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Study the Cropping Pattern, Their Spatial Variations and Correlate the Physical Base (Mulugu Division)

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Abstract – Earth is one land framework, epitomizing all the littler subsystems into one interconnected framework. The connection between living beings and the earth are a piece of a biological frameworks multifaceted nature. Advancement arranging includes more than thinking about individual assets. It centers on the characteristic frameworks and biological procedures that support the assets. The main aim of this paper is to Evaluation and Analysis of Resources for Development Planning in Mulugu Division, Warangal, Telangana, India. The test in formative arranging is to adjust the transient requests for products and ventures with the long haul supportability of environmental frameworks. Creating nations like India are under a ton of strain to contend monetarily with created nations and their modern headways are harming too. The investigation incorporates inside its edge work the current situation and potentialities in the fields of agriculture, forestry Minerals and businesses and so on., and suggested for the advancement of these areas on an optimal premise..

Keywords - Crop Combination, Crop Intensity, Crop Concentration, Crop Diversification

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1. INTRODUCTION

The idea of incorporated methodology for development of an area is accomplishing significance over the previous decade. It incorporates the parts of spatial and utilitarian coordination. The spatial component incorporates into it the subjects which are straightforwardly identified with land, similar to physiography, atmospheres, soils land use, vegetation and so forth., the useful component incorporates every one of the parts of social and economic exercises like agriculture, domesticated animals enterprises and so on., which impact the life of individuals. Change in priorities of one division will affect the other part. Any proposed change for development needs to altogether explore every one of the above component and it is bury relationship. In this manner, the setting of development when, new elective exercises and proposed the area of such capacity become critical. Arranging for land use is not an end in itself. It is a way to accomplish different objectives and targets. The procedural perspective to be pursue to change the objective and goals into the truth are urgent. For achieving these destinations, it is basic to have a persistent progression of common resources data of a locale, up to the town level ear denoting the profile of the district in connection to the essential goals to define systems for developmental arranging. While getting ready for supportability of regular resources a ton of significance ought to be given for investigation of common phenomena, for example, land use, Hydro Geomorphology, Slope, Soil and so on., in light of the fact that these phenomena instantaneously affect environment. This will progressively rely upon the efficient utilization of the present ability accessible.

The association of the financial organization on present day lines can be followed to the British period. At the point when the British Crown assumed control over the organization from the East India Company, the financial organization was wrecked, to such an extent that it was a typical talk in England that anyone, who could get a vocation with the East India Company, could return to England adequately rich to spend a mind-blowing remainder like a ruler. It is this situation, which incited the British Government to advance a sound arrangement of financial organization, which can direction validity among the general population. A sound and concentrated arrangement of financial control was additionally viewed as an imperative to serve the colonial interests.

Physiography

Mulugu division, which is a piece of the Warangal region, is situated in the table place where there is Deccan and long slope ranges are not regular in

this division. Nevertheless, the trademark geology of the Deccan, as rough bunches and confined pinnacles, are additionally found in this division. The Deccan trap is found in the Northern Frontier and the stone bunches identify with the Archean gathering. These land developments contain a rich source of mineral store that incorporate dirt's, iron metal, manganese and cleanser stones. Two noteworthy streams water this division. The water of the Maneru and the Godavari waterways are utilized for water system in this division. There are additionally a decent number of streams, lakes, wells and artificial tanks, which are utilized for water system.

As there is a rich source of water system, the primary control of the general population of this division is agriculture. Paddy, Sugarcane and Cotton are developed to a vast degree because a noteworthy part of the division is secured by dark cotton soil and sandy soil. A large portion of the area is under timberland spread and this assumes a vital role in forming the economy of the division. Sadly, despite the fact that the division was secured to an expansive degree by the timberland belt and has a rich backwoods resource, this is not made to utilize, optimally.

2. OBJECTIVES OF THE STUDY

1) To arrange the territory as indicated by land framework, land structures and soils in the wake of recognizing the physical base of the division.

