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Water Demand Prediction using KNN Algorthim

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Abstract*: Many factors influence irrigation water requirement in an agriculture field. those factors are age of plant, type of soil, temperature, level of sunlight, water needed. Many factors influence irrigation water requirement in an agriculture field. those factors are age of plant, type of soil, temperature, level of sunlight, water needed. Despite the multiple solution proposed, still the quantity of water overflood and underfloor in the agriculture felid. The artificial influence on irrigation requirement should be thought of an important impact factor, considering the requirement of water, the technology can help in preserving large quantity of water in agriculture felid. development of complex and elaborate forecasting methods such as artificial neural network (ANN)can be costly to develop and implement with the limited recourses available The balance between water supply and demand requires efficient water supply system management techniques.** *This* ***Despite the multiple solution proposed, still the quantity of water overflood and underfloor in the agriculture felid. The artificial influence on irrigation requirement should be thought of an important impact factor, considering the requirement of water, the technology can help in preserving large quantity of water in agriculture felid. development of complex and elaborate forecasting methods such as artificial neural network (ANN)canbe costly to develop and implement with the limited recourses available

Keywords: **crop water demand; forecast; crop to crop modeling; KNN modeling; water utility demand prediction**

I. INTRODUCTION

Increasing food demand will challenge the agricultural sector globally over the next decades1. A sustainable solution to this challenge is to increase crop yield without massive cropland area expansion. This can be achieved by identifying and adopting best management practices. To do so requires a more detailed understanding of how crop yield is impacted by climate change 2,3 and growing-season weather variability4.

Even with that knowledge, prediction is challenging because various factors interact with each other. For example, variability in soil type can interact with weather conditions and mitigate or aggravate climate related impacts on crop yield 5 ,6. Additionally, seed genetics (G) and crop management decisions (M), interact with theeffect of environment (E: soil and inseason weather conditions), thereby resulting in a near infinite number of combinations of G × E × M that can impact crop yield. Irrigation water is the main component of off-stream water uses. It is important to reasonably estimate irrigation water demand. At present, the forecast methods at home and abroad are mainly of three types: The Judgment method, based on the individual and collective experience and knowledge to make predictions Development of water demand forecasting models can be time consuming and costly. For a water utility located in Essex County, Ontario, Canada, forecasting commercial greenhouse water demand has become a critical aspect of day-to-day operations.

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II. SCOPE OF THE PROJECT

Water demand predictor in agricultural land provides useful insights obtained by performing exploratory and predictive analysis. The product serves both commercial and entertainment purpose. The product is user friendly where the insights are presented in comprehensible manner and the user can navigate freely through the pages, improving the reliability of the product. Features present in the product will give the user a better knowledge about water needed for land and features incorporated are:.

A. India's Agriculture Sector

India ranks 2nd world wide in farm output. Agriculture and allied sectors like forestry andfisheries accounted 13.7% of the GDP (Gross Domestic Production) in 2013, and employed 50% of the workforce. The irrigation infrastructure includes a network of canals from rivers, ground water, well based systems, tanks and other rain water harvesting products for agriculture activities. Today ground system is the largest, covering – 160 million ha of cultivated land in India with 39 million ha irrigated by ground water, 22 million ha by irrigated canals and about two third of cultivation in India is still depending on monsoon.

III. WATER AVAILABLE FOR AGRICULTURAL PRODUCTION

The population of India is likely to be 1.6 billion by 2050, resulting in increased demand for water, food and energy. This calls for infrastructure expansion and improved resource utilization. It is worth mentioning that climate change will have negative impact on agricultural productivity ranging from crop selection; time of cultivation, irrigation methods etc. Rice, wheat and sugarcane constitute about 90% of India's crop production and these are the most water consuming crops. Rice, which is an important export crop, consumes as much as 3,500 liters of water for a kilogram of grain produced.

A. Water Availability in different regions of India

The availability and demand for water resources in India show sizeable variations from one region to another. There is an inefficient and inequitable use of and distribution of water. Nearly 90% of the India population lives in areas with some form of water stress or food production deficit. Ground water has been relatively abundant in most parts of India. However, in some regions, it is becoming one of the most serious resource issues. Conditions of poor water quality and water stress in India are shown in Figures 2a[5] and 2b[6].

B. Ground Water-based irrigation

The scope for further expansion of irrigation infrastructure on a large scale is limited. Over the years, there has been significant shift in the sources of irrigation.

