which continues to be dependent on the vicissitudes of monsoons. Low productivity is the hallmark of Indias agricultural sector. Therefore the situation demands abandoning the complacence on our food front and stop claiming about the self-sufficiency in food production and efforts should be made to devise the ways and means of increasing the productivity of land.

Generally, the land means the surface of the earth, the soil or the ground. But to the economists, land means not only the soil but also its properties like composition, location, fertility, the moisture and rainfall, air and light, climatic conditions, mines and minerals, forest, fisheries etc. It is more important in agriculture, as it is impossible to assume farming without land.

Land is a natural resource which can hardly be expanded. The major economic development activities in developing and developed countries rely on use of natural resources and usually have an effect on the environment. But it is disturbing to note that land and water resources have been misused due to a trial and error method and as a result the country has suffered severely.

According to the National Commission on Agriculture (1975) the food grain requirement of the population of 1000 million by 2000 A.D. will be 225 million tonnes. According to the Planning Commission the present fuel wood demand is 133 million tonnes as against the existing supply of 39 million tonnes (Hegde, 1988). The gap is feared to widen by 2000 A.D. Similarly fodder shortages are going to be acute. Presently the availability of fodder in Karnataka meets only 50 per cent of the existing demand (Hegde, 1988).

The shortages of food, fodder and fuel, both the present and prospective, call for an objective look at the inventory of our resources and plan for their judicious use.

India possesses 328 million hectares (m.ha) of geographical area, out of which only 266 m.ha. has any biotic potential. Of this, 143 m.ha. is under cultivation and the remaining 123 m.ha. comprises of forests, pastures and wastelands. Of 143 m.ha. of agricultural land, only 50 m.ha has access to irrigation (Vohra, 1988). In other words, around 93 m.ha or over two thirds of cultivated area is still rainfed.

The relative scarcity of land as a productive resource can hardly be denied. Demand for food, fodder, fuel, timber are ever increasing. Judicious use of this scarce non-renewable natural resource through proper management is the only solution to the problem of supporting over a sixth of

world's human population, over a half of its buffaloes, over a seventh of its cattle and goats with just a fortieth of its land.

Land use

The concept of land use has been defined in various ways. Sauer (1919) defined land use as the use to which the entire land surface is put. Stamp (1962) stated that the land as a whole must be so used as to satisfy as many needs and legitimate desires of the people as possible.

Based on capabilities, the land has been classified into eight classes. This classification provides information on the nature of parent material, colour, texture, structure of soil, type of clay mineral, consistency, permeability, depth of soils, soil reaction, root distribution along the depth of the profile, slope and erosion conditions. The classes of land from I to IV are suitable for regular cultivation. The class I is very good cultivable land which is deep and levelled, the class II is good cultivable land with good soil on gentle slopes subject to water or wind erosion, the class III is moderately good cultivable land with good soil on moderate slopes subject to water or wind erosion and the class IV is fairly good land with moderate steep suited for occasional or limited cultivation. The classes from V to VIII are not suitable for regular

cultivation. The class V is good productive mountain meadows which are very well suited for grazing, the class VI is also well suited for grazing (or forestry) in steep lands subject to erosion or for forestry in flat lands which are permanently wet or subject to overflow, the class VII is fairly well suited for grazing or forestry having very steep lands, and lastly the class VIII is suited only for wild life, recreation and protection of water supplies.

Siddiqi (1992) suggested the following bases for land classification.

i) Land classification on the basis of soil fertility
ii) Land classification on the basis of land capability
iii) Land classification on the basis of economic land use.

Till 1949-50, the land area in India was classified into five categories known as the five-fold land utilization classification.

The five categories were: Forests, Area not available for cultivation, Other uncultivated land excluding current fallows, Fallow lands and Net Area sown.

This five-fold classification was however, a very broad outline of land use in the country and was not found adequate enough to meet the needs of agricultural planning in the country. The States were also finding it difficult to

present comparable data according to this classification owing to lack of uniformity in the definitions and scope of classification covered by these five broad categories. To remove the non-comparability and to break up the broad categories into smaller constituents for better comprehension, the "Technical Committee on Co-ordination of Agricultural Statistics", set up in 1948 by the Ministry of Food and Agriculture, recommended a nine-fold land use classification replacing the old five-fold classification, and also recommended standard concepts and definitions for all the States to follow. The revised classification has been accepted in principle by all the States and has been adopted since 1950-51. The nine categories are Forests, Land put to non-agricultural uses, Barren and uncultivable land, Permanent pastures and grazing lands, Miscellaneous tree crops and groves not included in the net area sown, Cultivable waste, Fallow lands other than current fallows, Current fallows and Net area sown.

Land utilization in India and Karnataka

The data pertaining to land utilization both for India and Karnataka for 1984-85 have been presented in Table 1.1 A perusal of the table shows that about 99 per cent of the total geographical area of Karnataka was reported, which is comparatively higher than that of the country (93 per cent),

Table 1.1 : Land utilisation : Karnataka vis-a-vis India, 1984-85

(Area in 1000 ha)

Sl. No.	Category	India	Percen-tage	Karnataka	Percen-tage
1	Reporting area	304320	93.00*	19050	99.00*
2	Forest	67157	22.10	3047	16.00
3	Area net available for cultivation	40476	13.30	1963	10.20
3.1	Barren and un-cultivable land	20008	6.60	814	4.30
3.2	Land put to non-agricultural users	20408	6.70	1149	6.00
4	Other unclutivated land (excluding fallow land)	31057	10.20	2001	10.50
4.1	Permanent pastures and other grazing land	11934	3.90	1193	6.30
4.2	Miscellaneous tree crops and groves not included in NAS	3385	1.10	339	1.80
4.3	Cultivable waste	15738	3.20	169	2.00
5	Fallow lands	24915	8.20	1489	7.80
6	Net area sown (NAS)	140715	46.20	10549	35.40
7	Area shown more than once	35240		1110	
8	Gross area sown (GAS)	175955		11659	
9	Cropping intensity (%)	125.00		110.5	

Source - DES, Bangalore and observer Research Foundation, New Delhi.

Note :

* - Percent of total geographical area
% - Percent of Reporing area

indicating the prevalence of a better and well established reporting system. The area under forests (16 per cent) was found to be lower in the State as compared to that in the country (22.1 per cent). The proportions of other uncultivated land (excluding fallow land) in the State and the country were almost same. However, the percentage of permanent pastures to the reporting area was found to be higher (6.3 per cent) in the State as compared to the country (3.9 per cent).

The net area sown is comparatively higher in the State (55.4 per cent) than in the country (46.2 per cent). The area sown more than once in the State was found to be very low (10.5 per cent) when compared to that in the country (25 per cent). Consequently the cropping intensity was lower in the State (110.5 per cent) than in the country (125 per cent).

In Karnataka, out of the total geographical area of 19.22 m.ha, the reported area is 19.05 m.ha (1989-90), constituting 99.12 per cent of the total. Land utilisation in Karnataka from 1960-61 to 1989-90 is presented in Table 1.2.

There is a certain degree of change in the land utilisation pattern over the period. Area under forests, non agricultural uses and current fallows are increasing. The intensity of cultivated area is also increasing over the period. But areas under permanent pastures and other grazing land, miscellaneous tree crops, cultivable wastes are declined.

Table 1.2 : Land utilisation in Karnataka

(Area in 1000 ha)

Sl. No.	Category	1960-61	1970-71	1980-81	1989-90	% change 1960-61 to 1989-90
1	Reporting	19190 (100.00)	19135 (100.00)	19050 (100.00)	19050 (100.00)	-0.73
2	Forests	2709 (14.10)	2590 (15.10)	3033 (15.90)	3074 (16.10)	13.47
3.1	Barren and Uncultivable land	923 (4.80)	839 (4.40)	844 (4.40)	799 (4.20)	-13.43
3.2	Land put to non agricultural uses	812 (4.20)	938 (4.90)	1066 (5.60)	1183 (6.20)	45.69
4.1	Permanent pastures and other grazing land	1739 (19.10)	1619 (8.90)	1345 (7.10)	1100 (5.80)	-36.75
4.2	Miscellaneous tree crops and groves not included in NAS	366 (1.90)	311 (1.80)	343 (1.80)	377 (1.70)	-13.39
4.3	Cultivable waste	656 (3.40)	615 (3.20)	502 (2.60)	447 (2.30)	-37.86
5.1	Fallow land other than current fallows	513 (2.60)	627 (3.30)	558 (2.90)	403 (2.10)	-21.44
5.2	Current fallows	835 (4.40)	811 (4.20)	1459 (7.70)	1019 (5.30)	22.04
6	Net Area Sown (NAS)	10138 (52.80)	10248 (53.60)	9898 (51.90)	10708 (56.20)	5.62
7	Area sown more than once	451	639	761	1407	211.97
8	Gross Area Sown (GAS)	10588	10887	10660	12115	14.42
9	Total geographical area	NA	19177.30	NA	19220.00	——
10	Percent of (9) reported	——	99.78	——	99.12	——

Source - DES, Bangalore.

Note : Figures in the parenthesis indicate percentage to total reporting area

These are the combined results of increasing population at the same time increased developmental efforts of the government.

For improving land utilization pattern, Governments have launched many development programmes. To mention a few, Drought Prone Area Programme (DPAP), River Valley Programme (RVP), Tree Patta Scheme, Jawahar Rozgar Yojana (JRY), Wasteland Development Programme and Watershed Development Programme are operating. These programmes are concentrating on one or the other activities like soil and moisture conservation, afforestation and pasture development, restructuring of cropping pattern, management of irrigation, restoration of degraded ravenous areas, planting of trees on community lands and alongside roads and canals.

Significance of Land use studies

Agricultural land use is constantly changing with time. The land use pattern of a country or a region at any particular point of time is determined by the physical, economic and institutional framework and their interplay over a period. In other words, the existing land use pattern in different regions is a result of action and interaction of various factors such as the physical characteristics of land, institutional framework, Government policies, the structure of other resources available and location of the region in relation to other aspects of economic development. In the

dynamic context, keeping in view quantity and quality of natural endowments and recent advances in technology the over all interests of a country may dictate a certain modification of, or a change in the existing pattern of land use. The trends during recent years will help to suggest the scope for planned shifts in the patterns.

Land use studies are of paramount importance when the resource base of any region is under evaluation. Rational use, conservation and management of land resources play crucial role in developing the agricultural economy of any region. Hence, a scientific study of land use is a prerequisite for rational land use.

With this background, the present study is undertaken in Dharwad district with the over all objective of studying various land use categories over the years. The specific objectives of the study are-

1. to identify the clusters of taluks based on land use categories in Dharwad district.
2. to study various land use patterns in identified clusters.
3. to analyse the dynamics of land use pattern over a period.
4. to suggest measures for better land use.

Presentation of the study

The study is presented in six chapters.

Chapter-I deals with introduction to the topic and objectives of the study.

Chapter-II contains review of literature relating the objectives of the present study

Chapter-III Describes the main features of the study area, nature and sources of data, analytical techniques employed. The terms and concepts used in the study are also presented in this chapter.

Chapter-IV The results of the study are presented in this chapter.

Chapter-V In this chapter the results of the study are discussed in detail.

Chapter-VI Provides a brief summary of the main findings of the study.

II. REVIEW OF LITERATURE

II. REVIEW OF LITERATURE

This chapter presents review of the research work carried out so far on land use. The reviews are presented under the following heads :

1. Land use studies
2. Tools and techniques employed

2.1 Land use studies

Land utilization caught the attention of researchers as early as the sixties and various approaches were adopted to study the use of land resources among competing alternatives. In view of the food problem faced by India in the early fifties and sixties the research investigations into effective utilization of scarce resources, particularly land, came into the focus.

Giri (1966) analysed time series data on the land use over 13 years (1950-51 to 1963-64) to examine the changes in land use pattern in India. The changes in land use from crop enterprises to non-agricultural uses, from forests to cultivation, from cultivation to pastures and tree crops as well as the changes in land under fallow and waste were analysed.

Sau (1968) analysed the use of agricultural land among the competing alternative enterprises. He classified the various approaches broadly into two categories. The first category included those models which treated the use of land as a function of factors such as price, yields and rainfall, which the author called indirect effect. The second category of models treated relative profits as the guiding factor in land utilization and this factor was termed direct. The author built up two models which were essentially direct in their approach based on the principle of profit maximization.

Singh (1977) attempted to outline a strategy for integrated use of land and other resources in the hill regions of Uttar Pradesh, using the linear programming technique. The study was conducted in a watershed area. The existing land use pattern of watershed, according to the study, was not based on land capability considarations and as a result land resource base of the region had been deteriorating over time. However it was concluded that substantial potential existed in the region for increasing farm income and employment by proper land use planning and management on a watershed basis.

Nadda *et al.* (1978) optimised the crop production pattern in different agroclimatic zones of Himachal Pradesh using the linear programming method. The findings indicated sub-optimality in resources allocation including land, specially in the lower and middle hills where diversification

of agriculture was observed. The normative cropping pattern tended towards specialisation. It was also found that the labour was surplus and the credit was scarce.

Ratnam *et al.* (1978) studied land use planning in southern Karnataka and its relevance to agricultural policy. With the help of a macrolevel optimization model the authors delineated optimal cropping and land use pattern for different agro-climatic regions in Karnataka. The results indicated that with rational re-organisation of resources the same level of output could be produced by saving a net of 35.65 per cent of land resource.

Nadkarni and Deshpande (1979) assessed the magnitude of under utilization of land in the form of land under current fallow, other fallow, culturable waste and net sown area in Karnataka and Maharashtra states. According to them, there was an increase in the current fallows and culturable waste during the drought years. They also used regression equations by taking current fallows as dependent variable and the rainfall during May June and the rainfall during July-August, the proportion of net irrigated area to net sown area and the annual rainfall as independent variable to explain the behaviors of current fallow. The irrigation turned out to be a significant variable. The explanation offered by the authors was that, an increase in the proportion of irrigation led to an

increase in the proportion of current fallows. They concluded that, so long as drought district did not have irrigation, it tried to do its utmost through extensive cultivation, but, once there is irrigation on a farm, possibility arises of using the limited resources intensively on irrigated portion, which could result in an increase in current fallows.

Bora (1983) analysed the land utilization data in Assam for 27 years from 1951-52 to 1977-78 and concluded that the area under forest in the state has declined by 40.86 per cent over the period. This declining trend has been contributed by several factors like the extension of cultivation in the forest land, illegal encroachment of industries, development of new townships, use of forest land for defence purposes, practice of shifting cultivation and resettlement of land less and erosion affected people.

Das (1983) studied the regional distribution and trends in area, production and yield of forest in Bihar. He reported that there has been a continuous decline in the area under forests in Bihar. The reason attributed was the unscientific and over exploitation of forests. The private contractors with the connivance of the Government Officials have been engaged in indiscriminate felling of trees to get the maximum gain. Lack of a cheap alternative fuel resources was also responsible for the fall in the forest areas. Another factor which has caused a fall in the forest area was the

conversion of forest area into cultivable area and its distribution among adhivasis and other tribes. This is evident from the fact that there has been a slow but continuous increase in the net sown area in the state.

Joshi and Agnihotri (1983) made an ex-ante assessment of afforestation for fuel wood on waste lands in village Katlehari of district Karnal in Haryana. They reported that afforestation for fuel wood on waste lands of village panchayat would provide a key to economic prosperity in the country which besides meeting the fuel wood demand, would enhance food production, save tremendous soil nutrients, generate creative employment opportunities, increase the income of poor strata of rural population and narrow the income inequalities. The afforestation programme would also, be helpful in conserving the world's fuel resources, wage a war on waste lands and create a dynamic rural environment.

The success of afforestation programme however, depends on the social will and participation of the entire society to exploit the potential of existing resources. This requires efforts on proper education of the village community about the short and long run social benefits and make the society ecologically conscious.

Rao (1985) studied land use in Andhra Pradesh during 1955-56 to 1979-80. He reported that the net area sown

dominates the broad pattern of land use and declined by 0.41 per cent per annum during the study period. In order to maintain the ecological balance more area needs to be brought under forest cover. As a result of green revolution, the area under permanent pastures, cultivable waste and miscellaneous tree crops, are not included in net area sown has declined considerably. Land put to non-agricultural uses was considered likely to expand with increasing industrial development. Thus gains in cultivated area resulting from reclanation of waste and fallow lands are likely to be neutralized by increasing in land put to non-agricultural uses. In addition, the land which have been taken away from agriculture is generally of high grade while that being reclimed is of low to medium quality. It was concluded that intensification and diversification of agriculture rather its expansion should be the central theme of agricultural planning in the state.

Kumar (1986) worked on land use analysis in Nalanda district of Bihar. A critical analysis was made on various aspects of agricultural land use with particular emphasis on cropping intensity, diversity of cropping and crop combination.

Bowonder and Prasad (1987) worked on Afforestation in India : Policy and strategy reforms. They made an analysis of existing situation and possible policy intervensions and indicated that deforestation will continue if only marginal

changes are introduced. Unless comprehensive policy and strategy reforms are implemented, farming capability and soil system will be irreversibly degraded. There is need for both drastic structural change and organizational reforms in land use management for the existing land and a package of measures to recover degraded land and reduce land use conflicts.

Pandey and Tewari (1987) studied some ecological implications of land use dynamics in Uttar Pradesh. The results revealed that the forest area in the State has grown at a very slow rate of 0.7 per cent, virtually all of which has occurred in the hill region. There has been no significant growth of forest area in the plains. A declining growth was found in usar and other barren lands particularly in the hill areas, and also in the culturable waste lands in the plains. The net cultivated area has remained unchanged throughout the State, except for a marginal decline in the Eastern region. The increase in fallow lands, in general, was almost fairly at high rates causing a serious concern from the view point of both agricultural growth and ecological balance as such lands fastly get converted over time into usars. It was observed that substantial land shift have taken place from usar and other barren lands, to other sector throughout the State. From the aggregate State data, it appeared that almost half of the such land released is going to the non-agricultural sector.

