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Agriculture Crop Area Prediction for Mysore and Mandya Regions in Karnataka

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Abstract: The backbone of India's economy undoubtedly is agriculture which assumes the most conclusive job in the financial advancement of the nation. Indian farming is an extensive and miscellaneous division revolving around an extensive number of factors. The farming research system of India is one of the biggest and institutionally most complex on the planet. The target of this study is to decide the development of agriculture in the state of Karnataka based on the current data available. The result available from the preprocessing and segmentation of data tells that it depends on various factors such as soil type, rainfall, area for crop production and total production. The outcome of the result tells us the crop area increases with the profit made from the previous production. The impact of how various factors affect the agriculture is also discussed. This means that we need to look the fact of profit in production which usually decides on the increase in the area to produce same crop or crop rotation.

INTRODUCTION

In a developing country like India, agriculture stills hold the prime position for the country's economy. Agriculture provides food and energy which are the basic needs of human beings. It concludes a major part of the state domestic product. The growing population is demanding for a huge amount of food products and on the other hand we can see that the farmers are committing as they not getting the profit from the production. The main challenge to the agriculture sector in Karnataka is to mainstream the vast rainfed/drought prone area. At present, the undue share of this area is holding back the state to move onto the path of growth. The large presence of rainfed areas is also compounded by frequent climatic aberrations and not so frequent but devastating floods. Failure of technology to fight these challenges results in low average productivity thus leading to low income. Therefore, meeting this challenge upfront is the first priority in the coming decade. The vision is thus set to bring these rainfed regions under the new initiatives for growth. Agriculture has always been understood as synonymous to crop husbandry while all the other related activities are classified as allied agricultural activities. This document shall make an all-out effort to magnify the concept of agriculture to encompass Animal Husbandry, Fisheries, Horticulture, Dairy, Forestry and other allied activities as also the sunrise sectors that have a strong rural base. Promotion of Organic Farming has been initiated in the State which needs to follow the contours of the Organic Farming Policy adopted by the State. The two major district which contributes to almost half the agriculture in the state are Mysore and Mandya as they are located on the banks of river Kaveri. Kaveri river is the main water source for all the major work in the state of Karnataka. The crop production is majorly divided into four different seasons, where different types of crops are grown or cultivated based on each season. Technological

innovations in the State have always remained supply driven with barely enough attention to the demands arising from the field. That causes low adoption as a result not even 10% of the innovations has found roots in the farmer's field. Popularizing farm mechanization is needed along with adequate training to the farmers for usage of such advanced machineries. The future steps involve removing the bottlenecks presently operating in input supply chain along with the weak extension network. In the current scenario about 60% of total work force in the State is engaged in the agriculture sector and they are unskilled manual labor. On one hand the productivity and income flow are stagnating while on the other, there is no ease in the carrying capacity of the sector.

LITERATURE REVIEW

Agricultural crop yield prediction using artificial neural network approach[1]: Done by considering distinctive conditions of climatologically ponders impacting neighborhood atmosphere conditions in various pieces of the world. These atmosphere conditions specifically influences trim yield. Distinctive explores have been finished researching the relationship between immense scale climatologically ponders and collect yield. Counterfeit neural frameworks have been displayed to be extreme mechanical assemblies for showing and conjecture, to extend their practicality. Item desire technique is used to envision the sensible gather by distinguishing distinctive parameter of soil and moreover parameter related to air. Parameters like PH, sort of soil, phosphate, nitrogen, potassium, magnesium, characteristic carbon, calcium, significance, sulfur, manganese, press, copper, temperature, precipitation, dampness. Therefore, here, the framework used fake neural framework (ANN). Thusly, we construed that ANN is helpful instrument for alter desire. In this study, fuses the parameter of their regional soil parameter. By then it is separate by using feed forward back multiplication ANN. Separate in Matlab ANN approach to manage make it increasingly compelling.