2) To research the different sorts of water resources that are accessible and how they are optimally used. Utilizing subjective and quantitative information for examining the structure of land use and land spread.

3) To align the potentialities of ventures that depends on resources and their phases of development.

3. METHODOLOGY

In the current research, the data for the taken arrangement of periods between 2000-02 and 2010-12, has been gathered from two noteworthy sources viz. Primary and Secondary. The third kind of data was gotten from the primary and secondary data after a few processing and evaluations. Through and through the Secondary data and the Derived data were constantly checked with the Primary field data gathered progressively from the Study Area (Mulugu Division of Warangal District). At that point, the examination was embraced to get the ideal consequence of the research. The Primary data was gathered from the Study Area through GPS and DGPS Survey just as statistical surveys. The Secondary data was additionally subdivided into four sub classifications and were gathered from various Government experts. Those are Statistical, Geological, Topographical and Remotely Sensed data. Going to the Statistical Data, the Agricultural Data was gathered from the Directorate of Agriculture, AP. The Water Resources and Irrigation data were gathered from the Central Ground Water Board and Irrigation and Cad Department, Irrigation Wing, AP. The vast majority of the other statistical data and the Soil Information were gathered from the Directorate of Economics and Statistics, AP. The backwoods data was gathered from the "AP State Forest Report, 2013" distributed by "State Forest Department, AP". Modern data was gathered from the Statistical Report of the Ministry of Industrial Development, AP. Land topo sheets of 1:50000 scale was gathered from the Geological Survey of India (GSI) and the geographical data was separated from the topo sheets of 1:50000 scale, gathered from the Survey of India (SOI). Progressively over the Remote Sensing, innovation has been utilized limitlessly to extricate the Resource Information and to set up the Resource Information System Database (RIS). Multi-regular Scenes of the Landsat-7 Enhanced Thematic Mapper (ETM) and Landsat-5 Thematic Mapper (TM) were gathered from the authority United States' Geological Survey (USGS) database, for the time of 2000-02 and 2010-12 separately to set up the LULC maps. Once more, to set up the Relief and Slope maps the Global 1cS (30 m) DEM Satellite Scenes were gathered from the Japanese Database of ASTER (Advanced Space borne Thermal Emission and Reflection Radiometer) Satellite.

Thusly the intricate examination of the research was done for two arrangements of times of 2000-02 and 2010-12 for the Division of Mulugu of Warangal District in Telangana, chiefly focused on five methods viz. Crop Combination, Intensity of Cropping, Crop Concentration, Crop Diversification and Ranking of the Crops.

Hypotheses of the study

1) Agriculture in the Division depends on the Minor Irrigation facilities and Rainfall.

2) The Cropping Pattern of the Division determined by the quality of Land and Soil Characteristics.

4. DATA ANALYSIS

- **Crop combination (CC)**

The investigation of crop combination gives us the general position of crops on divisional scale. Ranchers develop crops in changed physical and social conditions. The example of crop combination gives the prevalence of specific crops or combination bringing about the development of crop locales. In the present examination, an

endeavor is made by utilizing Coppock's Least Square strategy.

- **Crop intensity (CI)**

For a particular crop the cropping intensity every number of times that crop is developed in one year on a similar field, the accompanying strategy has been use to decide the Crop Intensity.

$$Intensity\ of\ cropping = \frac{Gross\ cropped\ Area}{Net\ Sown\ Area}(100). \quad (1)$$

- **Crop concentration (CCnt)**

Crop Concentration implies the variety of thickness of any crop in a locale at a given purpose of time. It to a great extent relies upon its landscape, atmosphere, soils and agriculture practices of the ranchers. According to Bhatia, the accompanying strategy is utilized to decide the Crop Concentration for the investigation area:

$$Index\ for\ Determining\ Concentration\ of\ Crop\ (a) = \frac{Area\ of\ crop\ (a)\ in\ component\ areal\ unit\ (Mandal)}{Area\ of\ all\ crops\ (a)\ in\ the\ component\ areal\ unit\ (Mandal)} \div \frac{Area\ of\ crop\ (a)\ in\ entire\ Division}{Area\ of\ all\ crops\ (a)\ in\ entire\ Division} \quad (2)$$