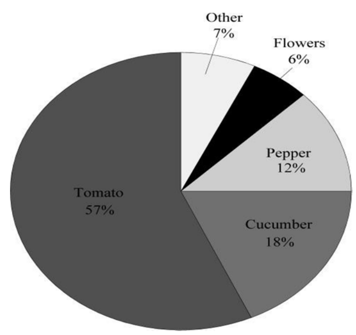
Area, production and yield in food grain in 2013-14 and the proportion of area underfood grains irrigated in 2011-12.

State	Area (m. hectares) (2013-14)	%of India (2013-14)	Production (million tons)(2013-14)	%of India (2013-14)	Yield (kg per hectare) (2013-14)	% area irrigated (2011-12)
Uttar Pradesh	20.23	16.05	50.05	18.90	2474.00	76.10
Punjab (northernIndia) (northern India)	6.560	5.20	28.90	10.92	4409.00	98.70
Madhya Pradesh (central India)	14.94	11.85	24.24	9.50	1622.00	50.50
Andhra Pradesh	7.61	6.04	20.10	7.59	2641.00	62.50
Rajasthan	13.42	10.64	18.30	6.91	1364.00	27.70

West Bengal	6.24	4.95	17.05	6.44	2732.00	49.30
Haryana	4.40	3.49	16.97	6.41	3854.00	88.90
Maharashtra (western India)(western India)	11.62	9.22	13.92	5.26	1198.00	16.40
Bihar (eastern India) (easternIndia)	6.67	5.29	13.15	4.97	1971.00	67.40
Karnataka	7.51	5.95	12.17	4.60	1622.00	28.20
Tamil Nadu	3.55	2.81	8.49	3.21	2396.00	63.50
Odisha	5.15	4.09	8.33	3.15	1617.00	29.00
Gujarat (Western India) (WesternIndia)	4.29	3.40	8.21	3.10	1917.00	46.00
Chhattisgarh	4.95	3.93	7.58	2.86	1532.00	29.70
Assam	2.53	2.01	4.94	1.87	1952.00	4.60
Jharkhand	2.24	1.77	4.19	1.58	1874.00	7.00
Uttarakhand	0.89	0.71	1.78	0.67	2001.00	44.00
Others	3.26	2.59	6.38	2.41		-

IV. LITERATURE SURVEY

In this there are many past research paper which has been discussed. Predicting the result of amount of water required to grow healthy crop In David's research paper in 2017 on four different crop I.e. tomato,pepper,cucumber and flowers The water demand estimate is shown in table-1 In this paper 118 bit of water wastage happens in agriculture felid fig-4.



The other factor which was taken into consideration was time,heat,temperature, wind etc

Input factors	Value	Value	Rank
Time	0.396	0.622	
Solar Radiation	0.249	0.368	
Outdoor Temperature	0.038	0.174	
Cumulative Solar Radiation	0.016	0.106	
Greenhouse Relative Humidity	0.012	0.097	
Month	0.009	0.096	
Wind	0.006	0.065	
Greenhouse Temperature	0.003	0.060	
Σ	0.729	1.588	

First and Total Indices for all input factors in order

Because of the seemingly linear relationship shown in Figure 2 between both crops watering schemes, the use of a linear regression model was appropriate. In a typical water demand forecasting situation, the use of a single linear regression model is unwarranted due to its inability to handle multiple indicators of water demand usually present in a complex highly non-linear relationship between consumers and various socio-economic and climactic factors . In this case the model involved two variables, which were treated as both dependent and independent, and were shown to have a linear relationship. By determining a best-fit line for the data using the least squares method to develop the coefficients (β0, β) for Equation, the linear regression model will provide demand forecasts solely based on the linear relationship between the two crops, where Wt and Wp represent the hourly tomato and pepper water usage. Both Wt and Wp will be switched in order to develop an equation for both crops.

$$Wt = \beta 0 \pm \beta Wp$$

The Algorthim used by research was linear regression and feed forward nural network (FFNN) to forecast the demand of water need to grow multiple crops.

According to survey the proposed system was efficient only upto 29% in terms of prediction.

The research done in year 2002,the research published an intelligence controlled system for artificial irrigation basses on ANN(artificial neural network).the structure of proposed system uses wireless sensor and water demand prediction algorithm to predict the demand of water.

The result show the need of water in each month by multiple crop shown below.