Crop and yield prediction model[2]: A horticultural division require for all around characterized and orderly methodology for anticipating the harvests with its yield and supporting agriculturists to take amend choices to upgrade nature of cultivating. The many-sided quality of foreseeing the best yields is high two-part harmony inaccessibility of harvest learning base. Product forecast is a proficient methodology for better quality cultivating and increment income. Utilization of information grouping calculation is an effective methodology in field of information mining to separate helpful data and give forecast. Different methodologies have been actualized so far are worked either for trim prediction. Crop forecast show supporting ranchers to take adjust choice. This for sure aides in enhancing nature of cultivating and produce better income for ranchers. Conventional grouping calculations, for example, k-means, enhanced harsh k-means and k-means++ makes the errands muddled because of arbitrary determination of introductory bunch focus and choice of number of bunches. Altered k-means calculation is along these lines used to enhance the precision of a framework as it accomplishes the top-notch bunches two-part harmony starting group driven determination. Grouping is an information investigation calculation and assumes huge job for separating learning increase in data. Bunching procedure connected in collect dataset has brought about novel methodology that has esteem achievement in foreseeing harvest. In any case, the key issue with existing bunching calculations like irregular introduction of bundle focuses and uniform supply of number of groupings as an information are expressed. The disadvantages are overwhelmed by proposing changed k-means bunching calculation which utilized the planned an incentive to instate group focuses additionally to decide number of bunches. This work appears about changed k-means grouping in edit guess by expanding quality and precision tally. The adjusted k-means bunching calculation is assessed by looking at k-means and k-means++ calculations and accomplished the greatest number of fantastic groups, right forecast of yield and greatest precision tally. Information mining assumes an imperative job in Agriculture part for better expectation of reaps. The proposed work is done on edit dataset have a place with Maharashtra Condition. Here the work incorporates to consider topographical zone utilizing world geographic data framework for worldwide gather expectation.

Agriculture crop prediction system based on meteorological information[3]: Farming is the foundation of our economy, yet Kerala is a buyer state which relies upon different states for their necessities and assets. The assets ought to be effectively and appropriately used to wind up a maker state. This work incorporates about the examination and the working of a powerful rural yield gauging framework in view of continuous month to month climate data. This framework gives a stage to right data at perfect time and furthermore gives a reasonable thought regarding agribusiness improvements, for example, data on trim, manure and soil. Because of the anomalous climate that happens each year and fast provincial environmental change it is hard to foresee the agrarian yield generation. Constant climate data is earnestly required for the advancement of rural yield anticipating framework. The proposed framework builds up the forecast framework for soil, yield and manure expectation by process the climate information and datasets. Here this framework gathers climate information, for example,

moistness, measure of precipitation, temperature, daylight for every area entered by the client and sets up two kinds of forecast show to foresee the harvest appropriate for that area. The Prediction show comprises of reasonable classifier (Naive Bayesian). Proposed framework executes two harvest forecasts show i.e., Naive Bayes trim expectation display and Fuzzy Naive Bayes expectation demonstrate. Additionally, proposed framework looks at the precision of two model utilizing perplexity lattice.

A model for prediction of crop yield[4]: Data Mining is creating investigation field in alter yield examination. Yield estimate is an essential issue in cultivation. Any farmer is busy with knowing how much yield he will envision. Previously, yield estimate was performed by contemplating farmer's association on explicit field and item. The yield figure is an imperative issue that outstanding parts to be settled in perspective on open data. Data mining frameworks are the better choice consequently. Unmistakable data mining techniques are used and surveyed in agriculture for assessing what's to come year's yield age. This investigation proposes and completes a structure to envision trim yield from past data. This is cultivated by applying association direct mining on cultivating data. This investigation focuses on generation of a conjecture show which may be used to future desire for collect yield. This study demonstrates a compact examination of reap yield estimate using data mining technique considering alliance rules for the picked district for example area of Tamil Nadu in India. The test outcomes exhibit that the proposed work gainfully anticipates the gather yield creation.