- **Crop diversification (CD)**

The idea of Crop Diversification is inspected through the adjustments in the allotment of land towards the development of various crops become throughout the years. So as to distinguish the spatial example of the Crop Diversification, the quantitative procedures proposed by Gibbs and Martin was utilized [3,4]. The formulae is as per the following:

$$Index\ of\ crop\ Diversification = 1 - \frac{\sum X^2}{(\sum x)^2} \quad (3)$$

- **Major findings**

From the data got through the satellite it winds up evident that there is an intrinsic connection between the landforms and land frameworks and the geological maps from Survey of India and the DTM arranged from ASTER items, portray the components and the example of slope (Figure 1) which shows that landforms are firmly identified with given land frameworks. Figure 2 demonstrates the slope of the Division.

The accompanying classes of the landscape were recognized from characterized Remotely Sensed Imageries after element extraction and post processing and were cross checked by ground truth in field visit mode (Table 2). The Mulugu division has an assortment of landforms made out of volcanic, sedimentary and changeable shake developments.

- **Sources of Irrigation**

Major four sources of irrigation found in the Division are Canals,

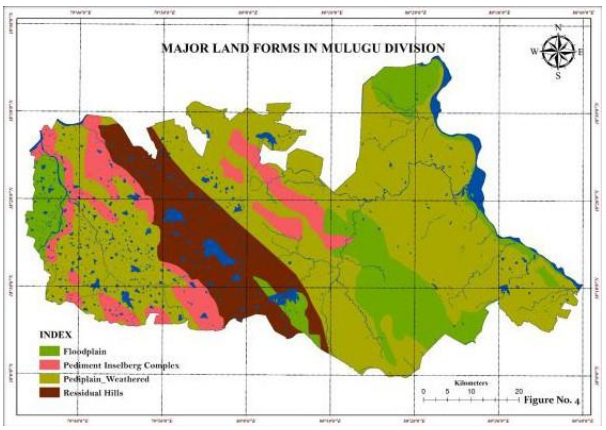

Figure 1: Major land forms in Mulugu Division

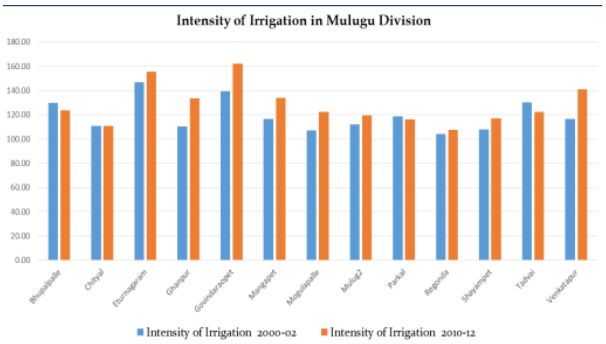

Figure 2: Graph -Comparative status of Irrigation Intensity between 2000-02 and 2010-12 for Mulugu Division.

Table 1: Area and percentage occupied by major soil types

Soil Categories	Area of the Division in Ha.	Area under the specific Soil Type in Ha.	Percentage to the Total Division
Clayey to gravelly clayey moderately deep Dark brown soils	448949	71764	15.98
Deep black clayey soils	448949	31011	6.91
Fine loamy gravelly clayey shallow Reddish brown soils	448949	19519	4.35
Light grey deep sandy soils	448949	5751	1.28
Loamy to clayey skeletal deep reddish brown soils	448949	102615	22.86
Loamy to gravelly clay deep dark reddish brown soils	448949	1058	0.24
Moderately deep calcareous black soils	448949	66024	14.71
Moderately deep calcareous moist clayey soils	448949	30035	6.69
Shallow gravelly Red soils	448949	109366	24.36
Unclassified	448949	9298	2.07
Water Body	448949	1792	0.40
Settlement	448949	711	0.16
Total		448949	100.00

Tanks, Wells and different sources give water office to the agriculture and unified exercises.