Kanauer (1989) discussed the ecological advantages of `set aside' fields and the management of these areas. Area under rotational fallow growing a single species of grass or legumes are of less ecological importance than long term fallows with natural and induced plant successions. The maintenance of fallows follows the individual ecological needs. Environmental factors such as the filter effect if the fallow is situated between a cultivated field and a water course need to be considered.

Prudhvi *et al.* (1989) studied on lands of moderate to steep slopes, the environment of which is degenerating due to excessive erosion as a result of indiscriminate felling of forest and inappropriate land use. These inturn are responsible for excessive run-off that brings serious down stream problems such as silting and flooding. Morphometric analysis, forest cover and land use area measurements form the nucleons of the qualitative land evaluation exercise.

Bills (1990) reported that early settlement of New York State centered around farming and the acreage used for agricultural purposes increased untill the early 1990's. Some 13 million acres have gone out of agricultural use during this century. Most of this has reverted to natural forest but a portion has been used to accommodate population expansion and growth in non-farm economy. During 1970, non-metropolitan areas in USA realized faster rates of population growth than

metropolitan areas. Decentralized manufacturing and commercial activities have developed and many thousands of people have moved to rural or small town locations to capitalize on lower living costs and for a variety of non-economic, quality of life reasons. Evidence suggested that in communities experiencing rapid growth and economic development, crop land contributes a disproportionately large share of the acreage canverted to urban uses.

Pal and Mruthyunjaya (1990) reported that more than 20 million people and 23 million live stock inhabit the arid regions of India. Despite official efforts to develop the area, productivity levels remain very low, encouraging regular migration of upto 3 million people at a time. Study viewed the arid areas as potentially useful, provided policies are implemented to utilize the waste lands that have so far been neglected by the authorities. An analysis of land use dynamics vis-a-vis waste land in the State of Rajasthan, revealed that highly unstable output levels lead to fluctuating incomes which inturn result in extensive cultivation, environmental degradation and once again, uncertain production. It was argued that the development of forest and grass land into silvipastures can break this vicious circle as it will result in the maintenance of the ecological balance and a harmonious relationship between community and commercial forestry.

Ramanaiah and Reddy (1990) reported that, the importance of the forest land use in Anadhra Pradesh is second only to agriculture. In 1978-79 it accounted for 22.7 per cent of the total geographical area of the State. The increase in the percentage of forest land in the State during the period 1963-64 to 1978-79, was negligible (only 0.4 per cent). This increase has been achieved due to the efforts of the State Government which launched schemes of afforestation, conservation and plantation of economically useful plants in the open scrub lands and old forest area. The non-cultivable land in the State showed an increase from 14.9 per cent in 1963-64 to 16.4 per cent in 1978-79 showing a net increase of 1.5 per cent. Between 1963-64 and 78-79 percentage of cultivable wasteland in the State has decreased by 1.8 per cent and the arable land in the State showed a marginal decrease of 0.1 per cent.

Singh (1990) studied the pattern of land utilization in problematic area of all five agroclimatic regions of Uttar Pradesh during the agricultural year 1988-89. The study revealed that the Hill Region has the highest area under forest, permanent pastures, grazing land, tree crops and groves, non-cultivable waste lands and land put to non-agricultural uses which presently lying unused or was not being used to its optimum potential due to certain constraints. The area sown more than once and the total cropped area as well as

the intensity of cropping have been found the highest in the Eastern Region and the lowest in the Hill Region. Bundel Khand Region has the highest potential for the expansion of cultivable area because it has the highest area under cultivable waste land. The slopes of the hill areas of Uttar Pradesh can be successfully developed for the plantation of temperate fruits like apples, pears, walnuts, apricots, peeches and plums.

Dahiya *et al.* (1991) studied changing profile of agricultural economy in Himachal Pradesh using secondary data. The data were analysed on the basis of simple statistical tools, namely, averages, percentages, coefficient of variation and the annual compound growth rates. They suggested that State should strive to achieve the critical minimum level of forest cover and soil conservation as a continued policy for checking the alarming increase in uncultivable waste lands and it must be a priority item on the future agenda for agricultural development in Himachal Pradesh.

Joshi and Prasad (1991) studied on optimal utilization of village community lands for sustainable development in Haryana. They reported that the State has large tracts of waste land in hands of village panchayats and its population is heavily dependent on its scarce forest and grazing land resources. Data were collected from the Karnal district and a linear programming technique was used to find an

optimal land use pattern with the objective of maximizing the incomes and meeting the basic needs of rural population.

Analysis revealed that the community lands have considerable potential for generating income as they are suitable for the production of crops as well as being a source of fodder and fuel wood. To achieve these objectives there is a need to educate the rural community with the help of suitable organizational and institutional action and create greater awareness with in it about the benefit of utilizing common land effectively.

Rathna Reddy (1991) studied under-utilization of land in Andhra Pradesh; its extent and determinants over the period, 1955-56 to 1987-88. The categories of under utilized land covered in the study were current fallow, other fallow and cultivable waste. He reported that the increase in the under-utilized land is more prominent in the drought prone districts and marginal increase in non-drought prone districts. The analysis suggested that under utilisation of land was associated with irrigation (especially well irrigation), tractors and commercialisation. This could be attributed to the inability of farmers to adjust to the higher demand for resources.

Shrivastva *et al.* (1991) studied dynamics of land use and cropping pattern in Tawa command area of Hoshangabad

district of Madya Pradesh. They assessed the impact of the Tawa irrigation project, on cropping patterns and land use in the area during the pre-project period (1970-71 to 1974-75) and the post project period (1975-76 to 1979-80). They observed that main feature of land use in the area was decline in forest land as a result of illegal felling of trees for domestic purposes, they also observed that fallow land was increased since the introduction of Tawa irrigation project.

Vaidya and Sikka (1991) studied the land utilization pattern in Himachal Pradesh using the secondary data. The changes in land use pattern have been evaluated for the period 1966-67 to 1986-87. They observed that there has been no uniform trend in the changes in the land use classes. Over time, the area under forest has increased, while in certain other categories it has shown a decrease. The actual land use pattern has been projected for the year 2000 A.D. on the basis of the compound growth rates calculated for the period under reference. The analysis revealed that the area under all categories excepting current fallow would show an increase.

2.2 Tools and Techniques employed

Krishnaraja (1980) examined the methodological issues in measuring the agricultural growth. According to him, though R^2 is not a very reliable guide to choose the correct functional form, the common procedure is to choose the form of

regression that gives the highest value of R2 from among a set of pre specified trend functions.

Sastry (1983) used cluster analysis of B-coefficient method (co-efficient of belonging) in order to asses the effect, if of the changes on the crop regions over the period, considering the area allocation to the 16 selected crops. He reported that land use efficiency improved not only in quantitative but also qualitative terms as indicated by the increased cropping intensity and changes in cropping pattern particularly in favour of non-food crops. He also reported that the prevalence of current fallows appeared to be due to unfavourable weather conditions, where as the existence of long fallows partly due to the pattern of holdings and the reform legislation in the State conferring ownership rights to the tenants.

Shankaramurthy (1986) while evaluating the performance of Karnataka State co-operative Marketing Federation employed compound growth rate analysis for the selected financial and physical indicators. The exponential function of the form $Y=ab^t$ was used.

Hegde (1993) evaluated the performance of the Karnataka Co-operative Oil Seeds Growers Federation Limited. He employed the exponential function of the form $Y=ab^t$ where in he estimated the growth in membership, share capital, owned funds etc.

Pattanashetti (1993) applied cluster analysis technique (B-coefficient method). For the purpose of regionalisation of Karnataka State Social Forestry Project for finding out the clusters of different districts of karnataka, based on the data available on the achievement of different components of Social Forestry Project viz., plantations in Gomal land, in C and D class lands, Tankforeshore, canal bank, bamboo plantations, and farm forestry.

III. METHODOLOGY

III. METHODOLOGY

This chapter deals with description of the study area, the nature and sources of data and the various tools and techniques employed in analysing the data and interpreting the results. At the end of this chapter, the important terms and concepts used in the study are also mentioned to facilitate a clear understanding.

3.1 Description of the Study Area

3.1.1 General description

Dharwad district is situated in the Northern part of Karnataka State. It is one of the biggest administrative districts of Karnataka, consisting of 17 talukas, the highest figure in the state and is situated at 14°-50' and 14°-50' North latitude and 74°-48' and 76°-00' East longitude. The altitude of the district ranges between 365 to 730 metres from M.S.L. The district has an area of 13,738 sq.km. and population of 22,79,259 as per 1991 census.

Its greatest length is 163.2 km from North to South and its greatest breadth is about 115.2 km from West to East.

The district is surrounded by Belgaum and Bijapur districts in the North, Raichur and Bellary on the East, Chitradurga and Shimoga on the South and Uttara Kannada to the

West. Two major rivers, namely, Malaprabha and Tungabhadra and minor rivers like Kumadvati, Varadha, Shalmala and Dharma are flowing in the district. For a length of 25.6 kms on the North, the Malaprabha separates the distinct from Bijapur district and for about 128 km on the East and in the south, Tungabhadra flows in between Dharwad on one side and Shimoga on the other.

The entire district is divided into four administrative sub-divisions viz., Dharwad, Gadag, Haveri and Savanur.

3.1.2 Dharwad Landscape

The relief in this district is marked by chains of low hills, occasional scrap lands, isolated "hogbaks" and narrow meandering valley courses. The hill ranges run through the strike of the Dharwad out drop, with a general North-East and South-West trend. More often, they develop bulging sides, a creast line of peaks and saddles, a much eroded face especially on the west, and a poor soil and vegetation cover. At places, the land-scape consists of "Scrap lands", as on the western side of the Dharwad town. These generally develop flat tops, and present a gradual slope towards the black soils plain, but on the west end, abruptly in escarpments to reach the valley levels below. Isolated hills like Unakalgudda near Hubli and the hill of Rayapur mid way between Dharwad and

Hubli, wear the typically, "hogback" appearence with bulging sides, a sharp creast and convex spurs on both ends. But the land scape of this sahyadrian region derives its significance and peculiarities mainly through numerous valley courses which separate and often determine the more elevated and forms of hill ranges, scrap lands and "Hogbacks".

3.1.3 Climate

The district has warm climate and temperature during the summer is around 95 °F and it ranges between 55°F to 60°F in western part of the district. However, the malnad tract and the western side of the district have a pleasant climate throughout the year except between February and May.

3.1.4 Rainfall

The annual average rainfall of the district is 64.9 cms and the rainfall varies from about 45 cms near Mundargi in the East to cover 90.00 cms to the west of a line going through Kalaghatagi and Hangal. There is a small area in the North near Naragund with a rainfall of about 50 cms to 55 cms. The increase in the rainfall in the west is rapid after a line running through Hubli and Bankapur. It is likely that a small area near the western border of the district may have rainfall of over 100cms. However, the rainfall is heaviest in the western region of Malnad tract which gradually decreases towards the East.

The major rainy months are from May to October. Rainfall over 2.5 cms is also received in April and November. April and May are the months of thunder showers. The South-West monsoon sets in this district in the first week of June and is replaced by the North-East monsoon in October and November. The western part receives 60 to 70 per cent of the total rainfall of the year in the South-West monsoon months from June to September, and the rest between 50 to 60 per cent during the remaining part of the year. About 15 to 25 per cent of the rainfall is received during October and Novermber. This is least in the Western part, rising about 25 per cent in the Eastern part of the district.

There are two major seasons in the district namely Kharif and Rabi. In recent years, summer crops are also raised where irrigation facilities are available.

Crops

The main kharif crops of the district are Rice, Maize, Jowar, Tur, cotton (DCH-32), Groundnut, Potato, Brinjal, Bhendi, Niger, Castor, Tobacco, Sugarcane, Chillies, Cuccurbits and leafy vegetables.

3.1.6 Soils

The soils of the Dharwad district are formed from the mixture of decomposed rocks of all types and found distributed all over the district. They are generally grouped as follows.

Soil types		Local terms	% of area
1. Black soil	——	Yeri bhumi	70
2. Brown soil	——	Hulakeri bhumi	20
3. Red soil	——	Kenga bhumi	10
4. Paddy soil	——	Bhattada bhumi	
5. Sandy soil	——	Maralu bhumi	
6. Alluvial soil	——	Ondu bhumi	

3.1.7 Regionalisation of Dharwad district

Considering physio-geographic features; the soils, rainfall, cropping pattern and irrigation facilities etc., Dharwad district can be broadly grouped into four regions (Figure 3.1). Taluk is considered as the unit. Taluks included, average annual rainfall and major crops grown under different regions are presented in Table 3.1.

3.2 Sampling Procedure

3.2.1 Selection of the district

Dharwad is the biggest administrative district in Karnataka having different types of soils, crops and agro-

Table 3.1 :: Regionalisation of Dharwad district

Sl. No.	Regions	Taluks	Average annual rain fall	Major Crops
1	Malnad Region	Kalghatagi, Hangal, Hirekerur	87.5-100 cm	Rice and Sugarcane
2	Trasitional Region	Dharwad, Shiggaon, Byadgi	62.5-75 cm	Cotton, Jowar, Onion, Wheat and Pulses
3	Dry-irrigated Region	Navalgund, Naragund, Ron	< 62 cm	Cotton (DCH-32), Jowar, Onion, Wheat and Rabi Jowar
4	Dry Region	Hubli, Kundagol, Mundargi, Gadag, Shirahatti, Savanur, Ranebennur & Haveri.	< 62 cm	Rabi Jowar, Cotton (Jayadhar) Wheat & Pulses

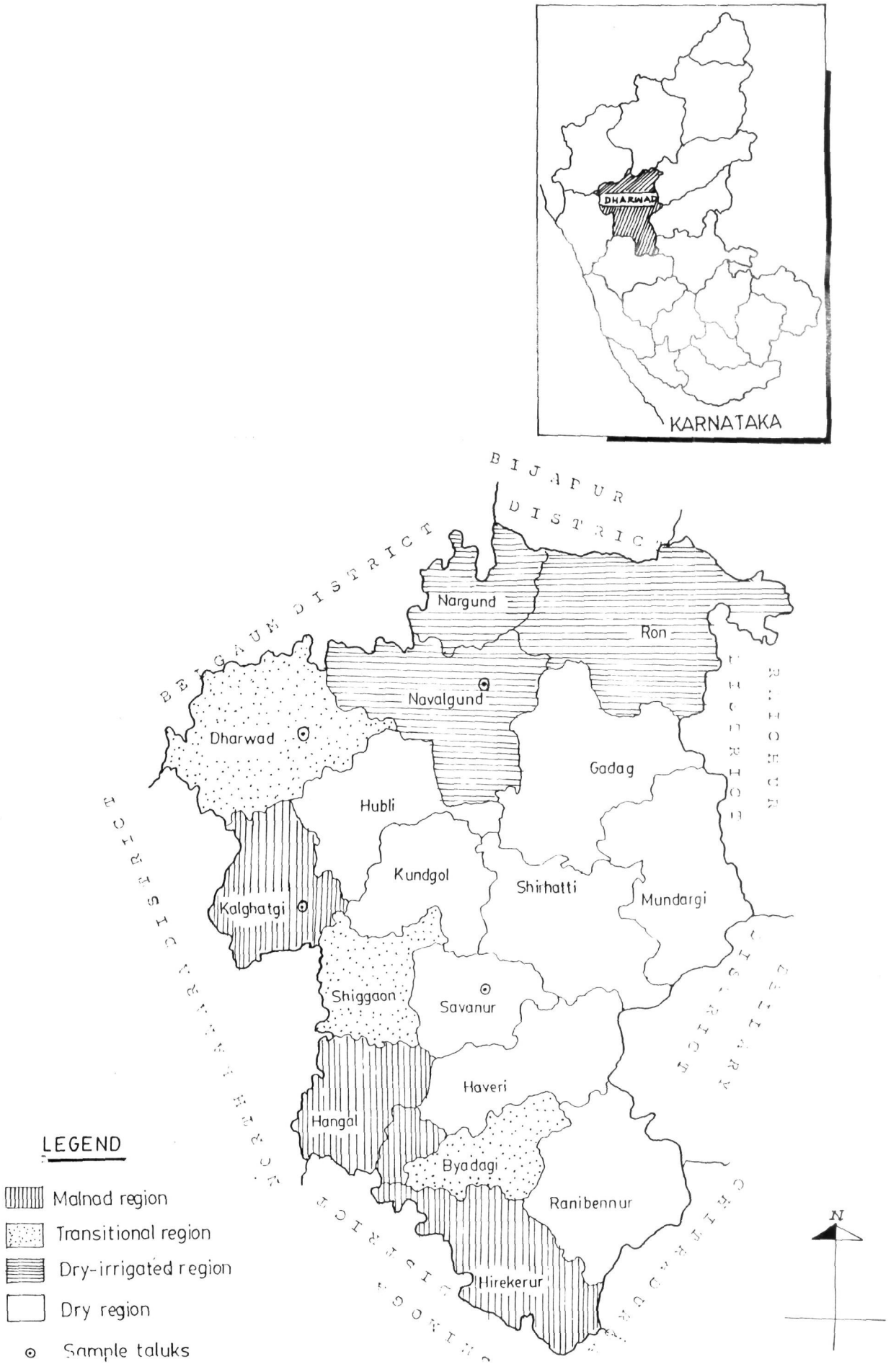

Fig. 3.1 REGIONALISATION OF DHARWAD DISTRICT

climatic conditions. This is one of the districts having the most efficient land recording system in the country. This type of study on land use has not been done earlier. So Dharwad district was purposively selected for the present study.

3.2.2 Selection of taluks

To study the pattern of land holdings, land capabilites, productivity levels and opinions regarding perennial crops, four taluks were selected, namely Kalaghatagi, Dharwad, Navalgund and Savanur representing Malnad, Transition, Dry-irrigated and Dry regions, respectively.

3.2.3 Selection of Villages and Farmers

In each taluk 9 circles were selected at random. In each circle one village was selected randomly for collecting the information.

In each village so selected, a fixed size of 5 farmers were selected randomly. Totally 45 farmers were interviewed in each taluk. So the total sample size constituted 180 farmers. Afterwards in each taluk they were post classified into 3 size groups namely small, mediium and large of size 15 farmers in each group by arranging them in assending order based on their land holdings.