Crop prediction system using machine learning[5]: India being a horticultural nation, its economy transcendently relies upon farming yield development and partnered agro industry items. In India, farming is to a great extent affected by water which is very unusual. Agribusiness development additionally relies upon various soil parameters, specifically Nitrogen, Phosphorus, Potassium, Crop pivot, Soil dampness, Surface temperature and furthermore on climate angles which incorporate temperature, precipitation and so on. India currently is quickly advancing towards specialized advancement. In this way, innovation will turn out to be advantageous to farming which will expand trim profitability bringing about better results to the agriculturist. The proposed venture gives an answer for Brilliant Agriculture by observing the rural field which can help the ranchers in expanding efficiency to an extraordinary degree. Climate gauge information got from IMD (Indian Metrological Department) for example, temperature and precipitation what's more, soil parameters store gives knowledge into which crops are reasonable to be developed in a specific region. This research presents a framework, in type of an android based application which utilizes information investigation strategies keeping in mind the end goal to foresee the most beneficial harvest in the present climate and soil conditions. The proposed framework will incorporate the information acquired from store, climate office and by applying machine learning calculation: Multiple Linear Regression, an expectation of most appropriate harvests as indicated by current ecological conditions is made. This furnishes a rancher with assortment of alternatives of products that can be developed.

In this manner, the task builds up a framework by coordinating information from different sources, information examination, forecast investigation which can enhance trim return profitability and increment the overall revenues of agriculturist helping them over a more extended run.

DIFFERENT SEASONS IN CROP PRODUCTION

The farming yield year in India is from July to June. The Indian horticultural season is assembled into two principal seasons: Kharif and Rabi reliant on the rainstorm kharif crop season is from July-October in the midst of the south-west tempest and the Rabi cutting season is from October-March (winter). The yields created among March and June are summer crops. Pakistan and Bangladesh are two distinct countries that are using the term 'kharif' and 'rabi' to depict about their cutting structures. The terms 'kharif' and 'rabi' start from Arabic lingo where Kharif infers pre-winter and Rabi suggests spring.

The kharif crops consolidate rice, maize, sorghum, pearl millet/bajra, finger millet/ragi (grains), arhar (beats), soyabean, groundnut (oilseeds), cotton, etc. The rabi crops fuse wheat, grain (oats), chickpea/gram (beats), linseed, mustard (oilseeds, etc.).

Kharif season: Kharif crops are ordinarily sown with the beginning of the essential rains in January, during the south-east rainstorm season in parts of India and in Bangladesh. In various parts like Maharashtra, the west shoreline of India and in Pakistan that see rains in June, kharif crops are sown in May, June and July. In India, the kharif season changes by yield and state, with kharif starting at the soonest in May and completing at the latest in January yet is pervasively considered to start in June and to finish in October. Kharif remain strangely with the Rabi crops, created during the dry season. In Kharif season the seeds are sown in the beginning of the Monsoon season. After improvement these items are procured toward the completion of rainstorm season (Oct.-Nov.). Kharif crops are commonly sown with the beginning of the essential deluges towards the completion

of May in the southern territory of Kerala during the methodology of south-west tempest season. As the rainstorm sowing dates vacillate as requirements be and accomplish July in some north Indian states. These items are liable to the measure of downpour water too its arranging. Too much, excessively little or at the wrong time may demolish the whole year's undertakings.

Rabi season: The rabi crops are sown around mid-November, ideally after the storm downpours are finished and reaping starts in April/May. The products are developed either with water that has permeated into the ground or utilizing water system. A decent rain in winter ruins the rabi crops however is useful for kharif crops. The major rabi edit in India is wheat, trailed by grain, mustard, sesame and peas. Peas are reaped right on time, as they are prepared early: Indian markets are overwhelmed with green peas from January to March, cresting in February. Numerous products are developed in both kharif and rabi seasons. The horticulture crops delivered in India are regular in nature and profoundly subject to these two seasons.

DIFFERENT FACTORS FOR AGRICULTURE

There are different components which influence the development of yields. This could be partitioned in two sections, for example, Physical components and Human variables which could additionally be subdivided.

Physical factors

Temperature: Most plants cannot grow if the temperature falls underneath 6°C or the dirt is set for five consecutive months. As a result, various zones are unsuitable for item advancement.