Among these four sources "Wells" are the central sources of water supply to the agricultural grounds inside the Division. Beside "Wells", it is tanks, which are the second most source of water supply for the reason water system in the Division. The accompanying Table 3 demonstrates the absolute watered area under different sources of water system for the years 2000-02 and 2010-12 uncovered that the area under trench water system was seen for the most part in the Mandals of Shayampet, Mangapet, Regonda.

Table 2: % of area under various landforms

Major Landforms	Division Area in Ha.	Class Area in Ha.	% age to the Division Area
Floodplain	448949	70707	15.75
Pediment Isenberg Complex	448949	45962	10.23
Pedi plain Weathered	448949	245007	54.57
Residual Hills	448949	60589	13.49
Drainage and Water bodies	448949	26682	5.94
Sum Total	448949	448949	100.00

Table 3: Area under various sources of irrigation for two sets of years

Total Irrigated Area	2000-2002 (Avg.)	2010-2012 (Avg.)
Canals	3539.17	1296.5
Tanks	61408.8	18342
Tubewells	16059.4	24256
Dugwells	71798.2	29285
Lift Irrigation	499.767	151.5
Other Sources	1438.25	1012.5
Net Irrigated Area	66122.90	90130.00
Gross Irrigated Area	111968.00	76083.45

Furthermore, Parkal. While Wells and Tanks gave the real sources of Irrigation for the Division. Not very many Mandals indicated Lift Irrigation and different sources of Irrigation. Just three Mandals inside the Divison (Mangapet, Parkal and Regonda) were under channel irrigation, which was under 5% for Parkal and Regonda between the years 2010-12. Tank and Well Irrigation commanded rest of the different Mandals. Not many Mandals were under Lift and Other sources of irrigation.

- **Intensity of Irrigation**

The Intensity of Irrigation exceptionally affects agricultural development. It is the rate proportion of gross watered area to the net inundated area. It is discovered that just Eturnagaram Mandal indicated Very High Intensity of Irrigation inside the Division and High Intensity was found in two of the Mandals viz. Tadvai and Govindaraopet. While Moderate intensity was found in, Bhupalpalle Mandal and rest of the nine Mandals demonstrated Low intensity. Going to the time of 2010-12, it tends to be seen that Govindaraopet and Venkatapur Mandals indicated Very High Intensity of Irrigation, which were High and low correspondingly amid the past arrangement of years. It is a result of the expansion in the quantity of Dug wells and Tube wells. Eturnagaram Mandal stayed at a similar dimension of intensity, which was high. It is likewise discovered that in light of the expansion in the quantity of Dug wells and Tube wells in the Mandals of Ghanpur and Mangapet, these Mandals indicated High Intensity, which was low amid the past arrangement of years. In the Moderate class, Bhupalpalle Mandal stayed at a similar dimension yet Tadvai Mandal moved from High to direct and Mogullapalle moved from low to Moderate. Rest of the Mandals stayed at a similar dimension of intensity that is Low. The accompanying Graph plainly delineates a relative status of the Intensity of Irrigation for two arrangement of periods in the Division.

- **Ranking of Crops**

Positioning of crops gives a knowledge in the land truth of cropping structure. Table 4 uncovered that the crops like foods grown from the ground and heartbeats have enrolled a phenomenal increment amid the example period and the cotton crop register an extreme decay.

- **Crop intensity**

“Intensive cultivation” implies multiplicity of cultivation on the same plot of arable land. It involves “double” or even “triple” cropping

Table 4: Cropping Pattern in % for two sets of Years.