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* The group of villages coming under one agricultural assistant as prescribed by the Department Agriculture, Karnataka.

3.3 Nature and sources of data

For achieving the objective of the study, the secondary data were collected from the District statistical office, Dharwad.

The Taluka wise data on total geographical area, area under different categories of land, area sown more than once, total cropped area were collected for a period of 21 years from 1971-72 to 1991-92.

The primary data was collected from 180 farmers. To suggest measures for better land use, the primary data were collected through personal interviews, with the help of a structured and pretested schedule. The data collected relates to size-wise pattern of holding, size-wise productivity of land in different regions, size-wise land capabilities in different regions and opinion of the farmers regarding perennial crops. The data so collected pertained to the agricultural year 1992-93. The information was collected from 180 farmers in 4 taluks, 45 farmers in each taluk.

3.4 Analytical Techniques employed

For the purpose of studying the objectives, the data were analysed using following techniques.

1. Tabular Presentation.
2. Cluster analysis.
3. Compound growth rate.
4. Correlation.

3.4.1 Tabular Presentation

The technique of tabular presentation was followed for estimating cluster-wise land use pattern in different periods.

3.4.2 Cluster analysis*

This is a simple form of correlation analysis. In this analysis each variable as a unit usually is placed in a cluster. This places each variable in only one category. The procedure followed here uses Tryons modification of Holfinger and Harmon's B-coefficient (Coefficient of belonging). The B-coefficient gives the ratio of the average inter-correlation of the variables in a cluster to their average correlation with the variables not included in the cluster.

The analysis starts with a zero-order correlation matrix of the variables to be clustered. The clustering starts with two variables which correlates highest and keeps adding variables until the B-coefficient shows a marked drop. Holfinger and Harmons (1941) have arbitarily set the minimum significant value of a B-coefficient at 1.30, although of course the goal is to obtain the highest possible set of meaningful B-coefficient.

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* For further details, the reader is reffered to Frutcher (1989), Introduction to Factor Analysis, East West Press, New Delhi, pp. 280.

In the present study cluster analysis was done to cluster the taluks taking area under different categories of land in a given period as variables. The variables considered were Area under forest, Land put to non-agricultural uses, Barren and uncultivable land, Cultivable wastes, Permanent pastures, Land under miscellaneous tree crops, Current fallows, Other fallows, Net area sown, Total cropped area snd area sown more than once. This was done for 3 periods, Period I, Period II and Period III considering area under different categories of land in each taluk in 1971-74, 1982-85, and 1988-91 triennium averages respectively.

3.4.3 Compound growth rate analysis

To know the changes in area under different categories of land in each taluk and also in the district, compound growth rates were estimated.

An exponential function of the following type was employed to estimate the growth rate.

$$Y_t = AB^t \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

where,

Y_t = area under a particular category of land in a particular taluk in the year t.

A = Intercept indicating Y in the base period (t=0).

B = (1 +g)

t_i = Time period where i = 1 to 21.

Annual average compound growth rate

g = (b-1) 100

3.4.4 Correlation analysis

Competition between different categories of land use make land use orientation rather dynamic. In this context, it is very necessary to examine the direction in which the mutual

transference of land uses have taken place. Here an endeavour is made to make correlation analysis to understand whether the mutual relationship has happened between two land use categories by interchanges. The intercorrelations were calculated between forest, Net area sown, cultivable waste and land not available for cultivation (non-cultivable). The area under these categories between 1971-72 to 1991-92 (21 years) were considered for this analysis. To study the shift between the two categories of land, only negative correlation values were considered. After wards, by looking to the actual data, the direction of the shift was studied.

These correlation values were tested for significance by using the following formula,

$$t_{(n-2)} = \frac{r\ (\sqrt{n} - 2)}{\sqrt{1 - r^2}}$$

where

n = number of observations

r = correlation value

3.5 Terms and Concepts

1. Forests

Area under forest includes all lands classed as forest under any legal enactment dealing with forests or administered as forests whether state - owned or private, and

whether wooded or maintained as potential forest land (Revised definition as per ministry of Food and Agriculture, GOI's letter Number F-3-5 /66-LRI-ES, dated 10th March 1966).

2. Land put to non-agricultural uses

All lands occupied by buildings, roads, railways or under water (rivers and canals) and other lands put to uses other than agriculture.

3. Barren and uncultivable land

All barren and uncultivable land like mountains, desserts etc land which can not be brought under cultivation unless at higher cost, should be classed as unculturable, whether such land is in isolated blocks or within cultivated holdings.

4. Cultivable waste

All lands available for cultivation whether not taken for cultivation or abandoned after a few years for one reason or the other, such lands may be either fallow or covered with shrubs and jungles which are not put to any use. They may be assessed or unassesed and may be in isolated blocks or with in cultivated holding. Land once cultivated but not cultivated for five years in succession shall also be included in this categories.

5. Permanent pastures and other grazing lands

All grazing lands, whether they are permanent pastures and meadows or not., village common and grazing lands within forested areas shall be included under this head.

6. Land under miscellaneous tree crops and groves not included in net area sown

All cultivated land which is not included in net area sown but ~~it is~~ put to some agricultural uses, land under casuarina trees, thatching grass, bamboo bushes and other groves for fuel etc., which are not included under orchards shall be classed under this category.

7. Current fallows

Cropped area which is kept fallow during the current year for example if any seeding area is not cropped again in the same year, it may be treated as current fallow.

8. Other fallow land

All lands which were taken up for cultivation but are temporarily out of cultivation for a period of not less than one year and not more than five years. The reasons for keeping these lands fallow may be one of the following (1) Poverty of the cultivator(2) Inadequate supply of water (3) Malarial climate (4) Silting of canals and rivers and (5) Nonremunerative nature of farming.

9. Net area sown

This should represent net area sown with crops, the are sown more than once during the year being counted once.

10. Total cropped area

Total area covered with crops, is the sum total of areas covered by all the individual crops and area sown with crops more than once during the year being counted as separate areas for each crop.

11. Area sown more than once

Area on which more than one crop cultivated during each agricultural year. This should be obtained by deducting net area sown from total area cropped.

12. Cropping intensity

It reffered to the traditional method of computing the cropping intensity, that is, by dividing the gross cropped area by the net sown area. In this method, the number of times a crop was seeded assumed importance rather than the occupancy of the land by the crop.

$$\text{Cropping intensity} = \frac{\text{Gross cropped area}}{\text{Net cropped area}} \times 100$$

13. **Land not available for cultivation**

Barren and uncultivable land and land put to non-agricultural uses together accounted for land not available for cultivation.

14. **Cultivable waste land**

The cultivable waste land is defined as the land which has potential status to raise the crops with in the scope of economic consideration and which has not been included in the net area sown. In the present study, cultivable waste land includes pastures and grazing lands, area under miscellaneous tree crops, cultivable wastes and fallow lands (current and other fallows).

IV. RESULTS

IV. RESULTS

This chapter presents the results of the study relating to the specific objectives indicated in chapter I and they are covered under the following broad headings.

4.1 Clustering of taluks

4.2 Cluster-wise land use patterns

4.3 Dynamics of land use patterns

4.4 Land use pattern in private ownership.

4.1 Clustering of Taluks

The cluster analysis brings together the taluks based on their association among themselves with respect to area under different categories of land (area under forest, land put to non agricultural uses, barren and uncultivable land, cultivable waste, permanent pastures, miscellaneous tree crops, current fallows, other fallows, net area sown, total cropped area and area sown more than once) in a given period. Relatively, the association among the taluks which belonged to different clusters are weak.

To study the changes in cluster formation among taluks, cluster analysis (using B-coefficient method) was done for three periods, taking 1971-74, 1982-85 and 1988-91 triannium averages of different land use categories.

Table 4.1 : Clustering of taluks in different periods

Period	Cluster	Taluks	B-Coefficient
Period I	Cluster I	All taluks	1.18
Period II	Cluster I	Hangal, Hirekerur, Byadgi, Dharwad, Gadag, Haveri	3.44
	Cluster II	Kalghatagi, Hubli, Kundagol, Naragund, Navalgund, Ron, Mundargi, Ranebennur	2.42
	Cluster III	Shiggaon, Savanur, Shirahatti	4.89
Period III	Cluster I	Hangal, Hirekerur, Byadgi, Dharwad, Gadag, Haveri, Kalghatagi, Hubli, Kundagol	3.46
	Cluster II	Naragund, Navalgund, Ron, Mundargi, Ranebennur	3.38
	Cluster III	Shiggaon, Savanur, Shirahatti	4.86

4.1.1 Clustering of Taluks in Period I (1971-74)

It can be seen from Table 4.1 that all 17 taluks came together under a single cluster. So only one cluster was formed in this period with a B-coefficient (which represents the degree of belongingness) of 1.18.

4.1.2 Clustering of Taluks in Period II (1982-85)

It can be observed from Table 4.1 that the taluks of the district segregated into three clusters in this period. The first cluster comprised 6 taluks namely Hangal, Hirekerur, Byadgi, Dharwad, Gadag and Haveri. The second cluster comprised 8 taluks namely Kalaghatagi, Hubli, Kundgol, Naragund, Navalgund, Ron, Mundargi and Ranebennur. The third cluster included the remaining three taluks - Savanur, Shiggaon and Shirahatti.

The B-Coefficient was 3.44 for the first, 2.42 for the second and 4.89 for the third cluster.

4.1.3 Clustering of Taluks in Period III (1988-91)

As is revealed from Table 4.1, in this period also, the taluks segregated into 3 clusters. But there was a shift of three taluks, namely, Kalaghatagi, Hubli and Kundgol from second cluster to first cluster as compared to Period II, where as the third cluster remained as it was in the Period II.

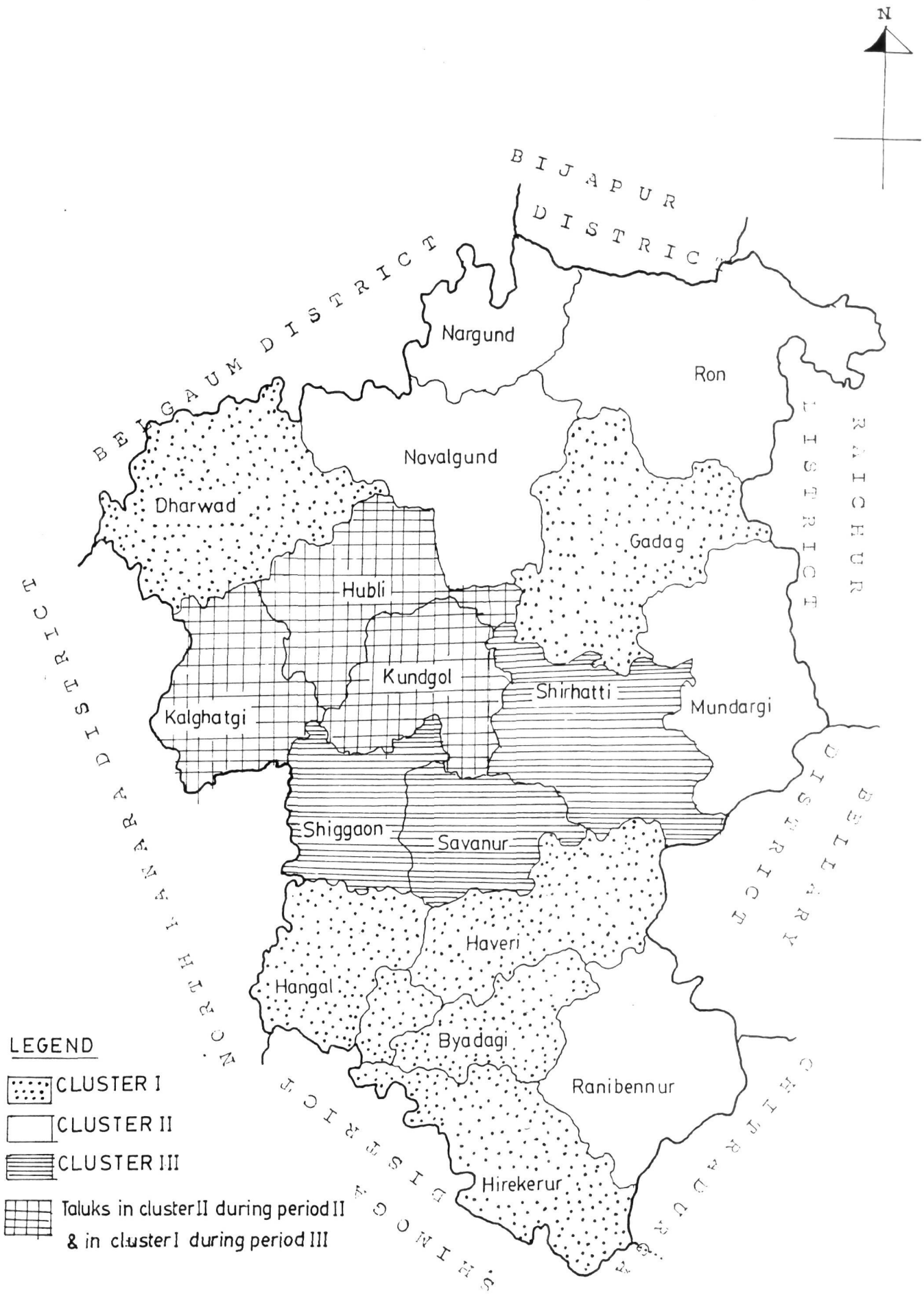

Fig. 4.1 CLUSTERS OF TALUKS IN DIFFERENT PERIODS

In this period, the first, second and third clusters comprised 9, 5 and 3 taluks (Figure 4.1) with B-Coefficients of 3.46, 3.38 and 4.86, respectively.

4.2 Cluster-wise Land use Patterns

To study the land use patterns in different clusters, percentage of area under different land use categories in each cluster to their respective total area were calculated for three periods. The results are presented in Tables 4.2, 4.3 and 4.4.

4.2.1 Cluster-wise Land use Pattern in Period I (1971-74)

In this period all 17 taluks aggregated together under a single cluster. It could be seen from Table 4.2 that the net sown area covered the highest percentage of area of the district accounting 80.93 per cent. It was followed by forest cover with 8.1 per cent. The area under other categories of the land was marginal and 2.14 per cent of area was sown more than once and the cropping intensity in this period was 102.6 per cent.

4.2.2 Cluster-wise Land use Pattern in Period II

The cluster-wise land use pattern in period II (1982-85 triennium average) to their respective total area are calculated and presented in Table 4.3.

Table 4.2: Cluster-wise land use pattern in Period I

(Area in ha.)

Sl. No.	Category	Area under cluster I	Percentage to total area
1.	Forest	111977	(8.10)
2.	Land put to non-agril. use	26326	(1.80)
3.	Barren and uncultivable	28962	(2.10)
4.	Cultivable waste	9624	(0.62)
5.	Permanent pastures and other grazing lands	37477	(2.52)
6.	Land under miscellaneous tree crops	4204	(0.30)
7.	Current fallows	30794	(2.20)
8.	Other fallow land	19370	(1.41)
9.	Net area sown	1115645	(80.95)
10.	Total cropped area	1145168	(83.10)
11.	Area sown more than once	29523	(2.14)
12.	Cropping intensity (in percent)	102.6	
	Total area	1378141	100

LEGEND

For	- Forestry
LPNU	- Land Put to Non Agricultural Uses
BUC	- Barren and Uncultivable Land
CW	- Cultivable Wastes
PP	- Permanent Pastures
LUMTC	- Land Under Miscellaneous Tree Crops
CF	- Current Fallows
OF	- Other Fallows
NAS	- Net Area Sown
TCA	- Total Cropped Area
ASMO	- Area Sown More than Once.

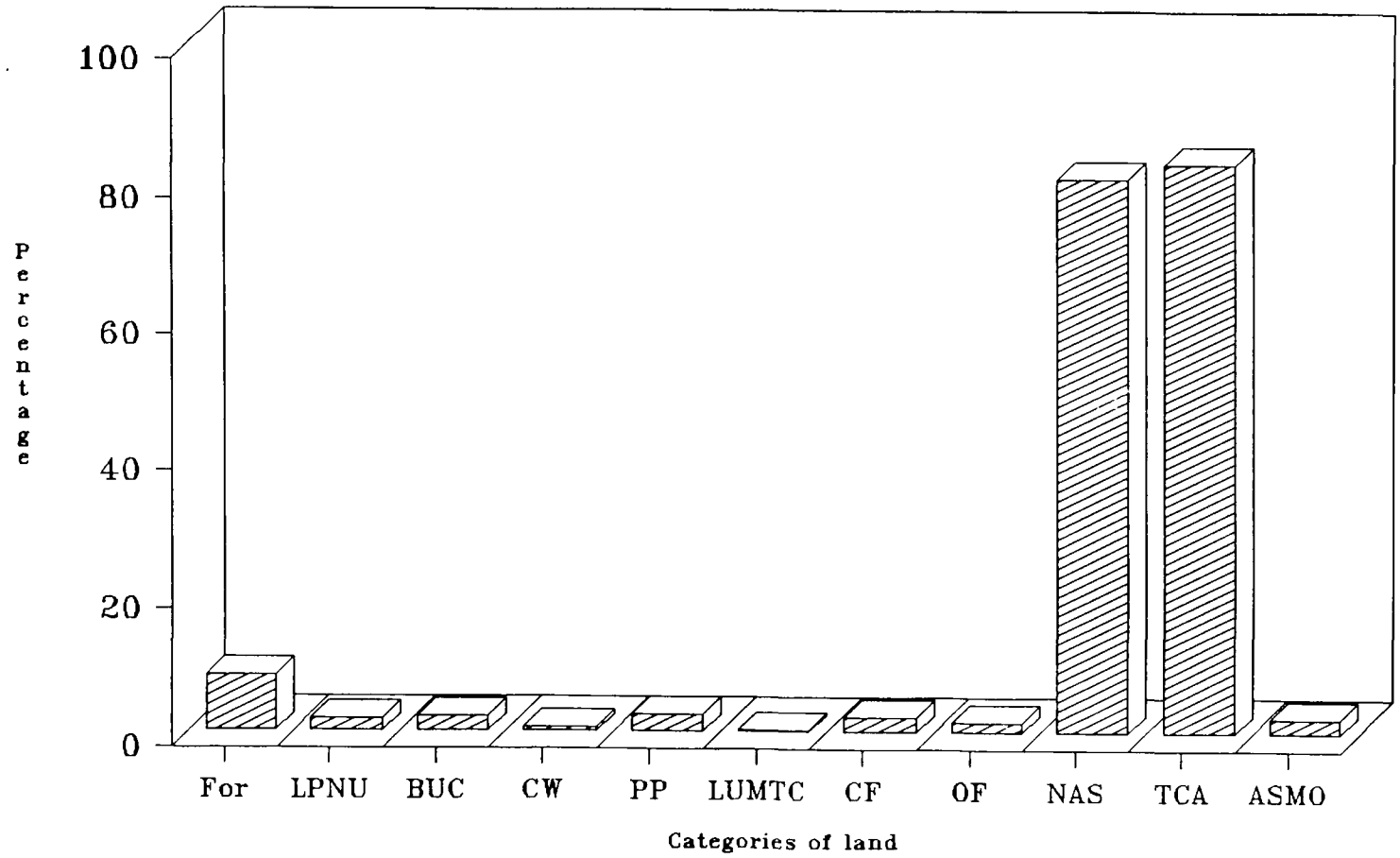

Fig. 4.2 Cluster-wise land use pattern period I

It could be seen from the table that among three clusters, the proportion of areas under forest, land put non-agricultural uses, barren and uncultivable land and current fallows were highest in the third cluster accounting to 10.87, 4.14, 2.16 and 2.57 per cent respectively to its total area. The percentages of areas under cultivable wastes (0.96 per cent), permanent pastures (3.49 per cent), land under miscellaneous tree crops (0.85 per cent), other fallows (1.44 per cent) and area sown more than once (9.47 per cent) were highest in the first cluster and net area sown (83.2 per cent) and total cropped area (89.68 per cent) were highest in the 2nd cluster. The highest cropping intensity of 112.23 per cent was found in the first cluster.