Rainfall: Water is clearly a key factor in plant improvement. The more unmistakable the typical temperature the more conspicuous the proportion of water required for plant advancement. Customary assortment is basic as different harvests require water at different events. Coffee for example ought to have a period of dry season already and during harvest while maize would benefit by considerable downpour in a comparable period. An agriculturist is in this way looking for precipitation steadfast quality with the objective that he can pick the most fitting harvest for the region.

Wind: Wind can ruinously influence crops. At its most genuine a typhoon can physically devastate countless of place where there is farmland. Less genuine yet moreover perilous are the breezes that dry soils so diminishing dampness and growing the potential for soil crumbling.

Soil: Soil type will impact crop development because diverse yields incline toward various soils. Dirt soils with their high-water maintenance are appropriate to rice while sandy soils with great seepage are useful for root vegetables. Soil type can be impacted through the contribution of lime, earth or manure yet this can just make constrained contrasts.

Human factors

Market: For any business ranch to prevail there must be request. If the interest for a harvest drops, at that point benefits will fall. That harvest will at that point be supplanted by an increasingly productive one. Conditions in the commercial center can be a result of various figures, for example, Changes society, Health reasons, Health alarms, Religion, Marketing.

Transport: Transport is an imperative factor in deciding area of homestead composes. If an item is massive, for example, potatoes then it ought to be developed near the commercial center to eliminate transport costs. If the great is short-lived on the other hand it ought to be developed near the commercial center. The impacts of transport have been incredibly lessened in the created world in view of advancements, for example, refrigerated lorries. It is yet an essential factor in numerous parts of the creating scene.

Capital: In the created world there is a settled in game plan of consistent banks, private monetary experts and government enrichments. This suggests cultivating is most likely going to be capital heightened and exceedingly robotized. Grain creating and dairy developing are extraordinary models.

Technology: Innovation is continually expanding effectiveness and yields yet innovation costs cash. Thusly, the hole between the created and creating world is developing. In India, agriculture is as yet a customary methodology. Be that as it may, when you contrast and the remote nations, they call it as modern agriculture. The contrast between both is the utilization of technology in agriculture. Since, technology and modern techniques in agriculture has a gigantic degree in India, gradually there is a move that we can watch. Yet at the same time, it isn't on par level when we contrast and the abroad nations. The fundamental explanation for this is the absence of mindfulness among the ranchers. Subsequently, we have attempted our best to acquire the most recent modern technology agriculture.

RESEARCH METHODOLOGY

Secondary data: The data which is collected is basically the primary data. Researchers reuse information as secondary data because it is easier. The data collected is the crop production data from almost all the districts from all the states in India from the year 1997-2014. The data collected involves the area of production and production from these areas.

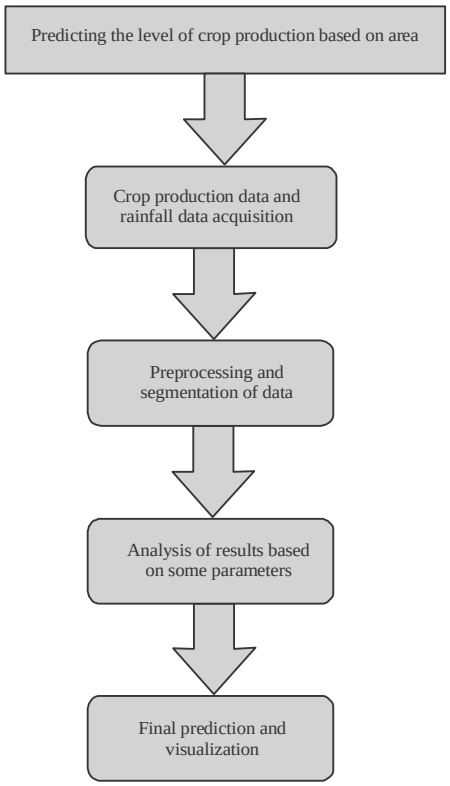

Fig. 1: Methodology

In this study, we are going to focus only in two districts from the state of Karnataka. The two districts which contribute to the major cultivation in the state of Karnataka are Mandya and Mysore. We have made the analysis from these two districts to figure out the increase or decrease in production from the period 1997-2014. The rainfall data is also taken into consideration from the southern Karnataka as rainfall plays a very vital role in agriculture. The rainfall data includes year and average rainfall in the respective years (Fig. 1).