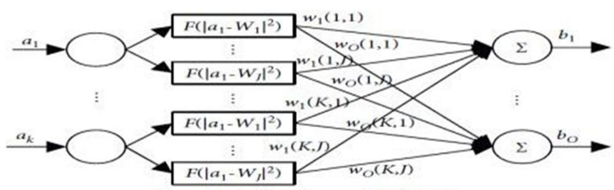


FIGURE 1: Structure of RBFNN.

The researcher took soybean crop to predict the result and declar that there is conflict in the result obtained

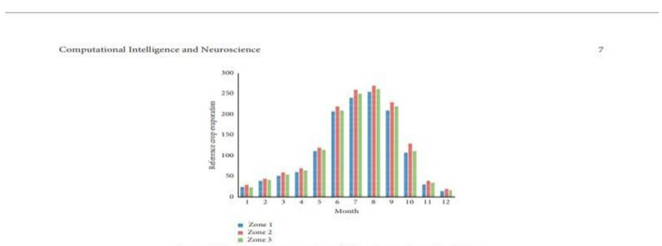


FIGURE 6: Monthly mean evaporations of different zones in an irrigated area.

The research done in the year 2014 focus on forecasting the water demand in agriculture felid by multiple crops Here the researcher used the data from 1980-1988 ,the demand of water in agriculture felid,Still the data from 2008 show that the dry land a as decreased from 1984 to till now and agriculture land has increased parallel Here the Algorthim used is simple linear regression.

The comparison of actual values and the predicted values.

Year	Actual value (billion m³)	GM(1,1) (billionm³)	Relative error %	Linear regression (billion m³)	Relative error %	α model (billion m³)	Relative error %
2006	25.6	25.0	–2.49	28.0	9.43	25.3	1.19
2007	25.1	24.7	–1.42	28.0	8.2	24.7	1.37
2008	23.9	24.5	2.63	27.1	10.15	23.9	0.24
2009	23.6	24.2	2.86	26.3	15.52	24.0	1.86
2010	23.0	24.0	4.27	27.2	14.6	23.5	1.92
2011	22.9	23.8	3.73	26.4	15.51	23.4	2.29
2012	22.1	23.5	6.22	26.5	15.05	22.2	0.37

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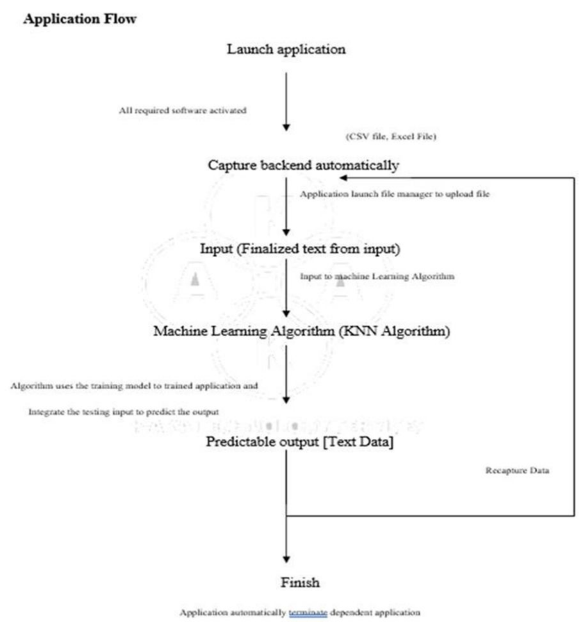
As can be seen from the trend, the GM(1,1) model cannot reflect changes in the single factors due to its characteristic of only considering the change of time series. Although the linear regression result fluctuates up and down with rainfall, the predicted values are significantly larger because they do not consider the change of water-saving level year by year.

It is also shown that the impact of climate change on irrigation water requirement has been reduced but the influence of human factors enhanced. The regression equation considering the irrigation water-saving technology changes can not only reflect the influence of different years, but also reflect the effects of water saving technology progress, so the simulation result is better.

V. PROPOSED SYSTEM

In the proposed system, the abusive content is checked and flagged by the machine rather than other users. certain disrespectful words/slang is reported as abusive and the same is intimated to the user. the bullied user is then prompted if they want the abuser to be blocked and reported. if the user opts to block the other person, it is done immediately, if not, then such case is treated as a false-positive.



Algorthim used us KNN which is highly efficient than other Data to this proposed system are

1) Data on multiple crop like paddy,wheat, arecanut.Because 90% of farmer depend on this crop.
2) The parameter we will consider is temperature moisture soil chemistry age , type of soil, temparture, water needed.
3) Actual data needed for healthy crop production is below.
4) Our proposed system focuses on improving the yield of crop under unsuitable condition.The Algorthim need large data set to predict the behavior of the plant.

