Climate Sensitivity in Agriculture of Sangli district

Mr. Sudhir.Y. Shesabhare. *Associate Professor in Economics,ACS College Palus Dist SANGLI. Mobile- 9421127141. Email* sudhirshesabhare@gmail.com.

Abstract

Indian agriculture is facing challenges due to climate variability, such as drought flood tropical cyclones heavy precipitation event hot extremes and heat waves are known to negatively impact on agriculture production and farmers livelihood. There have been a large number of studies over the past decade that tried to assess the impact of climate change. For this purpose we used the regression analysis to study effect of climate change on agricultural production, productivity and area under crop of Sangli district. The effect of climate change on cereal production productivity and area under crop were noted very clearly in Sangli district.

Keywords: climate change, agriculture and regression analysis.

Introduction and statement of problem

Climate plays an important role in shaping the agricultural production in India. Lack of irrigation makes agriculture a gamble with nature. The effects of climatic variability are quite visible in case of majority of farmers who are marginal and small and lack resources required for adjustment for climatic variations. Excessive rains and extreme variation in temperature would affect the productivity of crops adversely thereby affecting the incomes of farming families in a negative manner. Thus, suitable strategies pertaining to resource use, planting flood and drought resistant varieties of crops, better irrigation networks and crop mix are to be adopted for mitigating the harmful effects of climatic changes.

Review of literature

All the possible impact of climate change are yet not all fully understood but three main categories of impacts are severely seen on agriculture, sea level leading to submergence of coastal area and increased frequency of extreme events like, droughts and floods. These pose a serious threat to the country like India. India's main energy resource is coal. It is responsible to increase in GHGs. Let us view some of the work on such issues. We are more intended to review the impact on agriculture.

Kumar and Parikh, (2001a, 2001b) have examined the impact of climate change on agricultural crop yields, G.D.P. and welfare. Similar study by Kumar and Parikh (2001a) estimated that without considering carbon dioxide, fertilization effect, yield losses for rice and wheat vary between 32 and 40% and 41 and 52% , the G.D.P. would drop between 1.8 to 3.4%. Impact of climate change on Indian agriculture would remain significant. With temperature change of +2°c and accompanying precipitation change of + 7% farm level, the total net revenue would fall by 9%; whereas, with an increase of temperature by +3.5°c and precipitation change by +15%, the fall in farm level total net revenue would be nearly 25%. Moreover, the intrusion of sea water in the ground water and changes in temperature can reduce agricultural and fishing income. If a one meter sea level rise would displace 7 million people in India (A.D.B., 1995).

Objectives of the Study

1) To study the nature and magnitude of change in cereal due to possible climate change.
2) To study the nature and magnitude of change in pluses due to possible climate change.
3) To analyze the available data the impact on the cereal and pulses namely jawar, wheat, maize, paddy, Bajara and all pulses under the condition of climate change.
4) To examine the available data the impact on Area under crop production and productivity in Sangli under the condition of climate change.

Methodology

The study is based on the secondary source of data. Primary data collection may be un-necessary exercise, hence avoided. The secondary source of data includes, temperature, rainfall, production and productivity of selected crops. The secondary source of data has been obtained from Indian Meteorological Department, District Social and Economic Review. Disaster Management departments of Government of Maharashtra, IPCC Research Reports, Journals,

Statistical Tools:

Regression analysis for the environmental parameters is used to investigate the Temperature Rainfall Humidity (TRH) impact on the Area under crop Production and productivity (APP) of the crops. The constant value of combined TRH is derived along with un-standardized co-efficient B value. Besides, t value and level of significance is calculated for estimating TRH impact on PP of the selected crops. Similarly, for estimating the PP agricultural parameters we have used R square values and F value are derived from the data.

Discussion and Result

Table no 1

Regression analysis between temperature rainfall humidity and area under crop in Sangli district

The corresponding analysis examines the regression between TRH and the area under crops, crop production and productivity. The Tables from 1 to 3 explores the same. An attempt has been made explain the significant factors only. The insignificant values for the crops explored in the tables don't render any inferences; hence, those values are not taken into account.

