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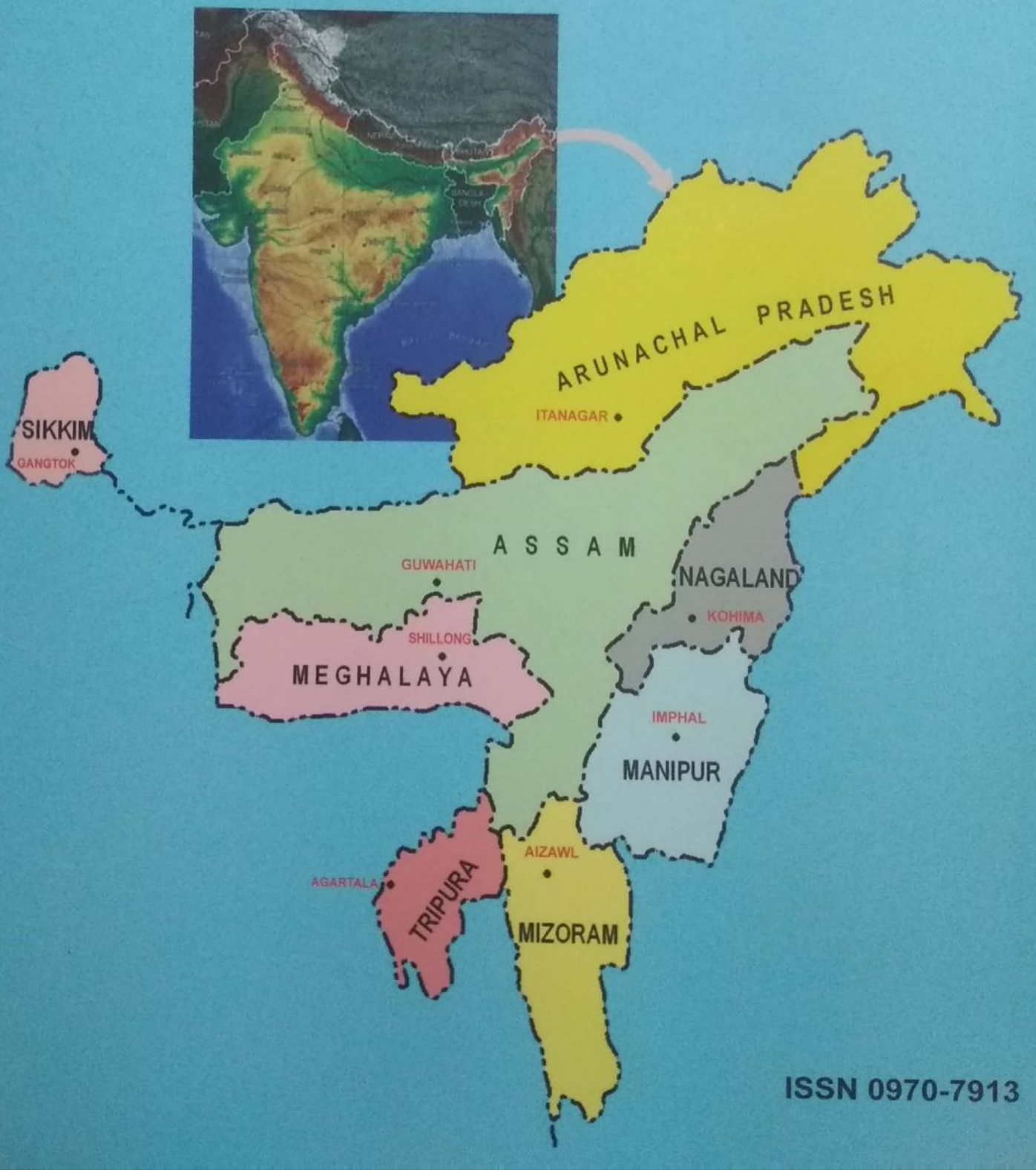

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Changing Pattern of Cultivation in Churachandpur District, Manipur

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Introduction

The most important use of land globally include cultivation in various forms, livestock grazing, settlement and construction, reserved and protected land, and timber production. For primitive tribes forest are the source of fruits, tubers, honey and wild animals for everyday sustenance. Over the past century agricultural land has doubled worldwide (Andre et. al. 2001). Churachandpur has 93% of its population living in rural areas who depends directly on the forest for their livelihood through jhum cultivation and extraction of forest products. The economic activities of the people affect the environment and land cover change proportionately. Driver of land cover change are both proximate such as soil and accessibility and exogenous such as global commodity markets and national and international policies (Etter et al 2006). According to Peter, "land use pattern are the results of many processes within the landscape that act over a large number of scales and are linked together in hierarchies".