Plant name	Age of plant	Temperature(in degree Celsius)	Types of soil	Water needed (in ltrs)
Arecanut	60 years	14-36	Laterite, red loam, alluvial soil	19-23
Paddy	90-120 days	21-37	Coastal planins	1.1-1.25
Wheat	135-180days	20-25	Loam texture or clay loam	0.95-2.5

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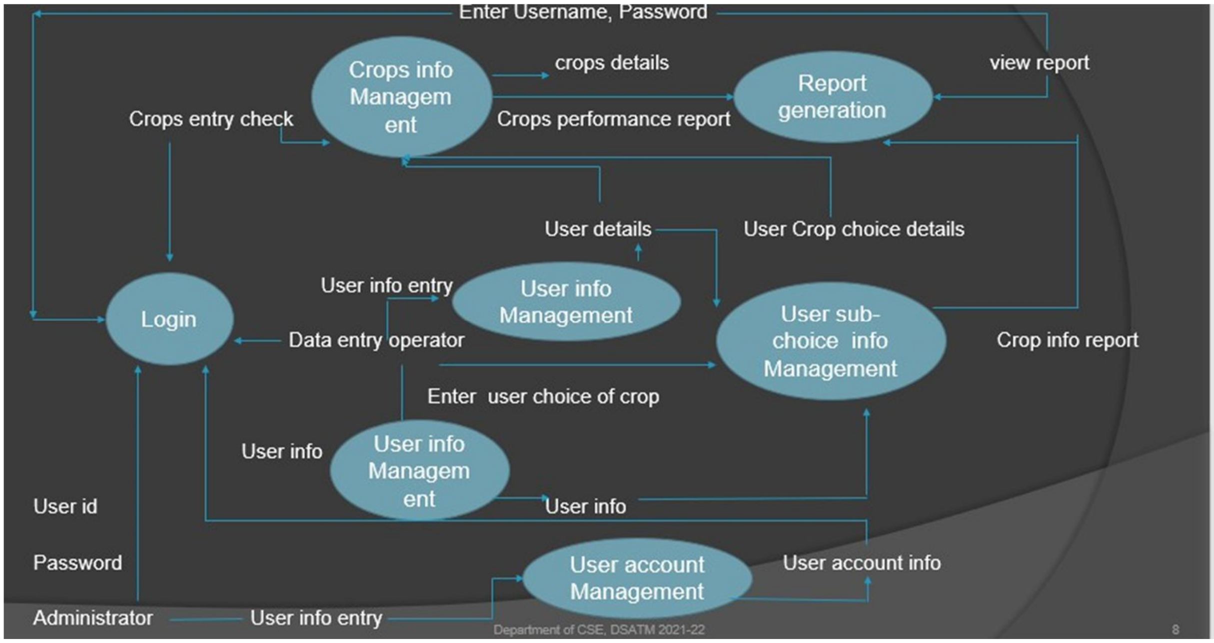
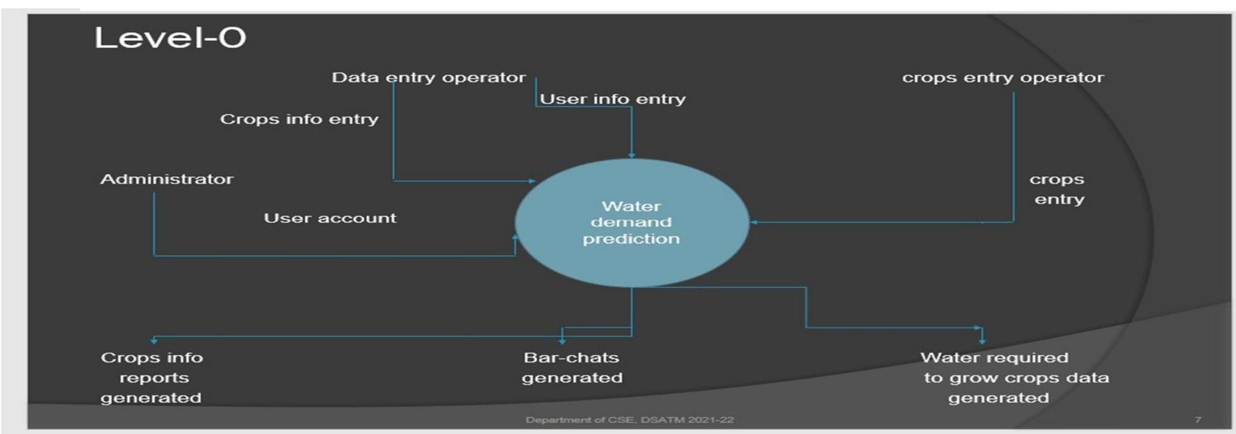
VI. METHODOLOGY





A. Sample Design

Secondary data is what is collected by someone. Some Common sources of secondary data include government public services department's Repository, libraries, internet searches and censuses. For this project, I have used Secondary data source to collect data.