Sl. No	Crops	2000-02	2010-12
01	Paddy	43.07	25.98
02	Maize	9.19	5.78
03	Total Pulses	2.49	4.96
04	Chili	9.80	9.55
05	Groundnut	2.45	0.59
06	Sesamum	0.60	2.33
07	Cotton	29.20	0.24
08	Fruits and Vegetables	0.79	48.40
09	Others	2.41	2.17
	Total	100.00	100.00

It is seen that in the Study Area for the years 2000-02, the mandals of Eturnagaram, Govindraopet and Mangampet show high degrees of crop intensity. It is a direct result of the guaranteed water supply either from the waterways, trenches or perpetual Waterbodies. Henceforth the greater part of the land is under development in both Kharif and Rabi season. The mandals like Bhupalpalle, Ghanpur and Tadvai demonstrated moderate intensity. It is because, the greater part of the geological districts of the mandals Tadvai and Bhupalpalle are uplands, albeit guaranteed surface water is

accessible but since of the land undulation the supply is inappropriate. Remaining seven mandals demonstrated low to exceptionally low crop intensity. It is all a direct result of unassured irrigation, timberland spread, bumpy and high grounds and so forth.

The outcomes for the period 2010-12 demonstrates that the mandals of Eturnagaram and Mangampet demonstrated a high level of crop intensity, though Govindaraopet has indicated moderate crop intensity. Venkatapur additionally indicated moderate cropping intensity which prior was under extremely low class. The intensity if there should arise an occurrence of Venkatapur expanded from extremely low to direct in view of the adjustment in crop combination and great irrigation. In course of time, the intensity of Bhupalpalle has tumbled from moderate to low. The development of mining action and the greatest use of accessible ground water in businesses have brought about the decrease of the agricultural movement. However, rest of the mandals keep up their ranks as it seemed to be.

- **Concentration of cropped area**

The level of concentration shifts spatially featuring the differential cooperation between different factors, for example, Physiography, Climate, and Hydrology and socioeconomic inconstancy of a specific locale. The investigation uncovered that amid the years 2000-02 extremely high concentration was found in one and only Mandal, which is Mogulapalle. High Concentration was found in the mandals of Parkal and Shayampet. While the mandals like Ghanpur and Regonda have indicated moderate concentration. These mandals are observed to be very much watered and to have exceedingly ripe soil, which support the most in serious development, so as the concentration. Low to exceptionally low concentration is appeared in rest of the mandals as the greater part of the mandals have most extreme timberland spread and fruitless soil with discrete undulation of the land causing low concentration.

For the years 2010-12, it was discovered that the mandal appearing high and high Concentration stayed unaltered following 10 years likewise; those are Mogulapalle as Very High and Parkal and Shayampet as High. The Concentration of Ghanpur mandal likewise stayed unaltered as moderate for both the investigation period. Likewise, the mandals with low concentration like Bhupalpalle, Mangapet and the mandals with extremely low concentration for example Eturnagaram and Tadvai demonstrated no change inside 10 years. In any case, the mandals like Regonda, Chityal and Venkatapur have appeared slight improvement in the crop concentration from moderate to high, Low to direct and exceptionally low to low individually. It is additionally seen that Mandals like Govindaraopet and Mulugu2 are seen as diminishing in the crop concentration inside 10 years from low to low.