Churachandpur has roughly uniform climate and topography. However there is local variation in soil types, nature of slope, relief, temperature and humidity that controlled the cultivation pattern. Land cover of the earth is heterogeneous at all levels of observations (Allen 1991). The study area, however small has vast diversity in production of varieties of agriculture crops. Potential productivity of land and its capability depends on physical conditions of land viz. nature of soil productivity, soil depth, degree of slope, nature of drainage, soil stoniness and sandiness, extend of rock exposure and erosion, etc.(Jha 1979). The district is capable of producing variety of food, fruits and spices (table1).

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Jhum cultivation is traditional and passed on to successive generations from a long time ago. The increasing trend of population demand to cultivate more land on the same region over a long period of time causes serious problems such as deforestation soil erosion etc. Geomorphological character exercise considerable influence on cultivation. People are compelled to jhum cultivation as an alternative to terrace cultivation due to limited flat surface (Thingo 1994). Landscape pattern and landscape type response to land use change on the other hand change in land use also influence the landscape type and its dynamic of change (Abdullah & Nakagoshi). Over time the cultivation pattern changes due to a number of physical factors along with social and economic attributes. In the past Jhuming was mainly for dry paddy cultivation and essential other food crops link maize, cucumber, watermelon, and vegetables. This pattern has now changed substantially due to easy access of food grains in the market and need to grow more cash crops in order to match up the prevailing cash driven economy to the society.

Objectives

To carry out the study the following objectives are taken in to consideration..

i. to know the physical characteristics of the study area
ii. to know the impact of terrain characteristics on agricultural pattern
iii. to evaluate the changing nature of agriculture

Database and Methodology

The study is based on data set collected from relevant agencies of the state government. The area of food grain, maize, fruits, vegetables and spices for the year between 2007-08 and 2011-12 are collected for analysis (Table 2). The land use map of NRSC and Earth Explorer of the USGS are used for cross examination of the findings in the data analysis. The Global Crop land map with 30 m resolution becomes very useful in identifying the cropped area with respect to the location. This has been the highest spatial resolution Global crop land map to date (2015). Terrain map showing elevation is prepared from satellite image using ArcGIS that enable easier identification of cultivation types based on the topography (Fig.2). Various statistical techniques are employed to analyze and understand the changes over time and in space. Conclusion is made based on the findings of the study, personal experience and field observation.

Study Area

Churachandpur is the largest district of Manipur with an area of 4570 sq.km and inhabited by 274143 people (2011 Census). The study area extending from

36°56′20″N to 24°36′46″ N latitude and 92°58′12″ E to 93°52′58″ E longitude. The district has 5 sub divisions and 10 tribal development blocks for local administration. There are total of 596 villages in the whole district with total rural population of 255786 according to Census of India, 2011. The district has an international boundary with Myanmar in the south, and surrounded by neighbor states i.e. Assam and Mizoram in the west and, south and southwest respectively. It is surrounded by districts like Chandel in the east, Bishnupur in the north and Tamenglong in the northwest (fig.1)