Statistical tools and techniques: For estimating different phenomena and analyzing the collected data effectively and efficiently to draw sound conclusions, certain statistical techniques were used. Trend analysis, graphical analysis and descriptive statistics like as Mean, Variance and Standard deviation etc. has been useful for the testing of hypothesis. Sometimes researchers use the tools like MS-Excel for analysis purpose.

Karnataka facts and figure of cultivation: Agriculture contributes 17% to the states gross domestic product. The major crop produced in different season is as wheat, rice, sugarcane etc. The state cultivates almost all the crop because of its rainfall, soil type and soil quality.

Table 1: Mandya kharif season

Years	Area (ha)	Production (tons)
1997	227187	537550
1998	183067	362880
1999	154685	303984
2000	179972	353689
2001	162007	323856
2002	104323	170832
2003	135244	250258
2004	178205	407140
2005	166819	349086
2006	91402	200864
2007	156794	351503
2008	178219	340988
2009	169883	314259
2010	167183	410033
2011	136399	336595
2012	121787	231309
2013	125051	288546
2014	130259	309019

Table 2: Mandya rabi season

Years	Area (ha)	Production (tons)
1997	19478	19321
1998	12297	8602
1999	36767	22059
2000	14919	12683
2001	30401	20207
2002	35569	21135
2003	37738	16227
2004	21661	12603
2005	2238	6824
2006	72650	21215
2007	20938	17413
2008	17741	13926
2009	30163	21709
2010	19337	1780
2011	24724	18489
2012	21825	19077
2013	19248	21497
2014	28228	26600

Below are the statics and the graphical representation of the area and production from the district of Mandya and Mysore. The graphs plotted are year V/S area and production (Table 1).

Observations from the data and graphs tell us that as the area has increased or decreased over the period of time the production of crops have been affected based on the area of cultivation. This season is mostly for main crop cultivation which gives high yield (Table 2).

Observations from the data and graphs tell us that as the area has increased or decreased over the period of time the production of crops have not been up to the level based on the area of cultivation. This season is mostly for main crop cultivation which gives high yield but we can see that production has been very poor (Table 3).

Observations from the data and graphs tell us that as the area has increased or decreased over the period of time the production of crops has been very high based on the area of cultivation. This season is mostly for normal crop cultivation which gives high yield (Table 4).

Table 3: Mandya summer season

Years	Area (ha)	Production (tons)
1997	54104	218327
1998	21580	71933
1999	22310	66470
2000	19842	61439
2001	15951	38392
2002	4044	8971
2003	2916	8372
2004	22303	99893
2005	24793	81014
2006	14985	43780
2007	25397	78300
2008	24867	79381
2009	21449	72953
2010	22969	79335
2011	20793	63172
2012	2687	9510
2013	15603	48166
2014	17634	58922

Table 4: Mandya whole year

Years	Area (ha)	Production (tons)
1997	27476	2959310
1998	18686	85900
1999	50641	4221536
2000	48338	3748755
2001	54642	4335287
2002	55836	3479068
2003	38624	1576882
2004	21457	678979
2005	35693	1511463
2006	41666	2202140
2007	44222	2511123
2008	47456	2816781
2009	52492	2990370
2010	67018	5410891
2011	60976	4506492
2012	51739	3761906
2013	41804	2663442
2014	50283	2829415

Observations from the data and graphs tell us that as the whole year crops are given very small area for production but as we can from the graph that the production of crops has been very high. This season is mostly for normal crop cultivation which gives high yield (Table 5).