4.2.3 Cluster-wise Land use Pattern in Period III

The clusterwise land use pattern in Period III (1988-91 triennium average) to their respective total area are presented in Table 4.4.

It could be seen that among three clusters the proportions of area under forest, barren and uncultivable land were similar to those in Period II accounting to 11.41 and 2.16 per cent respectively. The percentage of area under net area sown (78.26 per cent), total cropped area (89.83 per cent) were also highest in the third cluster in this period which were highest in second cluster in Period II.

Table 4.3: Cluster-wise land use pattern in Period II

(Area in ha.)

Sl. No.	Category	Area under		
		Cluster I	ClusterII	ClusterIII
1.	Forest	41490 (8.25)	49562 (7.43)	22578 (10.87)
2.	Land put to non-agril use	20563 (4.08)	24015 (3.60)	8606 (4.14)
3.	Barren and uncultivable	8516 (1.69)	12831 (1.92)	4477 (2.16)
4.	Cultivable waste	4763 (0.96)	1837 (0.28)	1244 (0.60)
5.	Permanent pastures and other grazing lands	17818 (3.49)	4619 (0.69)	3031 (1.46)
6.	Land under miscellaneous tree crops	4201 (0.85)	664 (0.11)	240 (0.11)
7.	Current fallows	9084 (1.80)	14288 (2.14)	5238 (2.52)
8.	Other fallow land	7140 (1.44)	4204 (0.63)	1418 (0.68)
9.	Net area sown	389824 (77.44)	555047 (83.20)	160901 (77.46)
10.	Total cropped area	437500 (86.91)	598232 (89.68)	180070 (86.68)
11.	Area sown more than once	47677 (9.47)	43185 (6.47)	19169 (9.23)
12.	Cropping intensity (in per cent)	112.23	107.78	111.91
	Total area	503399	667067	207734

Note : Figures in paranthesis indicate the percentage to the total area of the respective clusters.

LEGEND

For	- Forestry
LPNU	- Land Put to Non Agricultural Uses
BUC	- Barren and Uncultivable Land
CW	- Cultivable Wastes
PP	- Permanent Pastures
LUMTC	- Land Under Miscellaneous Tree Crops
CF	- Current Fallows
OF	- Other Fallows
NAS	- Net Area Sown
TCA	- Total Cropped Area
ASMO	- Area Sown More than Once.

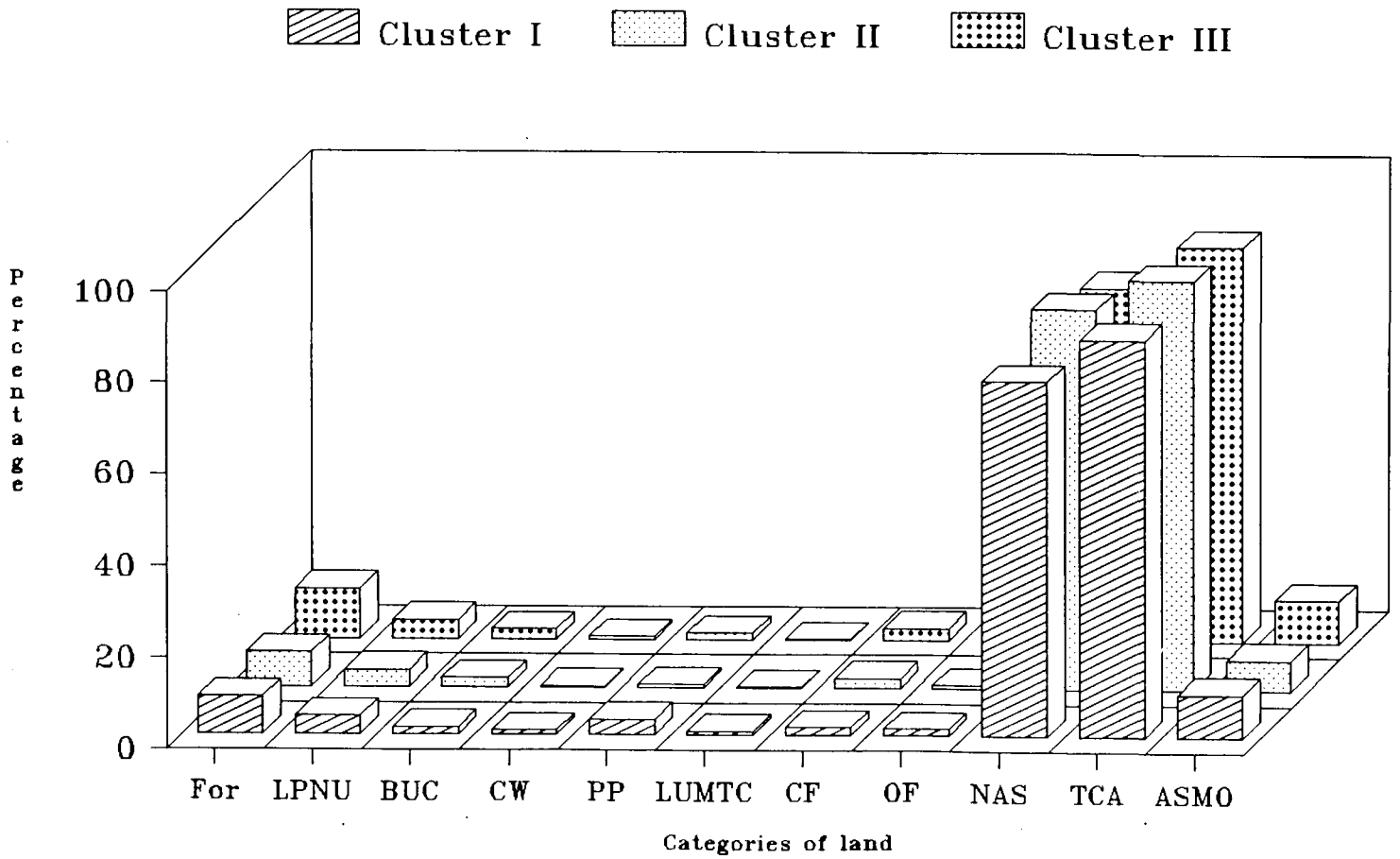

Fig. 4.3 Clusterwise land use pattern in Period II

The percentages of areas under cultivable wastes (0.80 per cent), permanent pastures and other grazing lands (1.76 per cent), land under miscellaneous tree crops (0.28 per cent) other fallows (1.19 per cent) and area sown more than once (12.57 per cent) remained highest in the first cluster to its total area as in Period II.

The proportion of area under current fallows (15.84 per cent) was found highest in the second cluster to its total area which was highest in the third cluster in Period II.

In this period also the cropping intensity was highest in first cluster.

4.2.4 Deviations from Percentage of Area in Different Clusters in Three Periods

An attempt is made to identify the factors responsible for formation of clusters in different periods. The deviations from percentage of area under different categories of land in different clusters in three periods are presented in Table 4.5.

It could be seen that the key factors responsible for change in cluster formation from Period I to Period II are forest, barren and uncultivable land, cultivable wastes, current fallows, other fallows and net area sown, These are having unique direction of change among three deviations in

Table 4.4: Clusterwise Landuse pattern Period III

(Area in ha.)

Sl. No.	Category	Area under		
		Cluster I	ClusterII	ClusterIII
1.	Forest	62950 (8.86)	28536 (6.21)	23695 (11.41)
2.	Land put to non-agril use	39663 (5.58)	15110 (3.29)	8735 (4.20)
3.	Barren and uncultivable	9039 (1.27)	8762 (1.91)	4477 (2.16)
4.	Cultivable waste	5696 (0.80)	1146 (0.25)	521 (0.25)
5.	Permanent pastures and other grazing lands	12498 (1.76)	3182 (0.69)	2945 (1.42)
6.	Land under miscellaneous tree crops	1966 (0.28)	116 (0.03)	224 (0.11)
7.	Current fallows	42313 (5.95)	73024 (15.84)	3917 (1.89)
8.	Other fallow land	8441 (1.19)	1601 (0.35)	658 (0.32)
9.	Net area sown	528157 (74.69)	328266 (71.40)	162563 (78.26)
10.	Total cropped area	61747 (87.26)	37751 (82.11)	18660 (89.83)
11.	Area sown more than once	89316 (12.57)	49246 (10.71)	24041 (11.57)
12.	Cropping intensity (in per cent)	116.82	115	114.79
	Total area	710722	459744	207734

Note : Figures in paranthesis indicate the percentage to the total area of the respective clusters.

LEGEND

For	- Forestry
LPNU	- Land Put to Non Agricultural Uses
BUC	- Barren and Uncultivable Land
CW	- Cultivable Wastes
PP	- Permanent Pastures
LUMTC	- Land Under Miscellaneous Tree Crops
CF	- Current Fallows
OF	- Other Fallows
NAS	- Net Area Sown
TCA	- Total Cropped Area
ASMO	- Area Sown More than Once.

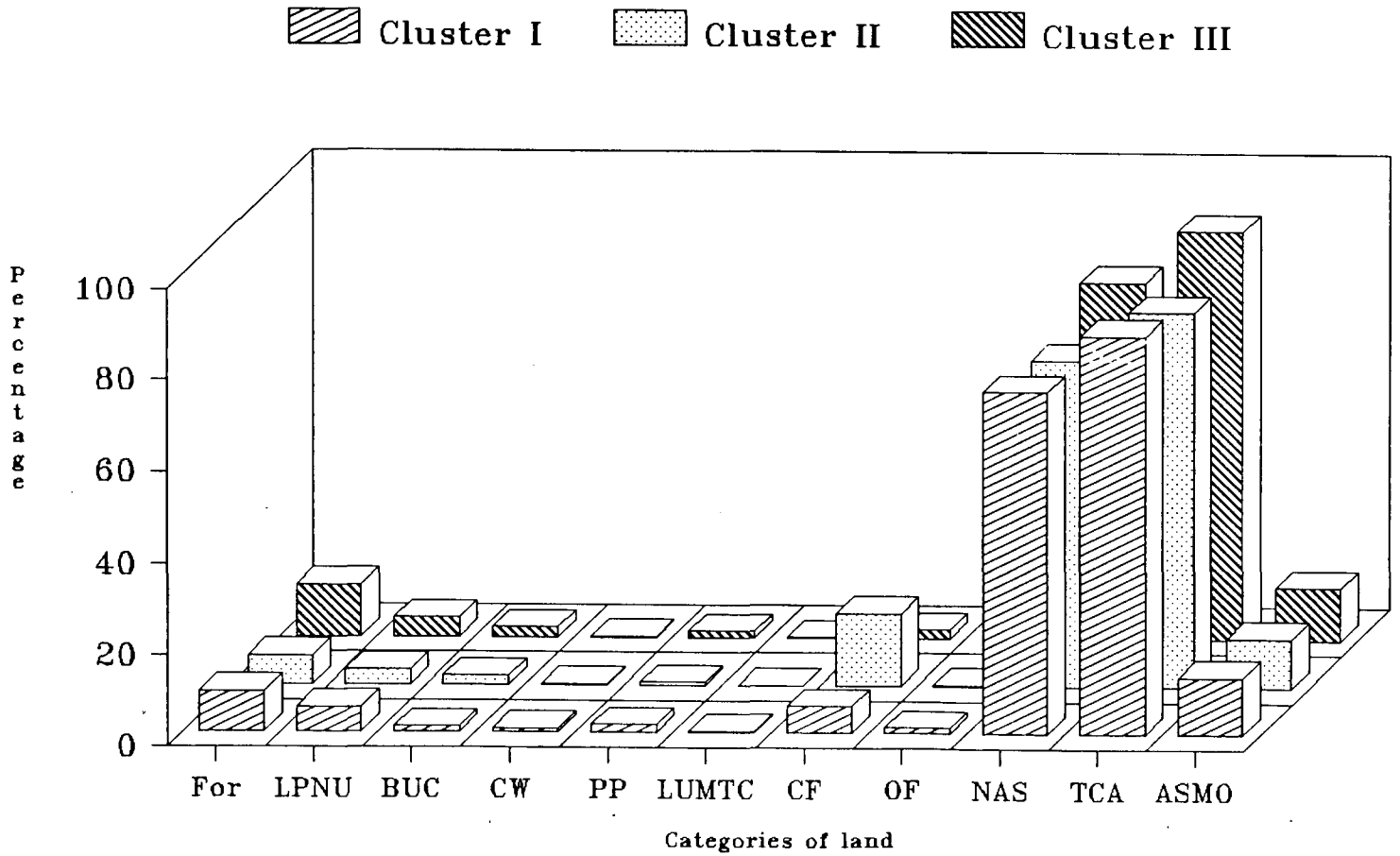

Fig. 4.4. Cluster-wise land use pattern in Period III

the respective category, which are indicated with stars in the table.

Similarly the factors responsible for cluster formation from first and third are forest, barren and uncultivable land, current fallows, total cropped area and those responsible for shift from second to third period are forests, land put to non-agricultural uses, total cropped area, current fallows and net area sown.

4.3 Dynamics of Land of Patterns

The changes in the area under different categories of land over the period were analysed and presented in this section.

4.3.1 Category-wise Compound Growth Rates in Different Taluks

The compound growth rates were calculated for the study period and are present in Table 4.6.

Forest Cover

No significant change in forest area was observed in any of the taluks and as well as in the district as a whole.

In 7 taluks positive compound growth rates in area under forest were observed. The highest growth rate was observed in Hubli taluk with 1.80 per cent followed by Byadagi (1.39 per cent), Shiggaon (1.25 per cent). In remaining 4 taluks, it was marginal.

Table 4.5: Deviations from percentage of area in different clusters in 3 periods

Sl. No.	Category	I to II			I to III			II to III		
		A - a1	A - a2	A - a3	A - b1	A - b2	A - b3	a1 - b1	a2 - b2	a3 - b3
1.	Forest	-0.15	0.67*	-2.77	-0.76	1.89*	-3.31	-0.01	1.22*	-0.54
2.	Land put to non-agril use	-2.28	-1.80	-2.34	-3.78	-1.49	-2.40	-1.50	0.31*	-0.06
3.	Barren and uncultivable	0.41	0.18	-0.06*	0.83	0.19	-0.06*	0.42	0.01	0.00
4.	Cultivable waste	-0.34*	0.34	0.02	1.30	1.85	1.85	0.16	0.03	0.35
5.	Permanent pastures and other grazing lands	0.97	1.83	1.06	0.34	1.41	0.68	1.73	0.00	0.04
6.	Land under miscellaneous tree crops	0.55	0.19	0.19	0.02	0.27	0.19	0.57	0.08	0.00
7.	Current fallows	0.40	0.06	-0.32*	-3.75	-13.64	0.31*	-4.15	-13.70	0.63*
8.	Other fallow land	-0.03*	0.78	0.73	0.22	1.06	1.09	0.25	0.28	0.36
9.	Net area sown	3.51	-2.25*	3.49	6.26	9.55	2.69	2.75	11.80	-0.80*
10.	Total cropped area	-3.81	-6.58	-3.58	-4.16	0.99*	-6.73	-0.35	7.57*	-3.15
11.	Area sown more than once	-7.33	-4.33	-7.09	-10.43	-8.57	-9.43	-3.10	-4.24	-2.34
12.	Cropping intensity	-9.63	-5.18	-9.31	-14.22	-12.4	-12.19	-4.59	-7.22	-2.88

Note :

A -> Percentage of Area in Period I.
a1 -> Percentage of Area in I cluster in Period II.
a2 -> Percentage of Area in II cluster in Period II.
a3 -> Percentage of Area in III cluster in Period II.
b1 -> Percentage of Area in I cluster in Period III.
b2 -> Percentage of Area in II cluster in Period III.
b3 -> Percentage of Area in III cluster in Period III.

* - Indicate the factors responsible for shift in the cluster

The negative growth rates in forest area was observed in 6 taluks. The highest decrease was observed in Gadag (-2.85 per cent) followed by Savanur (-2.38 per cent)and Haveri (-1.18 per cent). However no change was observed in Ron. In Navalgund, Naragund and Kundagol taluks forest area did not exist.