B. Data Source

For this project work, data has been taken from Kaggle.com. Kaggle is subsidiary of Google LLC. It is an online community ofdata scientists and machine learning aspirant. It is also a repository of open-source data.

C. Analytical Methodology

This Project work focus on following two Analytical Methods1) Descriptive Analytics: Descriptive Analytics is a Method usein primary stages of any Analytics project to create a summary of historical data to mine useful knowledge, based on which further analysis can be done. In simple language, Descriptiveanalytics answered question like "what happened?".

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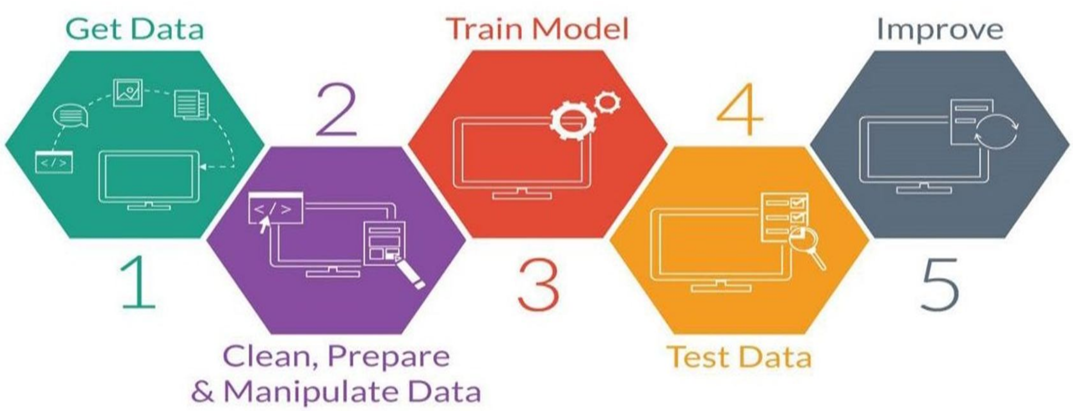
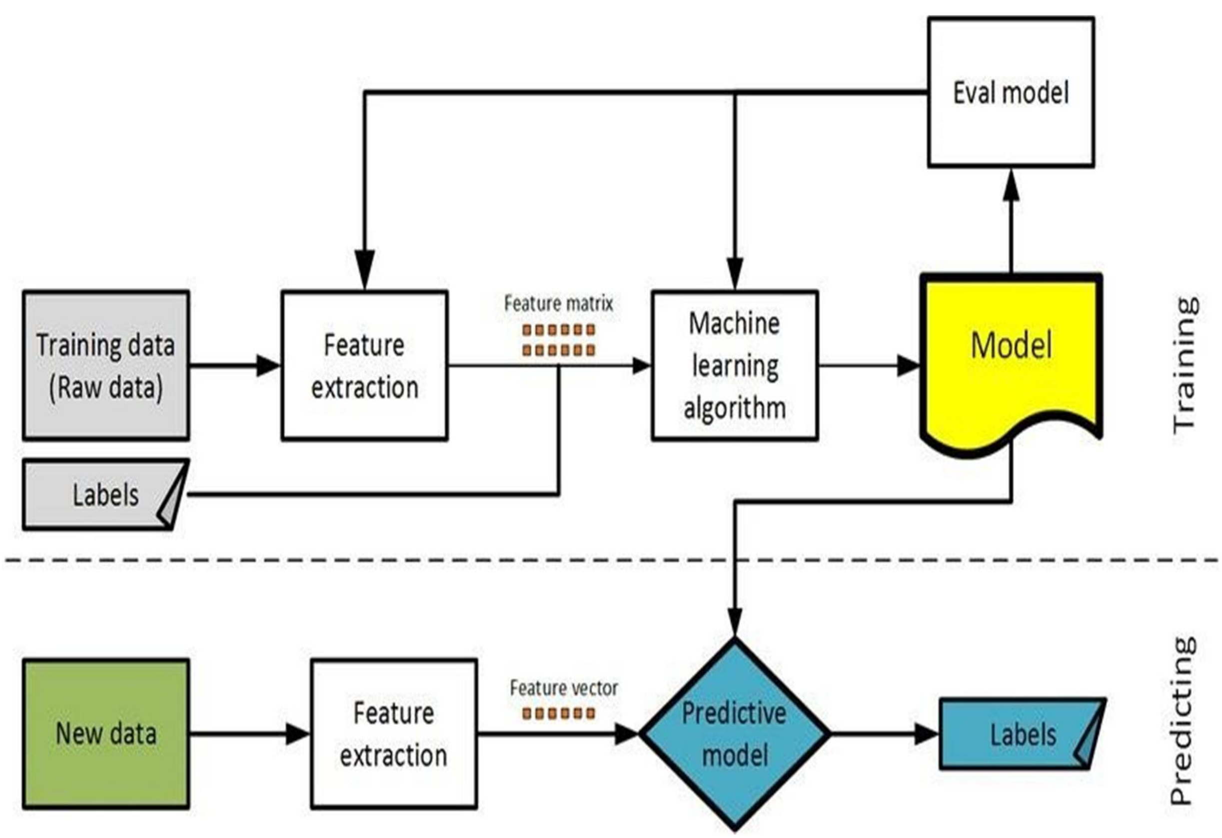
In our Project work, Descriptive model focus on two aspects:

1) Describe the data statistically.
2) Describe important factors.
3) Predictive Analytics: Predictive Analytics is a Method use in Advance stages of Analytics Projects to Predict Unknown future events based on different factors. Predictive Analytics use different Algorithms to build predictive models. Some of popularAlgorithms, used in Predictive Modelling, are –Linear Regression, Random Forest, etc. For our project work, we will use predictive analytics to predict result of any matches

VII. DATAFLOW DAIGRAM





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VIII. ANALYSIS AND INTERPRETATIONS

A. Overall Statistics

It is seen from Table 2,3 that while the skill of *Yes/No* rainfall forecast is around 90% during Rabi, it is around 69% in Kharif. Maximum temperature has a correlation of 65-70% and an *RMSE* of 2-3°C in Kharif while in Rabi the correlation is around 60%. On the other hand the correlation of minimum temperature forecast is less in Kharif and more in Rabi season. It is around 50% in Kharif and around 65% in Rabi season. On the other hand the *RMSE* of T_n is lower than T_x and is in the range of 1-2.5°C during both the seasons. The verification of wind speed, cloud cover shows that both the parameters have reasonably good skill, but the wind direction forecast needs improvement.

STATION	RAIN		Tn		Tx	
	RS	*HKS*	*RMSE*	*CC*	*RMSE*	*CC*
			Kharif			
Anand	74	0.45	1.59	0.68	1.97	0.87
Bangalore	57	0.19	1.29	0.17	1.68	0.7
Bhubaneshwar	65	0.3	1.65	0.54	2.7	0.74
Hisar	75	0.38	2.61	0.55	2.7	0.6
Coimbatore	60	0.13	1.67	0.29	2.33	0.33
Hyderabad	56	0.24	1.53	0.64	2.54	0.81
Jaipur	62	0.25	2.49	0.51	3.13	0.6
Jodhpur	80	0.48	2.78	0.45	2.97	0.65
Ludhiana	70	0.31	2.61	0.6	3.69	0.53
Nadia	78	0.33	1.6	0.28	2.24	0.35
Pantnagar	72	0.56	1.85	0.39	2.63	0.77
Pune	67	0.2	1.21	0.54	1.88	0.54
Raipur	67	0.33	1.79	0.58	2.36	0.81
Solan	70	0.42	1.87	0.56	2.23	0.82
Thrissur	82	0.5	1.22	0.2	1.66	0.6
			Rabi			
Anand	92	0.37	2.35	0.69	1.54	0.8
Bangalore	84	0.25	1.94	0.64	1.64	0.37
Bhubaneshwar	98	0.41	2.35	0.32	1.93	0.41
Hisar	96	0.3	2.12	0.68	2.85	0.7
Coimbatore	87	0.42	1.89	0.58	1.89	0.61
Hyderabad	95	0.39	1.98	0.74	1.5	0.66
Jaipur	91	0.22	2.99	0.67	2.07	0.76
Jodhpur	96	0.32	2.34	0.69	1.68	0.74
Ludhiana	87	0.38	2.86	0.62	2.41	0.68
Nadia	93	0.74	2.4	0.61	2.64	0.51
Pantnagar	92	0.46	2.14	0.77	3.09	0.31
Pune	98	0.5	2.67	0.53	2.45	0.56

Pradesh, Karnataka, Bihar, Assam, Odisha, Tamil Nadu, Maharashtra, Rajasthan, Chhattisgarh amongst the top ten agriculture produce states.