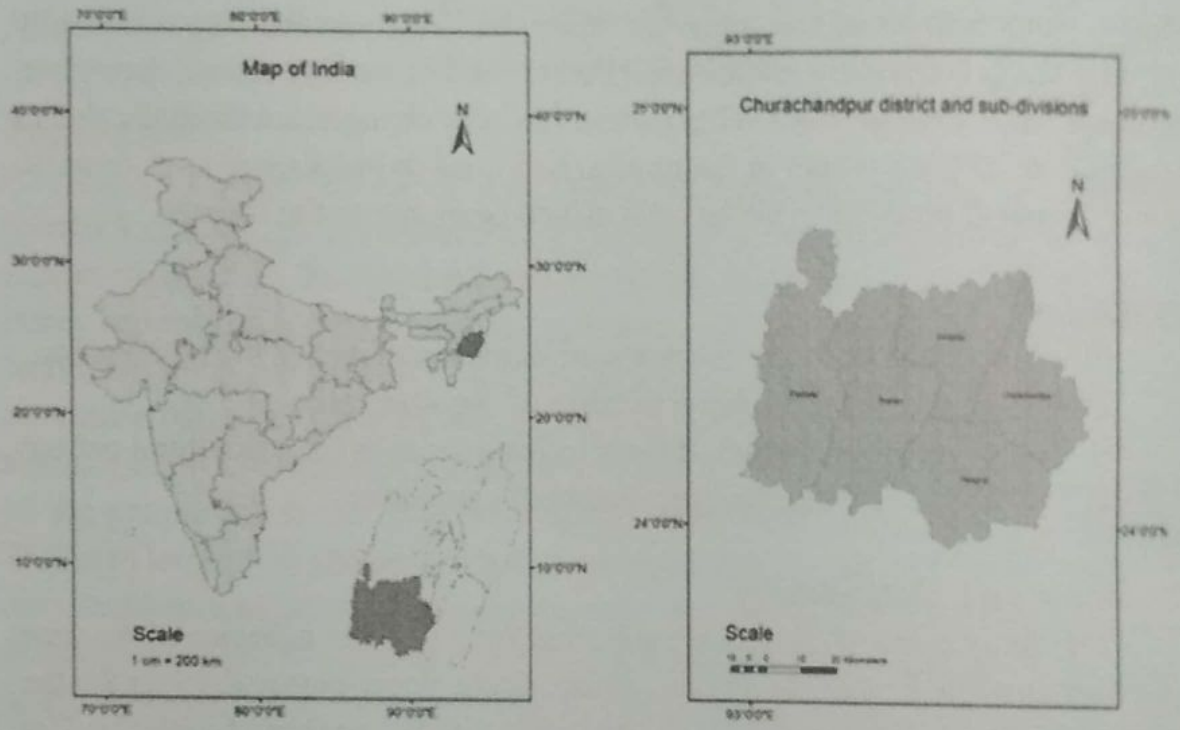

Fig. 1 Location Map

Geographical Base

Geology and Soil

The region has complex geology and thorough investigation has not been made to the present. The district fall under high seismic zone along Churachandpur Mao Thrust (CMT) situated West of Indo Myanmar subduction zone(Singh 2014). The geological formations has close semblance with that of Nagaland and part of Assam geological unit. The main rock groups are Disang, Barail, Surma and Tipam. The denudo-structural hills of Disang group surrounded the valley (around Churachandpur town) on all sides (Fig. 2).