In the case of area under all pulses and all cereals have the significant values in respect of rainfall and humidity. In the case of area under all cereals the R and H impacts are observed. The calculated value of 'f' for all cereals is estimated at 1398.127 and 'p' value is 0.019 signifies the test is significant and model can further be interpretive. The calculated adjusted R^2 is 0.999, which is good and acceptable. For the dependent variable of all cereals, the constant is significant; since its 't' value is 15.902 and 'p' is 0.040 and for rainfall's p value is 0.017 and the p value of the same crop for humidity is 0.046. The temperature value is insignificant. So it can be said that only independent variables i.e. R and H are significantly contributing the variations in the area under cereals. In the case of area under all pulses the values in respect of rainfall and humidity are significant. The calculated value of 'f' for all pulses is estimated at 2103.304 and 'p' value is 0.015 signifies the test is significant and model can further be interpretive. The calculated adjusted R^2 is 0.999, which is good and acceptable. For the dependent variable of all pulses, the constant is significant; since its 't' value is 21.810 and 'p' is 0.029. An independent variable i.e. rainfall's p value for the all pulses is 0.014 and the p value of the same crop for humidity is 0.038. The temperature value is insignificant. So it can be said that only independent variables i.e. R and H are significantly contributing the variations in the area under pulses.

Table no 2 and 3

Regression analysis between temperature rainfall humidity and production productivity in Sangli district

In the case of crop production and the productivity of the selected crops the TRH impacts on the crops in Sangli district is found insignificant. Hence, they are explored. (see Tables 2 to 3)

Table no 1

Regression analysis between temperature rainfall humidity and area under crop in Sangli district

Crop	Adjusted R Square	F	Sig.	Model	Unstandardized Coefficients		T	Sig.
					B	Std. Error		
Paddy	.203	1.424	.438[b]	(Constant)	27.255	43.252	.630	.593
				Temperature Mean	-.206	.803	-.257	.821
				Rainfall	.001	.001	.844	.487
				Humidity Mean	-.094	.440	-.214	.850
Wheat	-.846	.236	.866[b]	(Constant)	-144.081	306.799	-.470	.685
				Temperature Mean	3.833	5.698	.673	.570
				Rainfall	.004	.010	.396	.730
				Humidity Mean	1.357	3.122	.435	.706
Jowar	-.239	.678	.642[b]	(Constant)	690.679	998.333	.692	.561
				Temperature Mean	-9.306	18.543	-.502	.666
				Rainfall	.008	.032	.246	.829
				Humidity Mean	-3.475	10.159	-.342	.765
Bajra	.925	21.556	.045[b]	(Constant)	-667.851	1128.570	-.592	.614
				Temperature Mean	15.240	20.962	.727	.543
				Rainfall	.175	.037	4.793	.041
				Humidity Mean	4.015	11.485	.350	.760
Gram	-.341	.576	.684[b]	(Constant)	92.344	139.331	.663	.576
				Temperature Mean	-1.362	2.588	-.526	.651
				Rainfall	.001	.005	.154	.892
				Humidity Mean	-.504	1.418	-.355	.756
All cereals*	.999	1398.127	.019[b]	(Constant)	2060.993	129.609	15.902	.040
				Temperature Mean			1.000	.137
				Rainfall	.158	.004	36.647	.017
				Humidity Mean	-33.490	2.422	-13.86	.046
All Pulses*	.999	2103.304	.015[b]	(Constant)	334.437	15.334	21.810	.029
				Temperature Mean			1.000	.137
				Rainfall	.023	.001	44.992	.014
				Humidity Mean	-4.843	.287	-16.89	.038

Table no 2
Regression analysis between temperature rainfall humidity and production of crop in Sangli district

Crop	Adjusted R Square	F	Sig.	Model	Unstandardized Coefficients		T	Sig.
					B	Std. Error		
Paddy	-1.250	.074	.968[b]	(Constant)	1760.179	10981.260	.160	.887