Land put to non-agricultural uses

In all taluks except Navalgund, Ron and Shirahatti, positive growth rate in area under non agricultural uses were recorded. Under this category, the growth rates were significant in 7 taluks. The highest growth rate was observed in Hanagal taluk with 37.12 per cent followed by Hirekerur (27.93 per cent), Byadagi (22.98 per cent), Shiggaon (14.49 per cent), Kundagol (13.77 per cent) Savanur (13.77 per cent) and Ranebennur (11.28 per cent). The lowest growth rate was noticed in Kalaghatagi with 0.3 per cent.

Barren and uncultivable land

In 9 taluks, negative growth rates in barren and uncultivable land were observed. In Byadagi taluk it was found to be significant with highest negative growth rate (-11.67 per cent) followed by Ranebennur (-5.97 per cent), Haveri (-5.9 per cent) and Hirekerur (-4.9 per cent). The lowest negative growth rate (-1.02 per cent) was observed in Dharwad taluk.

The positive growth rate was noticed in 7 taluks, but in none of the taluks it was significant. The highest positive growth rate was observed in Shiggaon (3.93 per cent) followed by Mundargi (3.79 per cent) and Kundagol (3. 01 per cent). The lowest growth was recorded in Ron (0.5 per cent). For the district as a whole, the growth was negative with 2.27 per cent.

Cultivable wastes

The Growth rate in cultivable waste showed a negative trend in all taluks except Byadagi (0.69 per cent), Haveri (3.47 per cent) and Kundagol (2.03 per cent). But only in two taluks namely Kalghatagi and Hirekerur, there was a significant negative compound growth rate of 7.28 per cent and 7.15 per cent respectively. A negative trend in growth rate (2.27 per cent) was observed under cultivable wastes for the district.

Permanent pastures and other grazing lands

The area under this category showed a negative trend in the district with 4.5 per cent compound growth rate. In 8 taluks, negative growth rates were observed. In only two taluks namely Shiggaon and Hanagal, it was significant with -7.99 per cent and -6.16per cent respectively. The lowest negative growth rate was observed in Kalghatagi (-0.12 per cent).

Even though positive growth rate was observed in 6 taluks they were nonsignificant. The highest positive growth of 5.87 per cent was observed in Haveri and lowest in Savanur with 0.26 per cent.

Land under miscellaneous tree crops

The negative growth rate of -2.27 per cent was recorded in the district under land under miscellaneous tree crops. In 7 taluks the area under this category decreased and in the remaining 9 taluks, positive growth rates were observed. But no change in area under this category was noticed in Shiggaon taluk.

The highest negative growth rate was noticed in Dharwad taluk with 7.4 per cent which was significant at 5 per cent level of probability. This was followed by Ranebennur (-5.69 per cent), Hirekerur (-5.55 per cent) and Haveri (-4.06 per cent). The lowest negative growth rate was noticed in Navalgund with 0.02 per cent.

The highest positive growth rate was noticed in Hubli with 7.9 per cent followed by Kundagol (7.85 per cent), both of which were significant at 5 per cent level of probability. The lowest positive growth was noticed in Naragund and Ron with 0.01 per cent in both the taluks.

Current fallows

The growth rate in area under current follows showed a positive trend with 7.15 per cent in the district which is significant at 5 per cent level of probability. The growth rate in area under this category was nonsignificant in all the taluks. In 10 taluks positive growth rates were observed. The highest growth rate was observed in Ron (4.31 per cent) followed by Haveri (3.92 per cent) and Hirekerur (3.25 per cent). The lowest growth rate was observed in Naragund (0.21 per cent).

In remaining 7 taluks the negative trend was observed for the area under current fallows. The highest negative growth rate was in Kalghatagi (-5.93 per cent) followed by Kundagol (-4.23 per cent) and lowest in Shirahatti (-2.06 per cent).

Other fallows

The area under other fallows also registered a negative compound growth rate (-4.5 per cent) in the district.

In 11 taluks, the negative growth rate was observed. The highest negative growth rate was observed in Kundagol taluk with -9.4 per cent which was significant at 5 per cent. This was followed by Ranebennur (-6.48 per cent), Haveri (-6.23 per cent). The lowest negative growth rate was recorded in Shiggaon taluk with 2.02 per cent.

Table 4.6 : Category-wise compound growth rates in different taluks

Sl. No.	Categories Taluks	FOR	LPNU	B & UC	CW	PP	LMTC	CF	OF	NAS	TCA	ASMO
1.	Byadgi	1.39	22.98**	-11.67*	0.69	3.62	0.12	3.01	-4.15	-0.34	0.49	10.66**
2.	Dharwad	-0.31	6.13	-1.02	-1.54	-5.62	-7.40*	1.35	0.87	0.05	1.06	7.65*
3.	Gadag	-2.85	5.59	-1.86	----	-5.45	0.08	-2.29	-5.17	0.69	0.12	12.10**
4.	Hangal	0.26	37.12**	2.15	-0.71	-6.16*	-0.05	3.06	-3.76	-0.52	0.16	20.51**
5.	Haveri	-1.18	3.15	-5.90	3.47	5.87	-4.06	3.92	-6.23	-0.38	1.05	16.11**
6.	Hirekerur	-0.39	27.93**	-4.90	-7.15*	3.14	-5.55	3.25	-2.70	-0.61	1.23	16.70**
7.	Hubli	1.80	3.96	2.63	-0.76	0.74	7.90*	1.24	-2.12	1.01	4.60	9.18**
8.	Kalghatagi	-0.03	0.30	-2.97	-7.28*	-0.12	6.19	-5.93	6.19	0.57	-1.22	18.47**
9.	Kundagal	----	13.77**	3.01	2.03	0.09	7.85*	-4.23	-9.40*	0.14	0.68	16.70**
10.	Mundargi	0.66	0.89	3.79	-3.53	-3.33	0.19	3.79	4.28	-1.23	-1.03	6.09
11.	Naragund	----	0.76	-1.99	-1.01	-4.14	0 01	0.21	3.31	-0.45	0.41	17.62**
12.	Navalgund	----	----	----	-1.74	----	-0.02	-3.13	2.92	-0.53	0.42	1.24
13.	Ranebennur	0.19	11.28**	-5.97	-3.97	-0.74	-5.69	1.71	-6.48	-0.33	0.13	7.70**
14.	Ron	----	----	0.50	----	----	0.01	4.31	-4.52	1.03	1.27	12.70**
15.	Savanur	-2.38	13.77**	-2.44	-2.87	0.26	-3.16	-3.92	-2.26	0.24	2.07	13.34**
16.	Shiggoan	1.25	14.49**	3.93	-5.38	-7.99*	----	-3.29	-2.02	0.04	0.49	18.78**
17.	Shirahatti	1.49	----	0.54	-0.23	-----	0.20	-2.06	3.36	-0.28	0.54	17.67**
Dharwad district		1.33	4.70	-2.27	-2.27	-4.50	-2.27	7.15*	-4.50	2.33	0.68	14.8**

For - Forest; LPNU - Land Put to Non -agricultural Uses; B & UC - Barren and Uncultivatble;

CW - Cultivable Waste; P.P - Permanent Pastures and Other Grazing Lands; LMTC - Land under Miscellaneous Tree Crops;

CF - Current Fallows; OF - Other Fallows; NAS - Net Area Sown; TCA - Total Cropped Area; ASMO - Area Sown More Than Once.

* - Significant at 5 per cent
** - Significant at 1 per cent

In remaining 6 taluks, positive growth rates were noticed. The highest positive growth rate was in Kalghatagi taluk (6.19 per cent) followed by Mundaragi (4.28 per cent). The lowest positive growth rate of 0.87 per cent was observed in Dharwad taluk.

Net area sown

The net area sown showed a positive growth of 2.33 per cent in the district. In 7 taluks positive growth rates were observed where as in the remaining 10 taluks negative growth rates were observed. However, no significant change was noticed in either of the cases.

The highest positive growth rate was observed in Ron (1.03 per cent) followed by Hubli (1.01 per cent). The lowest positive growth rate was observed in Shiggaon with 0.04 per cent.

The highest negative growth rate was in Mundaragi with -1.23 per cent followed by Gadag (-0.69 per cent). The lowest negative trend was observed in Shirahatti taluk (-0.28 per cent).

Total cropped area

The growth rate of total cropped area in the district showed a positive trend with 0.68 per cent. In 15 taluks, positive growth rates were observed where as only in two

taluks namely Kalghatagi and Mundargi, negative growth rates were noticed with -1.22 per cent and -1.07 per cent respectively. The highest positive growth rate was observed in Hubli with 4.6 per cent followed by Ron (1.27 per cent). The lowest positive growth rate was observed in Gadag (0.12 per cent). However in all the taluks the growth rates were nonsignificant.

Area sown more than once

The area sown more than once showed a significant increase in the district with a compound growth rate of 14.8 per cent. The significant positive growth rate in this category was observed in all the taluks, except in Mundargi and Navalgund taluks where it was positive but nonsignificant.

The highest rate of growth was observed in Hangal with 20.51 per cent followed by Shiggaon (18.78 per cent). The lowest growth rate was observed in Navalgund (1.24 per cent).

4.3.2 Mutual transference of land use components

Competition between different categories of land use due to changing socio-economic scenario and technological progress make the land use orientation rather dynamic. In this context, it is very necessary to examine the direction in which the mutual transference of land use has taken place. The results are presented in Table 4.7.

Net area sown versus Forest

It is clear from the table that in 11 taluks, the correlation co-efficient between Net area sown and forest cover was negative. Out of this, in 5 taluks the shift was from net area sown to forest cover, but only in Hanagal taluk it was significant at 5 per cent with a correlation co-efficient of -0.47.

In the remaining 6 taluks shift was observed from Forest cover to Net area sown. Only 3 taluks - Gadag, Kalghatagi and Savanur-significant shift from forest area to net area sown was observed as revealed by correlation co-efficient of -0.71, -0.44 and -0.71 respectively.

Net area sown versus non-cultivable land

The correlation co-efficients between these two components were negative in 11 taluks. Among these the shift from Netsown area to non-cultivable land was noticed in 3 taluks -Hanagal, Mundargi and Ron. But only in Hanagal taluk, it was significant with a correlation co-efficient of -0.70.

Even though the shift from non-cultivable land to net area sown was found in 8 taluks, only in Savanur taluk it was significant at 1 per cent level.

Net sown area versus cultivable wastes

In 9 taluks, the relationship between these two components of land use was negative. But no shift was found significant either from net area sown to cultivable waste or from cultivable waste to net area sown in any of the taluks.

Forest versus cultivable wastes

These two land use types were negatively correlated in 4 taluks. The shift from forest to cultivable wastes was found only in Naragund taluk but it was nonsignificant.

The shift from cultivable waste to forest was found in 3 taluks. But only in 2 taluks - Hanagal and Mundargi- it was significant at 1 per cent level with correlation co-efficients of -0.62 and -0.75 respectively.

Forest versus non-cultivable

These two land types were negatively correlated in 6 taluks. The shift from forest to non-cultivable was found only in Naragund taluk but it was nonsignificant. The shift from non-cultivable to forest was observed in 5 taluks. Out of this in 3 taluks namely Byadagi, Hubli and Ranebennur it was found significant at one percent with correlation co-efficients of -0.8, -0.85 and -0.65 respectively.

Table 4.7 : Patterns of mutual tranfer of different categories of lands.

(Correlation co-efficients)

Sl. No.	Talnks	Net area sown versus Forest		Net area sown versus non-cultivable land		Net area sown versus cultivable wastes		Forest versus cultivable wastes		Forest versus non-cultivable		Non-cultivable versus cultivable wastes	
		Net sown area to Forest	Forest to Net sown area	Net sown to area to non-cultivable	Noncultivable to net sown area	Net sown area to cultivable waste	Cultivable waste to net sown area	Forest to cultivable waste	Cultivable waste to forest	Forest to Non cultivable	Non cultivable to forest	Non cultivable to cultivable waste	Cultivable waste to non cultivable
1	Byadgi	----	-0.06	----	----	----	-0.05	----	----	----	-0.80**	-0.10	----
2	Dharwad	----	-0.37	----	-0.12	----	----	----	----	----	----	----	----
3	Gadag	----	-0.71**	----	----	----	-0.05	----	----	----	----	----	----
4	Hangal	-0.47*	----	-0.70**	----	----	----	----	-0.62**	----	----	----	-0.98**
5	Haveri	----	-0.42	----	-0.16	-0.12	----	----	----	----	----	----	----
6	Hirekerur	----	----	----	----	----	----	----	----	----	----	-0.70**	----
7	Hubli	----	----	----	-0.32	----	----	----	----	----	-0.85**	-0.65**	----
8	Kalaghtgi	----	-0.44**	----	-0.35	----	-0.001	----	----	----	----	----	----
9	Kundagol	----	----	----	----	----	----	----	----	----	----	----	----
10	Mundargi	-0.28	----	-0.27	----	----	----	----	-0.75**	----	----	----	-0.72**
11	Naragund	----	----	----	----	----	----	-0.11	----	-0.25	----	----	-0.51
12	Navalgund	----	----	----	-0.15	----	-0.28	----	----	----	----	----	0.002
13	Ranebennur	-0.04	----	----	----	----	----	----	----	----	-0.65**	----	----
14	Ron	----	----	-0.33	----	-0.18	----	----	----	----	----	-0.05	----
15	Savanur	----	-0.71**	----	-0.62**	----	-0.21	----	----	----	----	----	----
16	Shiggaon	-0.01	----	----	-0.19	----	-0.14	----	-0.31	----	-0.27	----	----
17	Shirahatti	-0.01	----	----	-0.19	----	-0.14	----	----	----	-0.27	----	----

Note

* Significant at 5 %
** Significant at 1 %

Non-cultivable versus cultivable wastes

These two land use types were negatively correlated in 8 taluks. Out of these 8 taluks, the shift from non-cultivable to cultivable wastes was found in 4 taluks. Only in 2 taluks - Haveri and Hubli -it was significant with correlation co-efficients of -0.78 and -0.65 respectively.

The shift from cultivable waste to non-cultivable land was observed in four taluks. In 3 taluks - Hanagal, Mundargi and Naragund - it was significant at one per cent with correlation co-efficients of -0.98, -0.72 and -0.51 respectively.

4.4 Land use in Private Ownership

The land use pattern in private holding mainly depend upon, natural, physical and socio-economic dimensions. In this section, analysis were made based on the opinions of the farmers. For this purpose the four agro-climatic regions - Malnad, Transition, Dry-irrigated and Dry regions are considered.

4.4.1 Size wise pattern of holding in different regions

The size wise pattern of holding in the four regions are presented in Table. 4.8

Malnad region

The percentage of area under irrigation was high in large (50.8 per cent) followed by medium (48.24 per cent) and small (35.5 per cent) categories. Out of 15 farmers in each category, 5, 10 and 11 farmers were having the irrigation facility in small, medium and large categories respectively. The number of farmers who were hopeful of getting irrigation were 10, 4 and 4 in small, medium and large categories respectively with 66.67 per cent of small and 26.67 per cent in both medium and large categories.

Transition region

Out of 15 farmers in each category in this region, 3, 12 and 9 farmers were having the irrigation facility in small, medium and large categories respectively.

The percentage of area under irrigation was high in large (32.2 per cent) followed by medium (30.79 per cent) and small (25.49 per cent) categories.

The percentage of farmers who are hopeful of getting irrigation were 60 per cent in small, 13.33 per cent in both medium and large categories. The proportion of farmers who were desperate of getting irrigation were highest in large (26.67 per cent) followed by small and medium with 20 and 6.67 per cent respectively.

Tble 4.8 : Size-wise pattern of holding in different regions

(Area in ha)

Sl. No.	Regions/ size group	Total area	Net cultiv-ated area		Average size of holding	No. of farmers having irriga-tion		Irrigated area		No. of farmers hopeful of getting irrigation		Dry area		No.of farmers desperate of getting irrigation	
1	Malnad Region (Kalaghatagi)														
	a. Small	22.82	21.26	(100.00)	1.52	5	(33.33)	7.56	(35.56)	10	(66.67)	13.70	(64.44)	----	----
	b.Medium	47.68	45.60	(100.00)	3.18	10	(66.67)	22.00	(48.24)	4	(26.67)	23.60	(51.76)	1	(6.66)
	c. Large	118.76	110.80	(100.00)	7.92	11	(73.33)	55.60	(50.18)	4	(26.67)	55.20	(49.82)	----	----
	Over all	189.26	177.66	(100.00)	4.21	26	(57.78)	85.16	(47.93)	18	(40.00)	92.50	(52.07)	1	(2.22)
2	Transition Region (Dharwad)														
	a. Small	20.64	20.40	(100.00)	1.36	3	(20.00)	5.20	(25.49)	9	(60.00)	15.20	(74.51)	3	(20.00)
	b.Medium	55.65	55.20	(100.00)	3.71	12	(80.00)	17.00	(30.79)	2	(13.33)	38.20	(69.21)	1	(6.67)
	c. Large	151.46	147.80	(100.00)	10.10	9	(60.00)	47.60	(32.20)	2	(13.33)	100.20	(67.80)	4	(26.67)
	Over all	227.75	223.40	(100.00)	5.06	24	(53.33)	69.80	(31.24)	13	(20.80)	153.60	(68.75)	8	(17.70)
3	Dry-irrigated Region (Navalgund)														
	a. Small	20.60	20.48	(100.00)	1.37	12	(80.00)	14.60	(71.28)	3	(20.00)	5.88	(28.72)	----	----
	b.Medium	70.98	70.80	(100.00)	4.73	14	(93.33)	40.80	(57.62)	1	(6.67)	30.00	(45.38)	----	----
	c. Large	142.02	141.20	(100.00)	9.46	15	(100.00)	88.40	(62.61)	----	----	52.80	(37.39)	----	----
	Over all	233.60	232.48	(100.00)	5.19	41	(91.11)	143.80	(61.85)	4	(8.80)	88.68	(38.15)	----	----
4	Dry Region (Savanur)														
	a. Small	28.10	27.10	(100.00)	1.87	6	(40.00)	5.90	(21.77)	5	(33.33)	21.20	(78.23)	4	(26.67)
	b.Medium	66.74	66.60	(100.00)	4.45	7	(46.67)	15.80	(23.72)	5	(33.33)	50.80	(76.28)	3	(20.00)
	c. Large	179.17	175.40	(100.00)	11.94	12	(80.00)	45.40	(25.88)	3	(20.00)	130.00	(74.12)	----	----
	Over all	274.01	269.10	(100.00)	6.09	25	(55.56)	67.10	(24.93)	13	(28.88)	202.00	(75.06)	7	(15.50)
	District over all	924.64	902.64	(100.00)	5.14	166	(64.44)	365.86	(40.50)	48	(26.67)	536.78	(59.50)	16	(8.89)

Figures in the parentheses indicate the percentage to net cultivated area of respective size groups

In each size group there were 15 respondents

Dry-irrigated region

Out of 15 farmers in each category 12, 14 and 15 farmers belonged to small, medium and large farmers were with irrigation facilities. The percentage of area under irrigation was 71.28 in small, 57.62 in medium and 62.6 in large size groups. The proportion of farmers who are hopeful of getting irrigation were highest in small (20 per cent) followed by medium (6.67 per cent).