- **Crop diversification**

It is discovered that in the Division ten critical crops are developed, primarily as indicated by the sort of soil and because of the impact of the interest in the market. The ten fundamental crops developed in the Division are, Paddy, Jowar, Maize, Pulses, Chili, Fruits and Vegetables, Groundnut, Sesamum, Cotton and Other. For the year 2000-02, the high level of Diversification is found in the mandals of Parkal, Bhupalpalle and Shayampet. It tends to be ascribed to the socioeconomic and social components, poor management rehearses highlighted by precipitation shortfall bringing about low efficiency. Moderate level of Crop Diversification is found in the mandals of Chityal, Mogulapalle, Regonda, Mulugu and Ghanpur. A large number of these mandals show Monoculture (Crop Specialization). Low and low crop diversification is found in Venkatapur, Eturnagaram, Tadvai, Mangampet and Govindraopet. In Figure 2 for the year 2010-12, high diversification is being appeared by the mandals of Mulugu2, Eturnagaram, Shayampet, Bhupapalle and Ghanpur. Moderate crop diversification is found in the Mandals of Govindraopet, Tadvai and Parkal. Remaining mandals demonstrated low to exceptionally low Crop Diversification.

It is evident from the above talk that development is progressively extraordinary, stable and gainful in crop specialization (Low Diversification) areas where watered agriculture is normal. In the exceedingly enhanced cropping areas, agriculture is described by low profitability, vulnerability and inferior cropping framework, because of dangers generally connected with sprinkled farming.

From the Tables 5 and 6, it very well may be seen that, among the vast and medium scale units (Mainly Agro based units) of the division, involve number of units and investments. In spite of the fact that the industrial the primary spot in structure of the Division is expanded, Agro based enterprises account about portion of the completely industrial units of the division in both the timeframes. Aside from extensive scale units, the little scale units of the Division likewise have offered a noteworthy piece of employment to the industrial segment. The poor industrial development of the examination area is a striking pointer for the economic backwardness of the division when all is said in done. The previous investigation features the current industrial pattern and the kind of businesses to be created in the division.

- **Action Plan**

Keeping in view the backwardness of the division, which is

Table 5: Classified resource based Industrial Units, Workforce and Capital Investments (2000-02).

Sl. No.	Name of the Industry	Units	%age	Workforce	%age	Capital Investment (RS. in Millions)	%age
1	Agro based	119	29.60	383	35.43	48.45	51.54
2	Forest based	53	13.18	139	12.86	11.11	11.82
3	Mineral and Cement based	14	3.48	94	8.70	12.05	12.82
4	Leather based	7	1.74	16	1.48	0.70	0.74
5	Others (Engineering, Elec., Chemical, Cottage etc....)	209	51.99	449	41.53	21.69	23.07
6	Total	402	100.00	1081	100.00	94.00	100.00

Table 6: Classified resource based Industrial Units, Workforce and Capital Investments (2010-2012)

	Name of the Industry	Units	%age	Work force	%age	Capital Investment (RS. in Millions)	%age
1	Agro based	26	32.91	308	55.69	147.24	66.25
2	Forest based	0	0	0	0	0	0
3	Mineral and Cement based	11	13.92	112	20.25	44.76	20.14
4	Leather based	0	0	0	0	0	0
5	Others (Engineering, Elec., Chemical, Cottage etc....)	42	53.16	133	24.05	30.22	13.60
6	Total	79	100.00	553	100.00	222.22	100.00