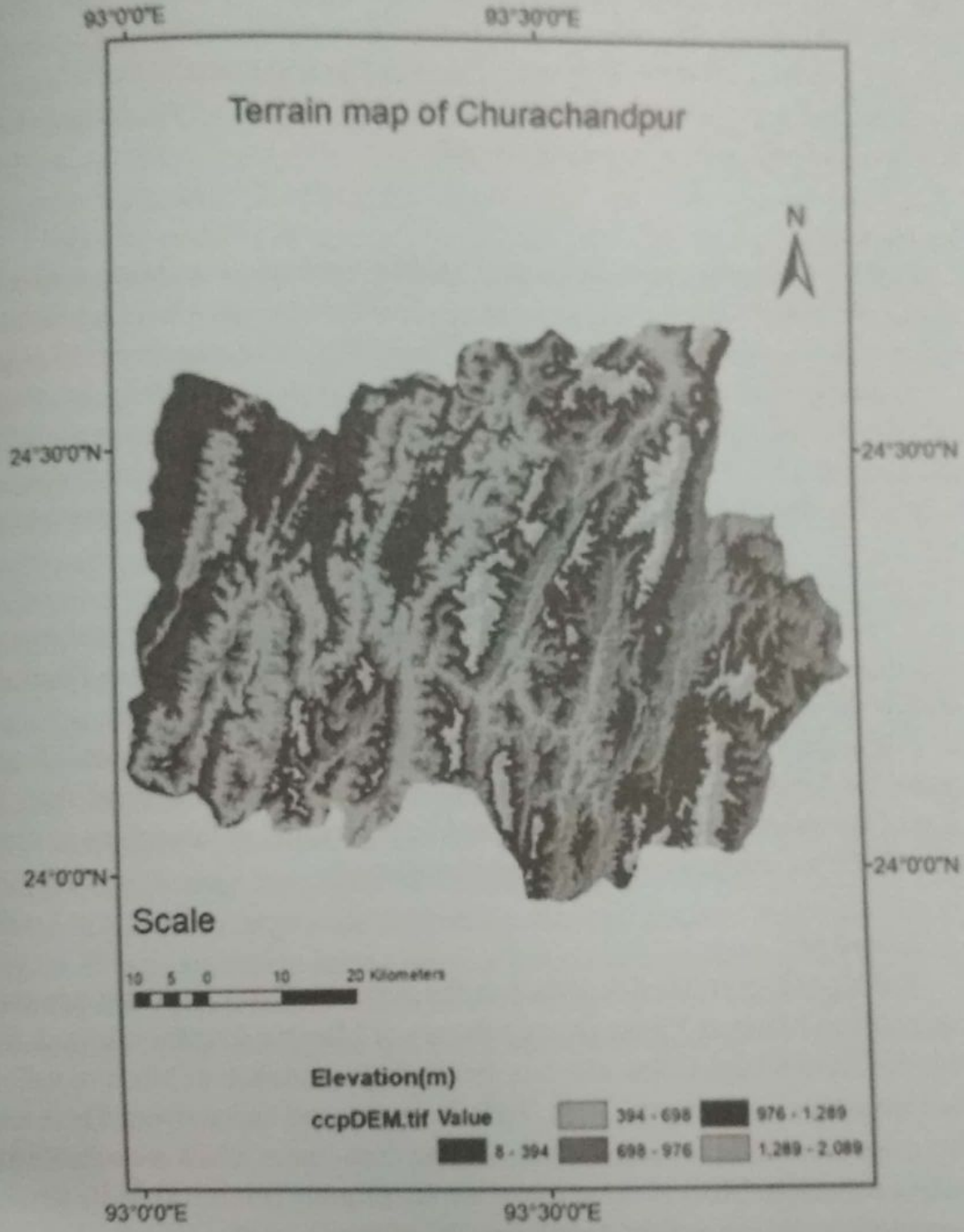

Fig. 2 Terrain Map

The major soil types of the area are residual and transported types. The residual soil are found in the hills where they developed in situ formed by decomposition of the parent rocks in their original place (Singh 2014). They are

yellow to red sandy loams usually 1.52 to 2.13 m deep with greater depth at the bottom of the slopes. Transported soils are two types namely alluvium and organic, they are grey to pale brown. Organic soil covers low lying areas of the valley. Old alluvium soils are found in the Barak basin areas formed by the deposition of alluvium of lateral origin from neighbor hills.

Climate

Owing to varying elevation the state has both subtropical and warm temperate types of climate. While the former is the result of its subtropical location, the later is due to its proximity to the Himalayas (Singh1986). The annual rainfall varies from south to north with more precipitation in the South. The 1500mm line touch only the NE portion of the district. The maximum summer temperature is 37°C and minimum is 1°C. The atmospheric humidity is lowest at 61! and maximum is 100!. Decline in water flow during non-monsoon make the state a mono crop.

Vegetation

Primary forest has not been found in the district due to the interaction between the indigenous people and the forest. Secondary forest including mixed bamboo forest is the characteristics of the vegetation cover in Churachandpur.

The main vegetation type is sub-tropical dry temperate forest which is found around the Khuga hills. Tropical wet semi evergreen forests are found along 3-5 km of Barak river. High temperature and heavy rainfall of this region produce dense forest dominated by bamboo and hardwood.