Dry region

Out of 15 farmers in each category, 6, 7, and 12 farmers who belonged to small, medium and large categories were having irrigation.

The highest percentage of area under irrigation was observed in large (25.88 per cent) followed by medium (23.72 per cent) and small (21.77 per cent) size groups.

The number of farmers who were hopeful of getting irrigation were more in small and medium (33.33 per cent) and low in large group (20 per cent).

The number of farmers who were desperate of getting irrigation were more in small (26.67 per cent) followed by medium (20 per cent) categories.

Table 4.8.1 : Size-wise pattern of holding in Dharwad district

(Area in ha)

Sl. No.	Size group	Total area	Net cultivated area		Average size of holding	No. of farmers having irrigation		Irrigated area		No. of farmers hopeful of getting irrigation		Dry area		No.of farmers disperate of getting irrigation	
a	Small	92.16	89.24	(100.00)	1.53	26	(43.33)	33.26	(37.27)	27.00	(45.00)	55.98	(62.73)	7	(11.67)
b	Medium	240.91	238.20	(100.00)	4.02	43	(71.67)	95.60	(40.13)	12.00	(20.00)	142.60	(59.87)	5	(8.33)
c	Large	591.41	575.20	(100.00)	9.86	47	(78.33)	237.00	(41.20)	9.00	(15.00)	338.20	(58.80)	4	(6.67)
	Overall	924.64	902.64	(100.00)	5.14	116	(64.44)	365.56	(40.50)	48.00	(26.67)	536.78	(59.50)	16	(8.89)

Figures in the parentheses indicates the percentage to net cultivated area of the respective size group.

In each size group there were 60 respondents

4.4.2 Size-wise Productivity Levels of Lands in Different Regions

The productivity level of lands in the four regions according to size-groups are depicted in Table-4.9.

Malnad region

It could be seen from the table that the area under average yield decreased with the increase in size of holdings. It was 100 per cent in small, 89.12 per cent in medium and 89.85 per cent in large holdings. The area under more than average yield was observed high in medium (7.89 per cent) followed by large (5.42 per cent). The area under 50 per cent of average yield was high in large size group (1.44 per cent) followed by medium (1.32 per cent). No area under 25 to 50 per cent of average yield was noticed in any of the size groups. Area under less than 25 per cent of average yield was high in large groups (3.29 per cent) and low in medium category (1.86 per cent).

Transition region

The area under more than average yield was not observed in any of the size groups. The area under 50 per cent of average yield was high in large group (4.26 per cent) and low in medium group (3.99 per cent). The area under 25 to 50 per cent of average yield was more in large groups with 4.46

Table 4.9: Area under various productivity levels in different regions

(Area in ha)

Sl. No.	Region/ category	Net cultivated Area	%	Area under average yield	%	More than average yield	%	Area under 50% of av.yld	%	Area under 25-50% of av.yld	%	Area under < 25 % of av.yld	%
1.	Malnad Region												
	a) Small	21.26	(100)	21.26	(100.00)	---	---	---	---	---	---	---	---
	b) Medium	45.60	(100)	40.64	(89.12)	3.6	(7.89)	0.60	(1.32)	---	---	0.85	(1.86)
	c) Large	110.80	(100)	99.55	(89.85)	6.0	(5.42)	1.60	(1.44)	---	---	3.65	(3.29)
	Over all	177.66	(100)	161.45	(90.87)	9.6	(5.40)	2.20	(1.23)	---	---	4.50	(2.53)
2.	Transition Region												
	a) Small	20.40	(100)	19.60	(96.08)	---	---	---	---	0.80	(3.92)	---	---
	b) Medium	55.20	(100)	52.60	(95.29)	---	---	2.20	(3.99)	---	---	0.40	(0.72)
	c) Large	147.80	(100)	132.30	(89.51)	---	---	6.30	(4.26)	6.60	(4.46)	2.60	(1.76)
	Over all	223.40	(100)	204.50	(91.53)	---	---	8.50	(3.80)	7.40	(3.31)	3.00	(1.34)
3.	Dry-irrigated Region												
	a) Small	20.48	(100)	19.58	(95.61)	---	---	0.40	(1.95)	0.20	(0.98)	0.30	(1.46)
	b) Medium	70.80	(100)	67.60	(95.48)	---	---	2.00	(2.82)	----	----	1.20	(1.69)
	c) Large	141.20	(100)	132.30	(93.70)	---	---	4.10	(2.90)	1.20	(0.85)	3.60	(2.55)
	Over all	232.48	(100)	219.48	(94.40)	---	---	6.50	(2.79)	1.40	(0.60)	5.10	(2.19)
4.	Dry-region												
	a) Small	27.10	(100)	26.93	(99.37)	---	---	----	----	0.15	(0.56)	0.02	(0.07)
	b) Medium	66.60	(100)	63.85	(95.87)	0.40	(0.60)	0.55	(0.83)	0.80	(1.20)	1.00	(1.50)
	c) Large	175.40	(100)	166.80	(95.10)	1.20	(0.68)	2.80	(1.60)	2.00	(1.14)	2.60	(1.48)
	Over all	269.10	(100)	257.58	(95.71)	1.60	(0.59)	3.35	(1.25)	2.95	(1.09)	3.62	(1.35)
	District Overall	902.64	(100)	843.01	(93.40)	11.20	(1.24)	20.55	(2.27)	11.75	(1.30)	16.22	(1.79)

Figures in the parenthesis indicates percentage to net cultivated area of respective category

per cent and the same was 3.92 per cent in small group and no area was found in medium category. Again the area under less than 25 per cent of average yield was high in large (1.76 per cent) and low in medium group (0.72 per cent).

Dry-irrigated region

The area under 50 per cent of average yield was high in large (2.9 per cent) followed by medium (2.82 per cent) and small (1.95 per cent). And no area was found in area under more than average yield category in any size groups. The area under 25-50 per cent of average yield was high in small (0.98 per cent) and low in large (0.85 per cent) and no area was observed in medium group. The area under less than 25 per cent of average yield was more in large (2.55 per cent) followed by medium and small with 1.69 and 1.46 per cent respectively.

Dry region

In this region, area under more than average yield was 0.68 per cent in large and 0.6 per cent medium size groups. The area under 50 per cent of average yield was high in large (1.6 per cent) and low in medium group (0.83 per cent).

The highest percentage of area under 25-50 per cent of average yield was observed in medium category (1.2 per cent) followed by large (1.14 per cent) and small (0.56 per cent) size groups.

Table 4.9.1: Area under various productivity levels in Dharwad district

(Area in ha)

Sl. No.	Size group	Net cropped Area	Area under average yield	More than average yield	Area under 50% of av. yield	Area under 25-50% of av. yield	Area under <25 % of av. yield
a)	Small	89.24 (100.00)	87.37 (97.90)	— —	0.40 (0.45)	1.15 (1.29)	0.32 (0.36)
b)	Medium	238.20 (100.00)	224.69 (94.32)	4.00 (0.45)	5.35 (2.25)	0.80 (0.30)	3.45 (1.45)
c)	Large	575.20 (100.00)	530.95 (92.30)	7.20 (2.25)	14.80 (2.57)	9.80 (1.70)	12.45 (2.18)
	Overall	902.64 (100.00)	843.01 (93.38)	11.20 (1.24)	20.55 (2.28)	11.75 (1.30)	16.22 (1.80)

Note : Figures in the parentheses indicates percentage to the net cropped area of the respective size groups

The percentage of area under less than 25 per cent of average yield was observed in medium followed by large and small size groups with 1.5, 1.48 and 0.07 per cent respectively.

However, in general, the percentage of area under below average yield to net cultivated area increased with the size of holding in all the regions.

4.4.3 Size-wise Land Capabilities in Different Regions

The results regarding type and topography of soil, soil capabilities (slope as proxy measurement) in the four regions are presented in Table 4.10a and 4.10b.

Malnad region

In this region 33 per cent of red, 18 per cent of black and one per cent of medium black soils were under rainfed agriculture. Overall 52 per cent of cultivated area was under dry land agriculture and remaining 48 per cent were under irrigation.

Out of the total net cultivated area 44 per cent of red, 27 per cent of black and one per cent of medium black soil were leveled, 18 per cent of red, 6 per cent of black and 0.23 per cent of medium black (totally 24.23 per cent) were moderatly slopy and remaining 3 per cent of red and one per cent of black soils were steep slopy.

Table 4.10a : Area under different soil types in the four regions

(Area in ha)

Sl. No.	Regions/ size groups	Dry area						Irrigated area					
		Red		Black		Medium black		Red		Black		Medium black	
1	Malnad Reagion (Kalaghatagi)												
	a. Small	7.50	(35.00)	6.20	(29.00)	----	----	6.00	(28.00)	1.56	(7.00)	----	----
	b.Medium	14.00	(31.00)	7.20	(16.00)	2.40	(5.00)	18.40	(40.00)	3.60	(8.00)	----	----
	c. Large	36.80	(33.00)	18.40	(17.00)	----	----	32.80	(30.00)	22.80	(21.00)	----	----
	Over all	58.30	(33.00)	31.80	(18.00)	2.40	(1.00)	57.20	(32.00)	27.96	(16.00)	----	----
2	Transition Region (Dharwad)												
	a. Small	10.40	(51.00)	4.80	(24.00)	----	----	5.20	(25.00)	----	----	----	----
	b.Medium	16.00	(29.00)	21.60	(39.00)	0.60	(1.00)	13.40	(24.00)	3.60	(7.00)	----	----
	c. Large	35.60	(24.00)	64.60	(43.70)	----	----	23.60	(16.60)	24.00	(16.24)	----	----
	Over all	62.00	(28.00)	91.00	(40.73)	0.60	(0.27)	42.20	(19.00)	27.60	(12.00)	----	----
3	Dry-irrigated Region (Navalgund)												
	a. Small	----	----	5.88	(29.00)	----	----	----	----	12.20	(60.00)	2.40	(12.00)
	b.Medium	----	----	21.60	(30.00)	8.40	(12.00)	----	----	26.40	(37.00)	14.40	(20.00)
	c. Large	20.00	(14.00)	30.80	(22.00)	2.00	(1.00)	6.40	(5.00)	66.40	(47.00)	15.60	(11.00)
	Over all	20.00	(9.00)	58.20	(25.00)	10.4	(4.00)	6.40	(3.00)	105.00	(65.0)	32.40	(14.00)
4	Dry Region (Savanur)												
	a. Small	12.80	(47.23)	8.40	(31.00)	----	----	4.50	(16.61)	1.40	(5.00)	----	----
	b.Medium	32.80	(49.25)	13.20	(20.00)	4.80	(7.00)	17.00	(10.51)	4.40	(7.00)	4.40	(7.00)
	c. Large	50.40	(28.73)	79.60	(45.00)	----	----	41.80	(23.83)	4.00	(2.00)	----	----
	Over all	96.00	(35.00)	101.20	(38.00)	4.80	(2.00)	53.30	(19.81)	9.80	(4.00)	4.40	(2.00)
	District over all	236.30	(26.18)	282.20	(31.26)	18.20	(2.02)	159.10	(17.63)	170.36	(18.87)	36.80	(4.08)

Figures in the parenthesis indicate percentage to net cultivated area of respective size groups

Table 4.10.1a : Area under different soil types in Dharwad district

(Area in ha)

Sl. No.	Size group	Net cultivated area	Dry area						Irrigated area					
			Red		Black		Medium black		Red		Black		Medium black	
a	Small	89.24	30.70	(34.48)	25.20	(28.24)	----	----	15.70	(17.59)	15.16	(16.99)	2.40	(2.69)
b	Medium	238.20	62.80	(26.36)	63.60	(26.70)	16.20	(6.80)	38.80	(16.29)	38.00	(15.95)	18.80	(7.89)
c	Large	575.20	142.80	(24.83)	193.40	(33.60)	2.00	(0.30)	104.60	(18.18)	117.20	(20.38)	15.60	(2.71)
Overall		902.64	236.30	(26.18)	282.20	(31.26)	18.20	(2.02)	159.10	(17.63)	170.36	(18.87)	36.80	(4.08)

Note : Figures in parentheses indicates the percentage to net cultivated area of the respective size group

Transition region

Totally 69 per cent of the cultivated area was under rainfed. Out of which 28 per cent was of red soil, 40.73 per cent was of black and only 0.27 per cent was of medium black soil. Remaining 31 per cent was under irrigation.

Out of total net cultivated area 17 per cent of red, 33 per cent of black and 0.27 per cent of medium black soils were levelled, 30 per cent of red, 20 per cent of black and one per cent of medium black soils were moderately slopy and no steep slopy area was observed in this region.

Dry-irrigated region

Out of net cultivated area 38 per cent was under dry and remaining 62 per cent was under irrigation. Out of total dry area, 9 per cent was of red, 25 per cent was of black and 4 per cent was of medium black soil.

Out of net cultivated area 11, 62 and 5 per cent of red, black and medium black soil were leveled and 8 and 24 per cent of black and medium black soil were moderately slopy respectively. In this region no area was found under steep slope.

Table 4.10b : Area under lands with different capabilities in the four regions

(Area in ha)

Regions	Levelled						Moderate slopy						Steep slopy					
	Red		Black		Medium black		Red		Black		Medium black		Red		Black		Medium black	
1. Malnad region (Kalaghatagi)																		
a. Small	5.20	(24.00)	4.36	(21.00)	----	----	7.50	(35.00)	1.80	(8.00)	----	----	0.80	(4.00)	1.60	(8.00)	----	----
b. Medium	20.40	(45.00)	8.40	(18.00)	2.00	(4.00)	12.00	(26.00)	2.40	(5.00)	0.40	(1.00)	----	----	----	----	----	----
c. Large	53.10	(48.00)	34.40	(31.00)	----	----	12.50	(11.00)	6.80	(6.00)	----	----	4.00	(4.00)	----	----	----	----
Overal all	78.70	(44.00)	47.16	(27.00)	2.00	(1.00)	32.00	(18.00)	11.00	(6.00)	0.40	(0.23)	4.80	(3.00)	1.60	(1.00)	----	----
2. Transition region (Dharwad)																		
a. Small	9.40	(46.00)	4.80	(24.00)	----	----	6.20	(30.00)	----	----	2.40	(12.00)	----	----	----	----	----	----
b. Medium	14.80	(27.00)	25.20	(46.00)	0.60	(1.00)	14.60	(26.00)	----	----	----	----	----	----	----	----	----	----
c. Large	12.80	(9.00)	43.80	(30.00)	----	----	46.40	(31.00)	44.80	(30.00)	----	----	----	----	----	----	----	----
Overal all	37.00	(17.00)	78.80	(33.00)	0.60	(0.27)	67.20	(30.00)	44.80	(20.00)	2.40	(1.00)	----	----	----	----	----	----
3. Dry-irrigated region (Navalgund)																		
a. Small	----	----	14.00	(68.00)	----	----	----	----	4.00	(20.00)	2.40	(12.00)	----	----	----	----	----	----
b. Medium	----	----	40.00	(56.00)	11.20	(16.00)	----	----	8.00	(11.00)	11.60	(16.00)	----	----	----	----	----	----
c. Large	26.40	(19.00)	90.00	(64.00)	----	----	----	----	7.20	(5.00)	17.60	(12.00)	----	----	----	----	----	----
Overal all	26.60	(11.00)	144.00	(62.00)	11.20	(5.00)	----	----	19.20	(8.00)	31.60	(14.00)	----	----	----	----	----	----
4. Dry region (Savanur)																		
a. Small	13.30	(49.00)	9.80	(36.00)	----	----	4.00	(15.00)	----	----	----	----	----	----	----	----	----	----
b. Medium	7.60	(11.00)	12.40	(19.00)	----	----	32.20	(48.00)	5.20	(8.00)	9.20	(14.00)	----	----	----	----	----	----
c. Large	46.60	(27.00)	78.80	(45.00)	----	----	45.60	(26.00)	4.80	(3.00)	----	----	----	----	----	----	----	----
Overal all	67.50	(25.00)	101.00	(38.00)	----	----	81.80	(30.00)	10.00	(4.00)	9.20	(3.00)	----	----	----	----	----	----
Dist. over all	209.50	(23.22)	365.96	(40.54)	13.80	(1.53)	181.00	(20.05)	85.00	(9.42)	43.60	(4.83)	4.80	0.53	1.60	0.18	----	----

Figures in the parenthesis indicate percentage to net cultivated area of respective size groups

Table 4.10.1b : Area under lands with different capabilities in Dharwad district

(Area in ha)

Size group		Levelled						Moderate slopy						Steep slopy					
		Red		Black		Medium black		Red		Black		Medium black		Red		Black		Medium black	
a	Small	27.90	(31.26)	(32.96	(36.93)	----	----	17.70	(19.83)	5.80	(6.50)	4.80	(6.50)	0.80	(0.90)	1.60	(1.79)	----	----
b	Medium	42.80	(17.97)	(86.00	(36.10)	13.80	(5.79)	58.80	(24.69)	15.60	(6.55)	21.20	(8.90)	----	----	----	----	----	----
c	Large	138.90	(24.15)	(247.00	(42.94)	----	----	104.50	(18.17)	63.60	(11.06)	17.60	(3.06)	4.00	(0.70)	----	----	----	----
		209.60	(23.22)	(365.96	(40.54)	13.80	(1.53)	181.00	(20.05)	85.00	(9.42)	43.60	(4.83)	4.80	(0.53)	1.60	(0.18)	----	----

Figures in the parentheses indicates percentage to net cultivated area of respective size group

Dry region

Of the net cultivated area 75.67 per cent of area was under rainfed. Out of this, 35.67 per cent was of red, 38 per cent was of black and 2 per cent was of medium black soil.