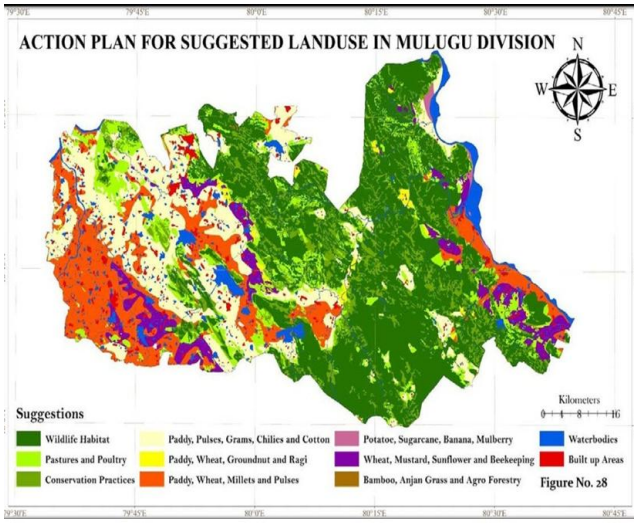

Figure 3: Action plan for suggested land use in Mulugu Division

enriched with bottomless resources, a future land use display for arranging reason has been proposed for the greatest utilization of land resources. The fundamental targets remembered in setting up an ideal land utilize display dependent on the parameters of physiography, soils, waste, ground water potential and existing land use pattern, is to delineate land utilization classifications for their use for which they are appropriate based on the above investigation, "Assessment and Analysis Of Resources For Development Planning In Mulugu Division, Warangal, Telangana, India", classifications of land have been distinguished for specific sorts of favored exercises (Table 7). Land is the most vital gainful resource among all other accessible resources on the planet. A satisfactory and proper utilization of it can give the ideal benefit for the occupation and sustainability of human creatures on earth [14-22].

Aside from the Built-up areas and Waterbodies of the division, rest of the land resources are separated into four classes, in view of the land rise (for example Plain, 15° to 30°, 30° to 45°, 45° to 60°), woods inclusion in changing densities and tree clad areas. Since woods lands can't be utilized for crop yielding however most appropriate for Wildlife, Animal cultivation and Poultry farming, as, generally excellent surface water and seepage is available there inside.

It tends to be seen that the primary classification of lands is secured by Deciduous Dry Dense Forest with thistle trees and the lands are raised extending from 30° to above 60°. In this way, these areas are most appropriate for natural life living spaces. Thick Tree Clad, Scrub Forest and Reserved Forest Plantation, wastelands cleans on red soils where the height ranges from 15° to 45°, for the most part spread the second classifications of lands recognized. Since satisfactory seepage gadgets and surface water is accessible in these areas thus can be utilized for fields and poultry farming. Albeit surface water offices are existing adjacent but since of the soil barrenness these can be recommended so as. The third sort of lands have 15° to 30° height and secured by Open Deciduous Forest. This kind of covering has developed on fruitless red soil and is not reasonable for cropping. Indeed, even Agroforestry cannot be recommended there because of a few backwoods protection guidelines to monitor the deforestation of Southern Plateau Deciduous Dry/Moist Open Forest. In this way, these lands should be monitored for Wildlife as the woodland has begun contracting because of once again munching of local dairy cattle. So just poultry farming can be polished rather than fields. The fourth and just a single class of lands are observed to be spread over plain lands secured by open vegetation. These areas are for the most part close-by the human settlements and the area is not much spread over when contrasted with different kinds of land classes. These lands could likewise be recommended to be utilized for field nibbling. Despite the fact that the initial three kinds of land classes depend on the territory height, yet subjectively these are recommended under three sorts (First three classes) of land use.

5. CONCLUSION

The Ministry of Finance is in charge of the monetary organization of the nation. It has three departments, Department of Economic Affairs, Department of Expenditure and Department of

Revenue. The Department of Economic Affairs has a Budget Division and it readies the financial plan of the Government. The Finance Ministry especially by its Department of Expenditure bases the role of the Ministry of Finance on 'Financial Control'. It has three primary parts, control practiced amid the arrangement of the financial backing, control practiced amid the execution of the financial plan and control on incidental issues. It investigates all recommendations exuding from the spending department in so far as they have financial ramifications.

The fourth class dependent on the height underneath 15° structure the fields. These fields are additionally subdivided into six classes dependent on soil types, existing cropping pattern and surface water. These are kept toward the western piece of the Division, which are for the most part agricultural lands. These lands are additionally distinguished as gorge wastelands and the exceptionally undulated with low height. Thus, no sustenance crops can be recommended for these kinds of lands. Just Bamboo and Anjan grass can be recommended there. Likewise, Agroforestry can be proposed for the best utilization of these lands. The principal theory "Agriculture in the division relies upon the minor irrigation offices and precipitation" is accepted. The second speculation "The cropping pattern of the division is dictated by the nature of the land soil qualities" is accepted.

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