Drainage

The biggest river that drains though the district is Barak river that originate from northern Manipur. Khuga river a tributary of Manipur river flow towards the north that form Khuga valley which is the southern extension of Manipur valley. Other important rivers are the Tuila, Tuili, Leimatak and Tuivai rivers. These and other smaller rivers form narrow valleys along their course which are suitable for paddy cultivation. Most of these rivers are structurally controlled by its terrain charateristics and are parallel to sub parallel with one another.

Terrain Impact on Cultivation pattern

Landform unit is the most important factor affecting vegetation distribution while moisture controlled vegetation pattern in the upper area of the hill slopes (Sakai, et al 2014). Cultivation pattern depends on the physical characteristics of the soil, climate and topography. The distribution of different crops varies according

to the means of irrigation, land capacity and soil conditions for concentration and diversification of various crops (Singh 2014). Churachandpur has two distinct types of cultivation these are settled farming practice in the plains, valleys, foothills and terraced slopes and shifting cultivation (jhum) on the hill slopes. In the hills cultivation are concentrated where there are human habitations. This implies that settlement area and cultivation area are affecting each other.

The flat ground and terraced slopes are used for paddy cultivation during Kharif season and vegetables in Rabi season in some areas where soil moisture is sufficient for the crops. The narrow alluvial plains formed by the rivers are suitable for paddy cultivation. The narrow patches of fertile plain on the bank of the rivers are used for wet paddy cultivation. Foothill regions and Piedmont hills are suitable for vegetables and fruit crops side by side exists settlement. The steep hills are not farmers friendly as modern machines are difficult to employ. The flat plains are convenient than the hilly area to cultivate which is easy to use modern tools and techniques and maintenance. But hilly tracks are also used by the cultivators to get more profit from the production causing rapid and extensive degradation of forest and the environment. There is notable changing trend in the use of land and cultivation pattern over the years as given in table 2 and fig.4. As stated by Abdullah and Nakagoshi," land development in several tropical countries has been influenced by high economic growth resulting in significant shift in the past few decades". A large portion of paddy fields has been converted to settlement in Churachandpur town area. In the hills and remote areas cultivation pattern has changed significantly from home consumption crops to cash crops. The researcher found that recently large scale cultivation of poppy plants is in progress in the region. Poppy cultivation have adverse affect on both physical as well as social environment. Since it is cultivated in the remote high hill area which not only affect the ecology of the hilly region but also leads soil erosion, deforestation etc.

Table 1: land use/ land cover of Churachandpur district (2011-12)

Land use/Land cover types		Area in sq.km
Agricultural	Crop land	106.71
	Current shifting cultivation	129.49
Barren/wasteland	scrub land	868.05
Built-up	Rural	32.85
	Urban	7.7
Forest	deciduous	2576.72
	evergreen/ semi evergreen	449.64
	scrub forest	362.94
wetlands/waterbodies	river/streams	33.92