Out of net cultivated area 25 per cent of red, 38 per cent of black soils were levelled and 30 per cent of red, 4 per cent of black and 3 per cent of medium black soils were moderately slopy. In this region also no area was found under steep slopy.

Overall 59.46 per cent of net cultivated area was under rainfed and remaining 40.54 per cent was under irrigation. Out of this 23.22 per cent of red, 40.54 per cent of black and 1.53 per cent of medium black soils were levelled, 20.05 per cent of red, 9.42 per cent of black and 4.83 per cent of medium black soils were moderately slopy and 0.53 per cent of red and 0.18 per cent of black soils were of steep slope.

4.4.4 Opinions of Farmers Regarding Perennial Crops

Opinions of farmers regarding the perennial crops are presented in Table 4.11.

Malnad region

Out of 15 farmers in each category 3, 7 and 10 farmers were growing perennial crops belonging to small, medium

Table 4.11 : Opinions of farmers regarding perennial crops in the four regions

(number of farmers)

Sl. No.	Regions/ size groups	Growing perennial crops	Who wants to grow perennial crops	With favarouble opinions		Reasons for favourable opinions					
						Better income		Less risk		Convenience		Better labour management	
1	Malnad Region (Kalaghatagi)										
	a. Small	3	7	3	(100.00)	2	(66.67)	2	(66.67)	2	(66.67)	3	(100.00)
	b. Medium	7	6	7	(100.00)	6	(85.71)	6	(85.71)	6	(85.71)	7	(100.00)
	c. Large	10	2	10	(100.00)	5	(50.00)	9	(90.00)	10	(100.00)	10	(100.00)
	Over all	20	15	20	(100.00)	13	(65.00)	17	(85.00)	90	(90.00)	20	(100.00)
2	Transition Region (Dharwad)												
	a. Small	5	6	5	(100.00)	5	(100.00)	3	(60.00)	5	(100.00)	5	(100.00)
	b.Medium	7	8	7	(100.00)	5	(71.43)	7	(100.00)	7	(100.00)	7	(100.00)
	c. Large	10	4	10	(100.00)	9	(90.00)	10	(100.00)	10	(100.00)	10	(100.00)
	Over all	22	18	22	(100.00)	19	(86.36)	20	(90.91)	22	(100.00)	22	(100.00)
3	Dry-irrigated Reg. (Navlgund)												
	a. Small	---	2	----	----	----	----	----	----	----	----	----	----
	b.Medium	1	5	1	(100.00)	----	----	1	(100.00)	1	(100.00)	1	(100.00)
	c. Large	---	7	----	----	----	----	----	----	----	----	----	----
	Over all	1	14	1	(100.00)	----	----	1	(100.00)	1	(100.00)	1	(100.00)
4	Dry Region (Savanur)												
	a. Small	4	4	4	(100.00)	4	(100.00)	2	(50.00)	2	(50.00)	4	(100.00)
	b.Medium	6	4	6	(100.00)	4	(66.67)	3	(50.00)	2	(33.33)	6	(100.00)
	c. Large	7	9	7	(100.00)	7	(100.00)	5	(71.43)	3	(42.86)	7	(100.00)
	Over all	17	17	17	(100.00)	15	(88.24)	10	(58.82)	7	(41.18)	17	(100.00)
	District Overall	60	64	60	(100.00)	47	(78.3)	48	(80.00)	48	(80.00)	60	(100.00)

Figures in the parenthesis indicates the percentage to the number of farmers growing perennial crops of respective size groups

and large categories respectively and all of them expressed favourable opinion regarding perennial crops. Out of the remaining 12,8 and 5 farmers, 7,6 and 2 belonging to small, medium and large farmers respectively were willing to grow perennial crops.

Out of total number of farmers growing perennial crops 66.67, 85.71 and 50 per cent of small, medium and large farmers had realised better income.

The highest percentage of large farmers (90 per cent) expressed less risk followed by medium (85.71 per cent), small (66.67 per cent) farmers.

The highest percentage of large farmers (100 per cent) expressed about convenience followed by medium (85.71 per cent), and small (66.67 per cent) farmers. Regarding better labour management also same trend was observed i.e. 90 per cent of large, 85.71 per cent of medium and 66.67 per cent of small farmers had achieved better management of labour.

Transition region

Out of 15 farmers in each category 5, 7 and 10 farmers were growing perennial crops belonging to small, medium and large categories respectively and all of them expressed favourable opinion regarding perennial crops. Out of the remaining 6,8 and 4 farmers in 10 small, 8 medium and 5 large

Table 4.11.1 : Opinions of farmers regarding Perinnial crops in Dharwad district

(number of farmers)

Sl. No.	Size groups	Growing perennial crops		Who wants to grow perennial crops	With favarouble opinions		Reasons for favourable opinions							
							Better income		Less risk		Convinience		Better labour management	
1.	Small	12	(100.00)	19	12	(100.00)	11	(91.67)	7	(58.33)	9	(75.00)	12	(100.00)
2.	Medium	21	(100.00)	23	21	(100.00)	15	(71.43)	17	(80.95)	16	(76.19)	21	(100.00)
3.	Large	27	(100.00)	22	27	(100.00)	21	(77.78)	24	(88.89)	23	(85.18)	27	(100.00)
		60	(100.00)	64	60	(100.00)	47	(78.33)	48	(80.33)	48	(80.00)	60	(100.00)

Figures in the parentheses indicate the percentage to number of farmers growing perennial crops in respctive size groups

farmers, 6,8 and 4 farmers respectively were willing to grow perennial crops.

Out of total number of farmers growing perennial crops 100, 71.43, 90 per cent of small, medium and large farmers opined better income from perennial crops and 60 per cent of small farmers, all medium and large farmers expressed less risk in growing perennial crops.

All the respndents expressed convinience and possibilities of better management of labour in growing perennial crops.

Dry-irrigated region

Out of 15 farmers in each category, only one farmer who belonged to medium category had taken Perennial crop. He opined favorable with respect to less risk, convenience and better management of labour. However, among remaining 15 small, 14 medium and 15 large farmers, only 2,5 and 7 farmers respectively were willing to take up perennial crops. .lh6

Dry region

Out of 15 farmers in each category 4, 6 and 7 farmers were growing perennial crops belonging to small, medium and large farmers respectively and all of them expressed favourable opinion regarding perennial crops.

Out of remaining 11 small, 9 medium and 8 large farmers, 4,4 and 9 farmers respectively were willing to grow perennial crops. Out of total number of farmers growing perennial crops 66.67 per cent of medium farmers and all large and small farmers opined better income from perennial crops.

The highest percentage of large farmers (71.43 per cent) and 50 per cent of small and medium farmers expressed less risk with perennial crops. However, 50, 33.33, 42.86 per cent of small, medium and large farmers respectively were having the opinion that growing perennial crops was convenient.

All farmers who were growing perennial crops opined better management of labour.

However, out of 180 farmers interviewed only 60 farmers had grown perennial crops and 64 farmers were willing to grow perennial crops.

The farmers who were growing perennial crops expressed favourable opinion, for different reasons. Among them 78.33 per cent of farmers because of better income, 80.33 per cent because of less risk, 80 per cent because of convenience and 100 per cent because of better management of labour when they were allowed to express more than one opinion.

The emergence of clusters, re-allignment among them over the period the pattern of land use in different clusters

over the period, growth rates of different classes of lands in different taluks, the mutual transference of different categories of land and opinions of farmers based on land use in private owner ship presented in detail in this chapter have close inter-relationships which have bearing on the dynamics of land use and planning. These are beeing discussed in the next chapter.

V. DISCUSSION

V. DISCUSSION

The results of the investigation presented in the previous chapter are discussed in this chapter. Consistent with the objectives of the study, the results are discussed under the following heads.

5.1. Clustering of taluks

5.2. Dynamics of land use patterns

5.3. Land use pattern in Private Ownership

5.4. Suggestion for better land use.

5.1 Clustering of Taluks

As indicated in results in Table 4.1, the clustering of taluks differed over the period indicating the changes in land use pattern. While all the 17 taluks of the district came together in a single cluster in period I, there were three distinct clusters in the second period. In the third period three clusters continued to exist but with some realignment among the taluks. This broadly implies that there was a shift in the land use pattern from period one to two and there were some readjustments between second and third period.

Detailed examination of the clusters of the third period would enable clear understanding the process of clustering. In the first cluster, there were 9 taluks mainly

characterized by existence of public and community lands and relatively high rainfall. The second cluster of 5 taluks were in plains almost without community and public lands and with relatively low rainfall. This cluster however, was having irrigation facilities served by major irrigation project or having the benefits of watershed development project for rainfed agriculture.

The third cluster with 3 taluks did not register any changes between second and third period indicating *status quo* in the nature of land use pattern in the constituent taluks. This cluster was characterised by dominence of rainfed areas.

Looking to the parameters which decided the type of clustering and its realignment inferred that the extent of public and community lands, forest cover, rainfall, area cultivated and sown more than once are the major features of any cluster. To achieve satisfactory changes, there is a need to look into these parameters.

5.2 Dynamics of land use Patterns

To plan for a better land use pattern, the dynamics of land use over the period were studied. The results are discussed below.

5.2.1 Category-wise Compound Growth Rates

Compound growth rates were estimated for forest cover, land put to non-agricultural uses, barren and uncultivable land, cultivable wastes, permanent pastures, land under miscellaneous tree crops, current fallows, net area sown, total cropped area and area sown more than once. The results indicated that the growth rates of area sown more than once in almost all the taluks were significant indicating the improvement in the management of cultivated lands. This improvement was due to increased irrigation potential and also better technology in cropping systems. Almost similar results were observed in the case of land put to non-agricultural uses. This reflected the pressure on land for dwelling, transportation, industrial and other purposes. While the improvement in area sown more than once is a land augmenting phenomenon, the growth in the land put to non-agricultural uses is a land demanding phenomenon.

Among the other parameters, in most of the taluks the growth rates of barren and uncultivable, cultivable wastes, permanent pastures, land under miscellaneous tree crops, current fallows, other fallows, net area sown and total cropped area were either negative or positive but in most of the cases non-significant. Similar mixed trend was reported in land use pattern in Himachal Pradesh (Vaidya and Sikka, 1991). A special mention needs to be made regarding the forest cover which

showed a very low growth rate at the district as well as taluk levels. Further in some of the taluks negative growth rates were noticed which reflected stagnation in the use of land. Looking to the above, it can be inferred that while there were continued efforts to intensify the land use on one hand, the increased population was demanding some portion of the land for non-agricultural purposes. In the process the area under other categories of land like forest, barren and uncultivable and fallows have not shown any dynamic nature from the point of view of land use of the district. Even the consorted efforts for promoting forest cover had not made sufficient dent in any of the taluks in the district.

During the survey it was observed that there were some efforts to resort to bund planting in individual fields under farm forestry programme. It was also observed that the scope in some of the maidan taluks for developing forests was limited due to non-availability of both public and community lands. Even the bund planting programme may not meet with success unless large number of farmers, in a continuous block accept this technology. If a few farmers take bund planting in isolation, their problems of bird watching during harvest season will be manifold and many times farmers have felled the trees which harboured birds in large number during harvest season. It is necessary to take up large scale planting and also to ensure that the preferred species are given to farmers to facilitate their proper establishment.

It is also necessary to have a clear vision for utilizing land for non-agricultural purposes. As already mentioned land put to non-agricultural uses increased substantially over time. This was because of various housing programmes launched by Government for weaker sections and also allocation of land for industrial areas, transportation and other purposes. The utilization of barren and uncultivable land for non-agricultural purposes is a desirable situation. But the results indicated that even cultivable wastes with tree cover, other fallows and some times, even cropped area have been allocated to non-agricultural purposes. There is a need for providing guidelines to allocate land for non-agricultural purposes so as to ensure for sustained land use planning.

5.2.2 Mutual Transference of Land Use

Based on correlation co-efficients and examining the actual data, the shift from one category of land to other are indicated in Table 4.7.

Cultivated land, cultivable wastes have been brought under forest in Hanagal taluk. But the forest has been converted into cultivated land in Gadag, Kalghatagi and Savanur taluks. Further efforts have been made to convert non-cultivable wastes into forest in Byadagi, Hubli and Ranebennur taluks. Non cultivable land has been, to some extent, replaced by cultivable wastes. But cultivable wastes have given way to

non-cultivable land in Hanagal, Mundargi and Naragund taluks. The above mentioned mixed trend indicated the existence of some of the favourable trends in locations like Hanagal, Byadagi, Hubli, Ranebennur and also some unfavourable trends in Gadag, Kalghatagi, Savanur over the period. Looking to the taluks where favorable changes have taken place it can be mentioned that the natural endowments, Government efforts and public awareness played an important role in the changes of land use over a period. In Hanagal taluk particularly there were some agitation regarding felling of trees on public land. In Byadagi and Ranebennur taluks there was Asundinala watershed development project where public and community lands were developed. It is necessary to mention here that the eastern maidan portion of the district (Naragund, Navalgund, Ron, Gadag, Mundargi) were having little public and community lands. Therefore possibility of increase in area under forest can not be expected in these taluks. However, in western part of the district (Kalaghatagi, Dharwad, Shiggaon, Hanagal) where some public and community lands are available, a project approach may help to improve the forest cover.

In the above said dual setting, in order to ensure more bio-mass cover, it is necessary to have dual strategies. In the western part of the district the development of public and community land should receive priority while in the eastern part of the district the tree cover should be encouraged in

private lands with active involvement of people. Joshi and Prasad (1991) also stressed the need to educate the rural community with the help of suitable organisational and institutional action and create greater awareness with in the community about the benefit of utilizing common land effectively.

5.3 Land Use Pattern in Private Ownership

The discussion in previous two sections were based on the results of analysis of secondary data. In this section, the discussions are based on the results of analysis of the primary data obtained from 180 farmers of four representative taluks. The discussions are in terms of pattern of holding, productivity levels, land capabilities as persued by the farmers and the opinions of the farmers regarding perennial crops.

5.3.1 Size-wise Pattern of Holding in Different Regions

In Table 4.8 the results indicated relatively high hope of getting irrigation in Malnad and Dry-irrigated regions. But about 15 to 20 per cent of farmers were not hopeful of getting irrigation in transition and dry regions.

The overall pattern of irrigated area under different categories in the district (Table 4.8.1) indicated that the percentage of irrigated area was directly related to the size

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of the holdings. However in the absolute terms, the dry area had negative relationship with the size of the holding. But in Navalgund taluk the percentage of irrigated area to net cultivated area is high in small farmers because of Malaprabha Command Area Project. Since any land use decision depends more on dry land owned by individual particularly when it is considered for tree cover, there is need for orienting the land use policies for all categories of farmers. The number of farmers desperate in getting irrigation facilities was relatively more in smaller holdings. The alternative land use appears to be the only possibility for all farmers in general and smaller the holdings in particular. Since the management differs in different groups of farmers, it is necessary to have appropriate models for each category for introducing alternative land uses. For instance in large farmers, where personnel management may not be forthcoming, fodder and forest species may be suggested and in case of small farmers where the land resource is minimum but personnel care is forthcoming, it may be appropriate to suggest high value horticultural crops.

5.3.2 Size-wise Productivity Levels of Lands in Different Regions

In Table 4.9, the proportion of lands with different fertility levels as reflected by productivity are provided.

As opined by respondents in different regions about 4 to 8 per cent of area owned by individuals farmers were yielding below average yields. Further it was observed that the

per centage of area under below average yield to net cultivated area of the respective category increased with the size of holdings.

These results indicated the availability of land for alternative enterprises for all the farmers in general and the larger holdings in particular. Since the farmers themselves were aware of low productivity in some portions of their land, alternative land use proposal would suit such lands which were not fertile in the opinion of the farmers. This would enhance the acceptance levels for alternative land use proposals.

5.3.3 Size-wise Land Capabilities in Different Regions

In Tables 4.10a, 4.10.1a, 4.10b, 4.10.1b the opinions of farmers regarding the land relief (slope) was taken to cross check with their opinions regarding the fertility of the land. From this table it is clear that highly slopy lands were to the tune of 4.0 per cent in malnad region and the moderate slopy lands were 24.23, 51,22,37 and 34.3 per cent in malnad, transition,dry-irrigated, dry regions and overall study district, respectively.

From these results it is obvious that the extent of land to be brought under alternative land use is more than those indicated in the Table 4.9, based on productivity. If we consider the percentage of land indicated in the Table 4.9 as minimum and those observed in the present table as

upper limits, it is obvious that the extent of land deserving specific attention is substantial. There is a need for further research in this area to identify location specific models to realise high level of acceptance of alternative land use by the farmers.

The results based on the size-category indicated that the larger the size of the holding more area needed attention. In addition to the slope (or relief) of the land there is need to consider the types of soils also. The table has indicated that red soils dominate among slopy land followed by black and moderate black soils. It is therefore necessary to look into land use pattern and to suggest measure for better use based on region, size of the holding and types of soils.

5.3.4 Opinions of Farmers Regarding Perennial Crops

The opinions of farmers regarding perennial crops also provided very good information regarding the potentials for bringing changes for land use pattern. From Table 4.11 it was observed that 33 per cent of farmers have already grown some perennial crops and about 34 per cent of the farmers wanted to grow perennial crops. Similar to the results of the previous table more number of large farmers have accepted the perennial crops as one of their land use components than small holdings. All the farmers who have already taken perennial crops have given favourable opinions. The reasons were better

management of labour, convinience less risk and better income. The number of farmers who expressed favourable opinion and the reasons mentioned by them are of utmost importance as for the public opinion is concerned. It was evident that substantial proportion of farmers were in favour of perennial crops for various reasons.