Observations from the data and graphs tell us that as the area has increased or decreased over the period of time the production of crops have been affected based on the area of cultivation. This season is mostly for main crop cultivation which gives high yield (Table 6).

Observations from the data and graphs tell us that as the area has increased or decreased over the period of time the production of crops have not been up to the level. This season is mostly for main crop cultivation which gives high yield but we can see that production has been very poor (Table 7).

Observations from the data and graphs tell us that as the area has increased or decreased over the period of time the production of crops have not been up to the level based on the area of cultivation. This season is mostly for main crop cultivation which gives high yield but we can see that production has been very poor (Table 8).

Table 5: Mysore kharif season

Years	Area (ha)	Production (tons)
1997	429707	1051263
1998	317780	685509
1999	313037	585862
2000	333980	639663
2001	349652	667767
2002	263279	373902
2003	272782	411196
2004	372869	641523
2005	320577	619790
2006	299246	531965
2007	313812	581353
2008	284403	567514
2009	327174	628356
2010	326800	648970
2011	311999	648868
2012	280104	433562
2013	269233	626941
2014	271769	606392

Table 6: Mysore rabi season

Years	Area (ha)	Production (tons)
1997	48542	30954
1998	39542	28685
1999	75692	42523
2000	41243	31430
2001	48150	32964
2002	86162	47317
2003	64718	22199
2004	66088	34808
2005	71026	69822
2006	73982	50425
2007	67478	59227
2008	61298	42485
2009	60257	49250
2010	55472	52787
2011	62036	62813
2012	55230	55493
2013	51739	45394
2014	64522	66692

Table 7: Mysore summer season

Years	Area (ha)	Production (tons)
1997	47412	154107
1998	16224	47170
1999	19148	50524
2000	18264	50308
2001	13215	35272
2002	3656	8422
2003	3496	11182
2004	22264	89662
2005	24417	72184
2006	14393	43228
2007	18127	57062
2008	14548	40965
2009	14993	45004
2010	19718	59206
2011	13871	47141
2012	1187	3254
2013	12390	43942
2014	9728	32321

Table 8: Mysore whole year

Years	Area (ha)	Production (tons)
1997	23135	2074393
1998	14605	45340
1999	64757	1371123
2000	59381	795373
2001	33077	1038722
2002	94654	1520266
2003	102637	1404269
2004	83137	603406
2005	141175	1189054
2006	162002	1784465
2007	172903	1449072
2008	153974	1027397
2009	164537	1353179
2010	137578	1963273
2011	133612	1696259
2012	110918	881701
2013	122607	1045472
2014	107840	767172

Table 9: Karnataka Rainfall

Region	Area (ha)	Production (tons)
Karnataka	1997	1180
Karnataka	1998	1113.3
Karnataka	1999	1149.6
Karnataka	2000	1207.2
Karnataka	2001	926.3
Karnataka	2002	755.8
Karnataka	2003	762.8
Karnataka	2004	1133.4
Karnataka	2005	1319.3
Karnataka	2006	1030.5
Karnataka	2007	1231
Karnataka	2008	1140.6
Karnataka	2009	1158.4
Karnataka	2010	1239.7
Karnataka	2011	1087.4
Karnataka	2012	877.8
Karnataka	2013	1110.7
Karnataka	2014	1184.2
Karnataka	2015	1112.5

Observations from the data and graphs tell us that even though small areas were available for the cultivation in this season there was high production in all the years (Table 9).

Observations from the graph tells us that there is been a lot of variation in rainfall over the period. From the above graph we can see that most of the years annual rainfall is >800 cm. Only the years 2002 and 2003 had annual rainfall below 800 cm.

CONCLUSION

In the above data analysis it is demonstrated that the season of crop such as summer and whole year season crop produce 60% more crop than in Kharif and rabi season. In the study, we can see that the annual rainfall in the state is increasing throughout the year which could help the farmers to plant their crops for more profit.

The statistical data of both the districts show that there is a loss in the production of crops up to 40% according to the area provided for cultivation.

Karnataka needs to improve their strategy to make efficient outcome from the agriculture to increase the states gross domestic product.

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