Source: *Directorate of Economics and Statistics, Govt. of Manipur*

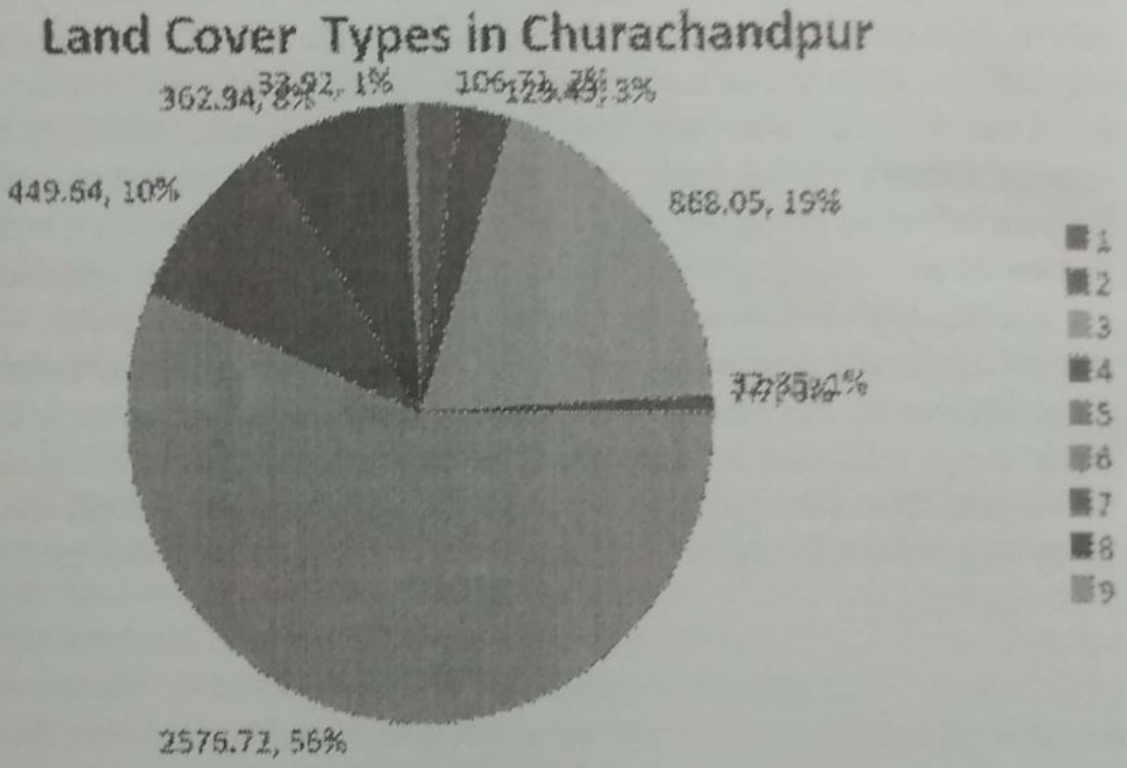

Fig.3 *land use/ land cover of Churachandpur district (2011-12)*

Table 2: Area and production of principle cereal crops in Churachandpur

Items	2007-2008 (In Hectares.)	2011-12(In Hectares)
Fruits	6914	8477
Vegetable	868	1509
Spices	2299	2571
Maize	306	1930
Rice	20430	252302

Source:Directorate of Economics and Statistics, Govt. of Manipur.

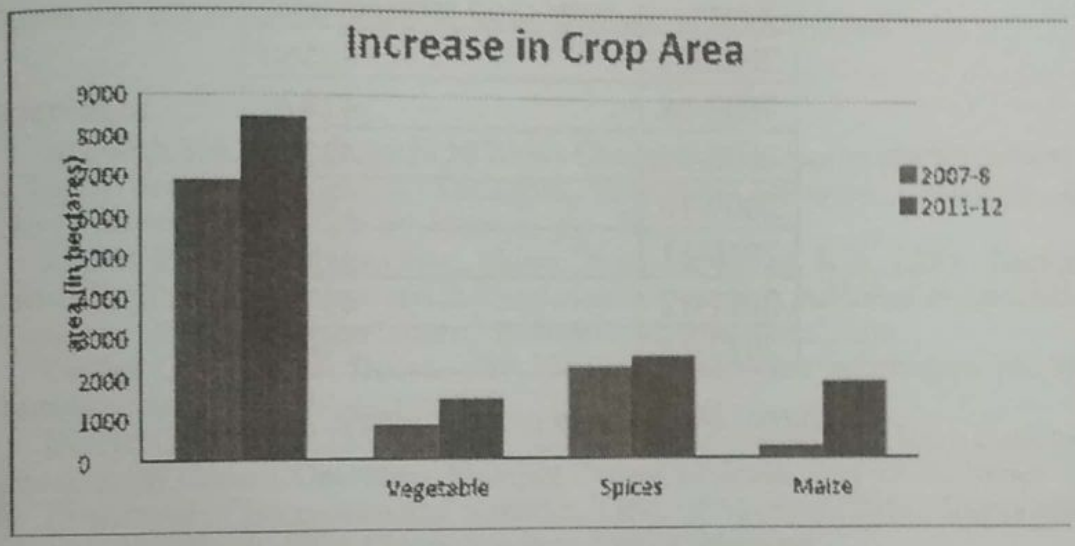

Fig.4 Showing the Increasing Trend of Crop Area

Discussion of Result

Shifting cultivation captured 3% of the district's total geographical area which is three times the settlement area whereas other agriculture crops comprised 2%. Paddy is the dominant crop which surpasses all the other crops combined. Area wise paddy is 17 times more than other crops i.e. fruits, vegetables and spices combined. The nature of cultivation paddy is mainly subsistence. Among the commercial crops, fruit has the most in terms of agricultural size with 8477 hectares which is roughly twice the size of vegetable, spices and maize combined. Pineapple and passion fruit are the major fruit production while banana, orange and lemon are also important fruit tree. Maize has seen an increase of 6 times between 2007-08 and 2012-13.