Any programme which envisages the alternative land use need to consider the above points and the situation provides an optimistic scenario for better land use programmes. If any resistance is observed it may be due to technical, financial or administrative defects. If these aspects are taken care of with reference to each setting it will be possible to promote better land use pattern. In other words planning, administration, execution and financial norms are to be tuned to suit different regions, groups, soil types and so forth.

5.4 Suggestions for Better Land use

Land is a limited resource. So it should be used in a rational manner. It can be put to different uses depending upon its properties and productivity so as to satisfy all types of human needs. So it is necessary to look into existing land use pattern and suggest measures for better use based on region, size of holding, soil types and preferences of the farmers.

The forest cover in the district showed a very low growth rate. In some of the taluks even negative growth rates

were observed. So in order to ensure larger biomass, it is necessary to have proper strategies depending upon the regions. In the western part of the district, the development of public and community lands should receive priority. In the eastern part of the district where public and community lands are not available, tree cover through agro-forestry should be encouraged with the active involvement of people in the private lands.

Since the management of land differs with different groups of farmers, it is necessary to have appropriate models for each category for introducing alternative land uses. For instance, on large farms where personnel management may not be forth coming, fodder and forest species may be suggested and in the case of small farms where the land resource is minimum but personnel care is forthcoming it may be appropriate to suggest high value horticultural tree crops.

It was clear from the results that the farmers themselves were aware of low productivity of some portion of their land. Therefore alternative land use proposals should be made to suit such lands which are not fertile in the opinion of the farmers.

Since the increasing population is demanding some portion of the land for non-agricultural uses, there is a need for providing guidelines to allocate barren and uncultivable land for this purpose so as to ensure sustained land use planning.

In other words, to promote better land use pattern planning, administration, execution and financial norms are to be tuned to suit different regions, groups, soil types and so forth.

The central land use Board at the national level and the State land use Boards in all the States have been constituted since over years. However, most of the Boards, including Karnataka State Land use Board have not started functioning earnestly. Since exclusive Boards were set up, they can plan, monitor and evaluate land use in their respective jurisdiction more effectively. All that is needed is to activate these Boards with clear mandate for land use planning. This would ensure integration of administration, planning, and execution through a single window delivery system.

VI. SUMMARY AND POLICY IMPLICATIONS

VI. SUMMARY AND POLICY IMPLICATIONS

Generally the land means the surface of the earth, the soil or the ground. But to the economists, land means not only the soil but also its properties like composition, location, fertility, the moisture and rain, air and light, climatic conditions, mines and minerals, forest, fisheries etc.

Land is a limited resource. Rational use, conservation and management of it play a crucial role in developing the agricultural economy of any region. Hence a scientific study of land use is a pre-requisite for rational land use. In this background the present study was undertaken in Dharwad district with the following specific objectives.

1. To identify clusters of taluks based on land use categories in Dharwad district.
2. To study various land use patterns in the identified cluster.
3. To analyse the dynamics of land use pattern over a period.
4. To suggest measures for better land use.

Methodology

Dharwad is the biggest administrative district in Karnataka having different types of soils, crops and agroclimatic conditions. This is one of the districts having most efficient land recording system in the country. This type of study on land use has not been done earlier in the district. Therefore Dharwad district was purposively selected for the present study.

For evaluating the specific objectives of the study secondary data were collected from District statistical office, Dharwad and primary data were collected from 180 farmers of four representative taluks of different regions. Then farmers were post classified into small, medium and large categories based on land holdings.

To analyze the data tabular, cluster, compound growth rate and correlation analysis were employed.

Findings

The cluster analysis was employed for three periods considering the land use pattern in different taluks. The clustering of taluks differed over the period indicating the changes in land use pattern. While all the 17 taluks of the district came together in a single cluster in the first period, there were three distinct clusters in the second

period. In the third period three clusters continued to exist but with some realignment among the taluks.

The compound growth rates were estimated for different categories of land for different taluks and also for the district. The growth rates of area sown more than once in almost all the taluks were significant indicating improvement in the management of cultivated lands. Almost similar results were observed in the case of land put to non-agricultural uses which reflected the pressure on land because of increased population. Among the other parameters, the growth rates exhibited mixed trend (negative or positive) but in most of the cases they were non-significant. However, a special mention needs to be made regarding the forest cover which showed a very low growth rate at the district as well as at taluk levels.

The primary data on pattern of holding, productivity levels, land capabilities, and performance of perennial crops as pursued by the farmers were collected to study the land use pattern under private ownership. The overall pattern of irrigated area under different categories in the district indicated that percentage of irrigated area is inversely related to the size of the holdings.

It was observed that the percentage of area under below average yield to net cultivated area increased

with the size of holdings, which indicated the availability of land for alternative land use. If we consider the land capabilities as pursued by the farmers, the high slopy lands were to the tune of 6.4 per cent in malnad region and the moderate slopy lands were 24.23, 51.00, 22.00, 37.00 and 34.30 per cent in malnad, transition, dry-irrigated, dry region and overall respectively. This indicated further scope for alternative land use than the area available based on productivity levels. It was also observed that 33 per cent of farmers were already growing some perennial crops and about 34 per cent of farmers wanted to grow perennial crops. All the farmers who were already growing perennial crops have given favourable opinions.

The above results provide an optimistic scenario for better land use programmes. So the planning, administration, execution and financial norms are to be tuned to suit different regions, groups, soil types and so forth.

Policy Implications

1. In order to ensure better land use it is necessary to have dual strategies. In Dharwad district western part (Malnad and Transitional region) of the district the development of public and community lands should receive priority while in the eastern part (dry and dry-irrigated

regions) of the district the agro-forestry should be encouraged with active involvement of people in the private lands.

2. Since the management of land differs with different group of farmers, it is necessary to have appropriate models for each category for introducing alternative land uses.

3. Since the farmers themselves are aware of low productivity of some portion of their land alternative use proposal should be made to suit such lands.

4. There is a need for providing guidelines to allocate land for non-agricultural uses preferabley by allocating barren and uncultivable lands.

5. The existing State Land Use Board need to be activated to discharge the above responsibilities.

VII. REFERENCES

VII. REFERENCES

ANONYMOUS, 1991, "Land use Planning : an inter-regional analysis in Uttar Pradesh". Agricultural Situation in India, 46 (6) : 459-461.

BILLS, N.L., 1990, "Land use in Rural New York Agriculture or development ?" New York's food and Life Science Quarterly, 20 (1/2) : 8-11.

BORA, A.K., 1983, "Forest in Assam - Its Trends in Area, Production and Productivity". Indian Journal of Agricultural Economics, 38 (3) : 22-28.

BOWONDER, B. AND PRASAD S.R., 1987, Unni, N.V.M., "Afforestation in India : Policy and strategy reforms". Land use Policy, 4 (2) : 133-146.

DAHIYA, P.S.,BHATI, J.P. AND SHARMA, H.C., 1991, "Changing profile of Agricultural Economy in Himachal Pradesh". Agricultural Situation in India, 36 (8) : 85-98.

DASHEMCHANDRALAL, 1983, "A Study of Regional Distribution and Trends in Area Production and yield of Forests in Bihar". Indian Jouranal of Agricultural Economics, 38 (3) : 45-49.

GIRI, R., 1966, "Changes in Land use Patterns in India" Indian Journal of Agricultural Economics, 21 93) 23 - 32.

HEGDE, B.R., 1988, "Concepts and components of Watershed Development", Presented at the subject matter workshop - Cum - Seminar on Watershed Management held at University of Agricultural Sciences, Bangalore.

HEGDE, D.S., 1993, "Performance of the Karnataka Co-operative oilseed Grower's Federation Limited - An Economic Analysis". Unpublished M.Sc. (Agri) Thesis Submitted to U.A.S., Dharwad.

JOSHI P.K. AND AGNIHOTRY, A.K., 1983, "Ex-Ante Assessment of Afforestation for fuel wood on waste lands - A multi-objective Programming Approach". Indian Journal of Agricultural Economics, 38 (3) : 308-315.

JOSHI, P.K. AND PRASAD R., 1991, "Optimal utilization of village community land for sustainable development". Agricultural Situation in India, 45 (1) : 755-759.

KANAUER. N., 1989, "Ecology and Land Diversion", University of Kiel, Germany.

KRISHNARAJ, J., 1980, " Measuring Agricultural Growth". Indian Journal of Agricultural Economics, 35 (2) : 31-41.

KUMAR, J., 1986, "Land use analysis-a case study of Nalanda district, Bihar". Department of Geography, Magadh University, Bihar, India.

NADDA, A.L., SHARMA, L.R., BHADAURIA, V.S. AND SWARUP, R., 1978, "Optimising crop production pattern in Different Agroclimatic Zones of Himachal Pradesh". Indian Journal of Agricultural Economics, 33 (4) : 22-28.

NADKARNI, M.V. AND DESHPANDE, R.S., 1979, "Under Utilization of Land-Climatic or Institutional Factors". Indian Journal of Agricultural Economics, 34 (2) : 1-17.

PAL, S. AND MRUTHYUNJAYA, 1990, "Silvipastiral system for Development of Wastelands of Arid Regions". Agricultural situation in India, 45 (5) : 333-338.

PANDEY, V.K. AND TEWARI, S.K., 1987, "Some ecological implications of Land use Dynamics in Uttar Pradesh". Indian Journal of Agricultural Economics, 42 (3) : 388-394.

PATTANASHETTI, M.B., 1993, "An Economic Evaluation of Forest Development in Karnataka with special reference to Social Forestry Programme", Unpublished Ph.D Thesis Submitted to U.A.S., Dharwad.

PRUDHVI, R.K.N., KHAN, A.R. AND SINGH, S., 1989, "Geographic information systems to evaluate land for environmental Management : a case study from Eastern Madya Pradesh". Annals of the National Association of Geographer, 2 (1) : 19-27.

RAMANAIAH, Y.V. AND REDDY, N.B.K., 1990, "Land use pattern and Dynamics of Land use in Andhra Pradesh" P. 37-61 In : Land utilization and Management in India (Ed) B.N. Mishra, CHUGH Publications, Allahabad.

RAO, V.M., 1985, "Land use Pattern in Andhra Pradesh during 1955-56 to 1979-80". Agricultural Situation in India, **40** (1) : 617-620.

RATNAM, N.V., RAO M.R. AND VISWANADHAM, Y.K., 1978, "Land Use Pattern and Agricultural Policy" (A macro level approach to resource management in a developing economy). Centre for Agricultural and Rural Development. II, Bangalore.

RATNA REDDY, V., 1991, "Under-Utilization of Land in Andhra Pradesh : Extent and Determinants". Indian Journal of Agricultural Economics, 46 (4) : 555-567.

SAU R. K., 1968, "An Approach to the Analysis of Land Utilization". Indian Journal of Agricultural Economics, 23 (2) : 45-52.

SASTRY, K.N.R., 1983. "Growth Dimensions of Agriculture in Karnataka". An unpublished Ph.D Thesis submitted to U.A.S. Bangalore.

SAUER, C.O., 1919 , "Mapping the utilization of the land". Geographical Review, 8 : 47-54.

SHANKARMURTHY, H.G., 1986, "Performance of the Karnataka State Cooperative Marketing Federation Limited and its Impact on Farm Market - An economic analysis". An unpublished Ph.D. Thesis, submitted to A.P.A.U., Hyderabad.

SHRIVASTAVA, S.N., MISHRA, B.L., BHAGHEL, A.S., SAHU, R.M., AND SINGH, R.P., 1991, "Dynamics of Land - Use and cropping pattern in Tawa command Area of Hoshangabad District, Madhya Pradesh". Agricultural Situation in India, 45 (11) : 743-748.

SINGH KARAM, 1978, "Optimum Land Use Pattern and Resource Allocation in a Growing Economy". Indian Journal of Agricultural Economics,33 (1) : 34-38.

SINGH RAJENRA, 1990, "A study on Inter-Regional Disparities in the Pattern of Land Utilization in Uttar Pradesh". Indian Journal of Agricultural Economics,45 (3) : 344.

STAMP, L.D., 1962, The Land of Britain - its use and misuse. Longmans publication, London.

VAIDYA, C.S. AND SIKKA, B.K., 1991, "Land Utilization Pattern in Himachal Pradesh". Agricultural Situation in India, 46 : 539-540.

VOHRA, B.B., 1988, Regenerating the Land. The Hindu, 111 (220) : 9.

APPENDIX

APPENDIX

Schedule

Title : DYNAMICS OF LAND USE IN DHARWAD DISTRICT, KARNATAKA

I) General Information :

a. Name of the farmer :

b. Village :

c. No of family members :

d. No. of family members engaged in agriculture :

II) Land Use pattern : Use	Hectares
1. Total land holding	
2. Forest	
3. Barren and uncultivable land :	
4. Land put to non-agricultural uses :	
5. Cultivable waste	
6. Permanent pastures and other grazing lands :	
7. Land under misc. tree crops (No. of tree, sp.wise) :	
8. Current fallows :	
9. Long fallow land	
10. Net area sown :	
11. Area sown twice : Area sown thrice	
12. Total cropped area :	

III) Details of the land holding

a. Particulars (in hactares) :

	Red	Black	Medium
i. Dry land			
ii. Wet land			
iii. Garden land			
iv. Other type of land with specification			
v. Land leased in Area :			
vi. Land leased out Area :			
Reason			

b. **Topography of land** :

	(Area) Red	Medium Black	Deep Black
i. Levelled			
ii. Moderate slopy			
iii. Steep slopy			

c. **Land under non-agricultural uses :**

Use	Area	Reasons
1.		
2.		
3.		
4.		

d. Land unfit for growing crops Hectares

Reasons : 1.
2.
3.
4.

Can it be used for growing forest : Crops ? : Yes/No.

If Yes

Crops **Area** : **with what measures/support**

1.

2.

3.

If No. Reasons :

1.

2.

3.

e. Land more suitable for horticultural/Forest/Fodder crops

	Horticulture		Forestry		Fodder	
	Dry	Irrigated	Dry	Irrigated	Dry	Irrigated
1. Area						
2. Crops that can be grown						
i.						
ii.						
iii.						
iv.						
v.						
3. Reasons for not adopting at present						

f. Is there any change in the land holding in past 10 years ? Yes/No.

Addition/Reduction	Areas	(Approx) Year	Reasons
1.			
2.			
3.			
4.			

VI. Sources of Irrigation : Year Area Under Irrigation

	K	R	S
a. Wells-Tube well Open well			
ii. Canal/Nala			
iii. Tank			
iv. Other types.			

b. Is there any changes in area under irrigation in the past 10 years?

Yes/No.

Acres added	Year	Method (Well, Canal...)
1.		
2.		
3.		
4.		

c. Forest Crops

Actual/Expected

Crops	Age	Life period	Average cost	Average return	How many years
1.					
2.					
3.					
4.					
5.					

d. If you takeup horticulture/Forest crops, how do you make up your financial adjustment durig the question period ?

1. Remaining area is sufficient :

2. Income from non farm

3. Off-farm income.

4.

5.

e. What is the Maximum/minimum area that you can go for under a particular crop ?

Crops	Maximum	Minimum (Based on consumption needs)
Dry : 1.		
2.		
3.		
4.		
5.		
Irrigated :		
1.		
2.		
3.		
4.		
5.		

f. From how many years you are growing these crops ?

Crop		: Crop.....Area....Years.....
1. Horticultural Crops	a. b. c.	
2. Forest Crops	a. b. c.	
3. Fodder crop	a. b. c.	

g. Fertility/productivity levels.

Yield range	:	Area	Reasons
i. Average yield	:		
ii. More than Avg. yield	:		
iii. 50% of the yield	:		
iv. 25-50% of the yield	:		
v. 25% of the yield	:		

VII Effect of changes in Landuse pattern

		Favourable/unfavourable.
a. Income below	:	
b. Social status	:	
c. Risk	:	
d. Convinience of labour	:	
e.		
f.		
g.		
h.		

VIII. How much time you personally spend on the following activities ?

Activities	Time required	Time spent
1. Input purchases		
2. Land preparation		
3. Sowing		
4. Weeding		
5. P. protection		
6. Harvesting		
7. Threshing		
8. Bagging and Transport		

IX. What are the changes that you will go for if financial support is given ?

Changes		Existings	Possible changes
1. Dry to irrigated	:		
2. Land development (Bunding, levelling)			
3. Changes in cropping pattern	:		
4. Possession of machinery and equipment	:		
5. Possession of livestock	:		
6. Dairy and Poultry	:		

X. What are the present constraints in producing crops ?

	Field crops	Horticulture	Forest	Fodder
Production				
Financial				

XI. What are the suggestion to overcome these constraints ?

1.
2.
3.
4.
5.

XII. Is there any community land in the village ?

	Type of land	Area
1.		
2.		
3.		
4.		
5.		

XIII. Facilities available from the community lands.

1. Fodder Qty/ac
2. Fuel Qty
3. Horticultural products Qts
4. Grazing livestock.

Dynamics of land use in Dharwad District, Karnataka

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ABSTRACT

The land, the most limited resource, which decides the performance of the economy was studied in detail with respect to its use under public, community and private ownership. The study was conducted taking four taluks respresenting different agro-climatic regions. The secondary data were collected for a period of 21 years starting from 1971-72 and primary data from 180 farmers for the period 1992-93. Then farmers were post classified into small, medium and large size-groups based on land holdings. Tabular, cluster, compound growth rate and correlation analysis were employed. The cluster analysis was employed for three periods considering the land use pattern in different taluks. All the seventeen taluks for the district came together in a single cluster in the first period (1971-74), there were three distinct clusters in the second (1982-85) and third (1988-91) period with some realignment among taluks. The growth rates of Area Sown More Than Once and Land Put to Non-agricultural Uses were significant in almost all taluks. Forest cover showed a very low growth rate both at the district and taluk levels. The results of the primary data revealed that the percentage of irrigated area is directly related to the size of the holdings. The percentage of area under below average yield to net cultivated area and the area under high and moderate slopy lands indicated the scope for alternative land use. And also the farmers were having favourable opinions regarding perennial crops. with this optimistic scenerio, for a better land use programme, the planning, administration, execution and financial norms are to be tuned to suit different regions, groups, soil types, etc.