Impact area	Indicator
Perception of stakeholders	Reliability, dissemination, adequacy, value addition
Awareness about AAS	Farmers knowing AAS (%)
Usefulness-farmers' perception	Farmers considering it useful (%)
Use of information	Farmers using weather forecasts (%)

IX. RESULT AND ANALYSIS

Irrigation water requirement is mainly affected by climate change and human factors. Rainfall is the main climate factor and human factors include irrigation area, irrigation technology level, etc. With the development of water-saving irrigation technology, the influence of human factors is more and more notable. The concept of the water-saving improvement coefficient is introduced into the water demand forecasting model based on the dual characteristic of "artificial–natural". The model set up in this paper can reflect the influence of water-saving technology and planting structure adjustment on irrigation water better, and has a better simulation effect than time series analysis and the traditional regression. Our paper presents an intelligent control method for agricultural irrigation through ANN-based water demand prediction. Firstly, the ecological water demand for agricultural irrigation of crops was calculated, and an RBFNN was constructed for predicting the water demand of agricultural irrigation. - en, the authors developed an intelligent control strategy for agricultural irrigation based on water demand prediction, detailed the structure of the intelligent control system, and designed the main program.-rough experiments, the ecological water demand for crops in the targeted irrigated area was separately calculated by the area quota method, the phreatic evaporation method, and the vegetation evapotranspiration method, providing the data support to the weighted prediction of water demand indices. -en, the authors compared the predicted water demands for the target irrigated area and prediction errors, respectively, and demonstrated that our method could predict the water demand in the irrigated area more accurately and stably than other models.

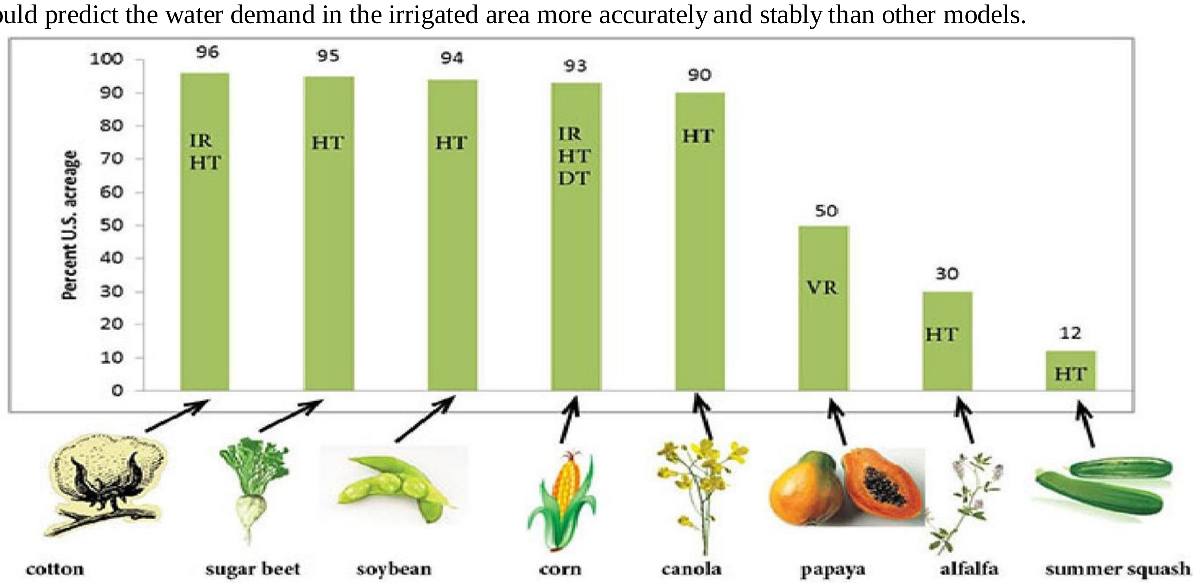

Fig9:

X. CONCLUSION

Presently, India is facing a decrease in available water resources that has implications on India's agriculture sector. Several regions in the country are experiencing water stress. If water use efficiency does not improve, the country could suffer under water scarcity in the next 1 to 2 decades. It is exceedingly important that the agriculture sector contributes to prevent the exacerbation of the situation by making best use of the available technologies and resources to increase water use efficiency. Improvement of policies, strategies and regulatory measures to prevent the water misuse should be taken into consideration. Awareness and orientation of water users in the agriculture sector to switch to more water efficient production methods can help the country against water scarcity. Moreover, enforcement of best practices can help present policy makers and planners to enhance governance structures to further understand key indicators that can assist in data-driven decision-making. These challenges can be better implicated, provided there are favorable policies and mechanisms that encourage the agriculture sector to increase water use efficiency.

Further India's Western corridor, the aim of solar pump promotion strategy should be to:

1) Reduce the deadweight subsidy burden on DISCOMs;
2) Reduce the huge carbon footprint of the groundwater economy; and
3) Remedy perverse incentive to over-exploit groundwater with subsidized electricity.

2) Target studies could include case studies of:

1) Groundwater management
2) Specific socio-economic impacts resulting from over abstraction and pollution caused bythe agriculture sector Competition among water users (private and public) in regard to the agriculture sector.

XI. SCOPE OF FUTURE STUDY

India must review its current trend of producing water intensive crops, such as sugarcane and rice in water scarce areas. Also, it should review its policies related to exporting of water intensive crops such as rice and cotton. Lack of adequate enforcement and monitoring or existing water policies undermines water governance.

1) Technologies such as conservative agriculture should be popularized, as it is known to increase water useefficiency.
2) Practicing conservation agriculture on a large scale has the added advantage of conserving soil moisture,improving soil nutrient status, soil texture, less weeds, among others.
3) Water pricing for the agriculture sector should be reviewed and revised.
4) Watershed development must be planned to pave way to safeguard the surface and ground water rechargemechanisms.
5) Increase awareness to increase water use efficiency in the agriculture sector

REFERENCES

[1] Extensive study about the topic was performed and various methodologies used in this domain were found. Predominantly there were two types of analysis: exploratory and predictive. Exploratory analysis visualizes events thathave occurred in the past and provides meaningful insights that can be used for decision making

[2] Evaluation of Crop to Crop Water Demand Forecasting: Tomatoes and Bell Peppers Grown in a Commercial GreenhousDean C. J. Rice, Rupp Carriveau *, David S. -K. Ting and Mo'tamad H. BataTurbulence and Energy Laboratory, Ed Lumley Centre for Engineering Innovation, University of Windsor, Windsor.

[3] Forecasting of irrigation water demand considering multiple factors Xuemei wang, Xiaohui Lei, Xuning guo, Jinjun you & Hao Wang .

[4] Intelligent Control Of Agricultural Irrigation Through Water Demand Prediction Artificial Neural Network. Ouiyu Boand Wuqun Cheng Institute of urban rural construction, Agricultural University of Hebei.Baoding 071001,China.

[5] A. pani and P. Mishra, "Hapa Irrigation for promoting sustainable agricultural intensification: experience fromBankura district of India, "geocoronal vol. 86, no 1, pp, 109-132, 2021.

[6] A. Pani and P. Mishra, "Hapa irrigation for promoting sustainable agricultural intensification: experience fromBankura district of India," Geojournal, vol. 86,

[7] C. Sutcliffe, J. Knox, and T. Hess, "Managing irrigation under pressure: how supply chain demands and environmental objectives drive imbalance in agricultural resilience to water shortages," Agricultural Water Management, vol. 243, Article ID 106484, 2021

[8] Bougadis, J.; Adamowski, K.; Diduch, R. Short-term municipal water demand forecasting. Hydrol. Process.2005, 19, 137–148

[9] Orgaz, F.; Fernández, M.D.; Bonachela, S.; Gallardo, M.; Fereres, E. Evapotranspiration of horticultural cropsin an unheated plastic greenhouse. Agric. Water Manag. 2005, 72, 81–96. [CrossRef]

[10] Bougadis, J.; Adamowski, K.; Diduch, R. Short-term municipal water demand forecasting. Hydrol. Process.2005, 19, 137–148

[11] Orgaz, F.; Fernández, M.D.; Bonachela, S.; Gallardo, M.; Fereres, E. Evapotranspiration of horticultural crops inan unheated plastic greenhouse. Agric. Water Manag. 2005, 72, 81–96. [CrossRef]