The average total crop area from 2006-07 to 2012-13 show a gradual decreased in total crop area in the district. Data for recent agriculture is not available however it is observed and experienced that there is surge in practice of illegal crops like poppy and marijuana. There is no proper record on the amount of production and the areal size of the illicit drug crops. From the field observation and secondary sources it has been found that it occupied large share in local economy and occupation of the farmers. The prevailing economy and occupation significantly changes the cultivation and landuse pattern.

Table 3: Crop Area, 2006 to 2013

Year	Total crop area(hectare)
2006-07	43560
7007-08	42870
2008-09	42270
2009-10	14660
2010-11	41970
2011-12	43320
2012-13	29870

Source: Department of Agriculture, Manipur.

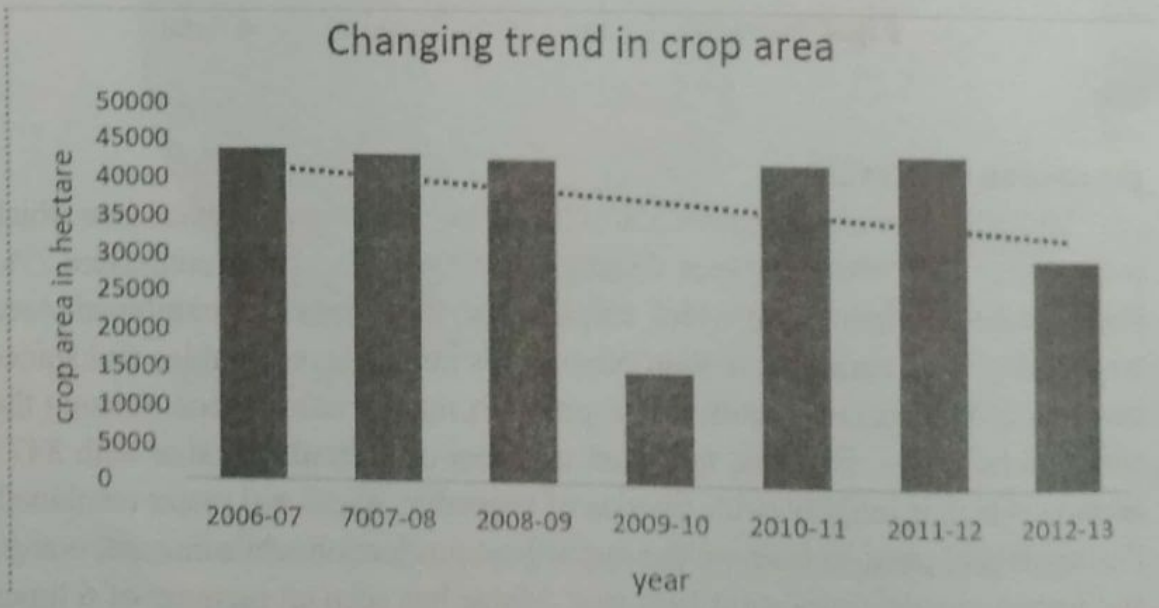

Fig.5 Changing trend of Crop Area

Conclusion

Cultivation pattern is not location specific but some crops are more suitable to a particular place depending on the physical conditions. Rice occupies an important place in terms of cultivation. However cultivation pattern shift from food crops to cash crops in recent years. This phenomenon significantly changed the landscape pattern and land cover types. The small mountain valleys are used for settlement and paddy cultivation resulting in land pressure. On the other hand the hilly areas are intensively and extensively exploited through jhum cultivation, fuel wood, charcoal making and timbering. Low productivity in agriculture is mainly due to progressive deterioration of soil as the landholders using traditional practices in the study area. Therefore, the problem needs to be solve through the holistic approach to improve the physical as well as social environment.

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