				Temperature Mean	-47.780	204.403	-.234	.837
				Rainfall	-.097	.355	-.274	.810
				Humidity Mean	-2.325	111.644	-.021	.985
Wheat	.282	1.656	.398[b]	(Constant)	13219.964	11504.946	1.149	.369
				Temperature Mean	-321.707	214.151	-1.502	.272
				Rainfall	-.309	.372	-.830	.494
				Humidity Mean	-82.416	116.968	-.705	.554
Jowar	.417	2.194	.328[b]	(Constant)	25092.348	20563.118	1.220	.347
				Temperature Mean	-591.062	382.758	-1.544	.263
				Rainfall	-.373	.665	-.560	.632
				Humidity Mean	-155.494	209.060	-.744	.535
Maize	.729	5.480	.158[b]	(Constant)	-12434.28	22491.313	-.553	.636
				Temperature Mean	336.319	418.649	.803	.506
				Rainfall	-.972	.727	-1.337	.313
				Humidity Mean	101.547	228.664	.444	.700
Gram	-.126	.814	.592[b]	(Constant)	5387.009	6803.690	.792	.511
				Temperature Mean	-134.094	126.643	-1.059	.401
				Rainfall	-.148	.220	-.673	.570
				Humidity Mean	-31.500	69.171	-.455	.693
All cereals	.469	2.472	.301[b]	(Constant)	57144.135	34365.356	1.663	.238
				Temperature Mean	-1310.419	639.670	-2.049	.177
				Rainfall	-1.617	1.111	-1.455	.283
				Humidity Mean	-360.644	349.384	-1.032	.410
All Pulses	.090	1.166	.493[b]	(Constant)	47429.895	66205.998	.716	.548
				Temperature Mean	-1096.160	1232.345	-.889	.468
				Rainfall	.053	2.141	.025	.983
				Humidity Mean	-356.567	673.100	-.530	.649

Table no 3
Regression analysis between temperature rainfall humidity and productivity of crop in Sangli district

Crop	Adjusted R Square	F	Sig.	Model	Unstandardized Coefficients		T	Sig.
					B	Std. Error		
Paddy	-1.332	.048	.983[b]	(Constant)	4753.935	55686.754	.085	.940
				Temperature Mean	-136.759	1036.542	-.132	.907
				Rainfall	-.386	1.801	-.214	.850
				Humidity Mean	17.675	566.154	.031	.978
Wheat	-.045	.928	.556[b]	(Constant)	18777.33	19533.452	.961	.438
				Temperature Mean	-434.317	363.592	-1.195	.355
				Rainfall	-.762	.632	-1.206	.351
				Humidity Mean	-103.317	198.592	-.520	.655
Jowar	.114	1.214	.481[b]	(Constant)	7411.637	9254.639	.801	.507
				Temperature Mean	-176.719	172.264	-1.026	.413
				Rainfall	-.076	.299	-.254	.823
				Humidity Mean	-41.980	94.090	-.446	.699
Bajra	.357	1.927	.360[b]	(Constant)	5638.380	6430.959	.877	.473
				Temperature Mean	-137.080	119.705	-1.145	.371
				Rainfall	-.014	.208	-.067	.953
				Humidity Mean	-34.035	65.382	-.521	.655
Maize	-.439	.491	.724[b]	(Constant)	-3206.332	82522.844	-.389	.735
				Temperature Mean	756.171	1536.064	.492	.671
				Rainfall	-.372	2.669	-.140	.902
				Humidity Mean	286.577	838.990	.342	.765

Gram	-.183	.742	.618[b]	(Constant)	9632.502	13567.551	.710	.551
				Temperature Mean	-228.886	252.544	-.906	.460
				Rainfall	-.527	.439	-1.202	.352
				Humidity Mean	-50.421	137.938	-.366	.750
All cereals	NA	NA	NA	(Constant)	NA	NA	NA	NA
				Temperature Mean	NA	NA	NA	NA
				Rainfall	NA	NA	NA	NA
				Humidity Mean	NA	NA	NA	NA
All Pulses	.225	1.483	.427[b]	(Constant)	-31297.52	64012.70	-.489	.673
				Temperature Mean	885.862	1191.520	.743	.535
				Rainfall	-.580	2.070	-.280	.806
				Humidity Mean	195.239	650.802	.300	.792

Conclusion

Crops are 08 in Sangli district. Significant value in area under crops is two (all cereals all pulses) these are climate change vulnerable crops.

Sangli district experienced high amount of rainfall and humidity impact on all cereals and all pulses.

References

1) Kavi, Kumar and Parikh, J. (2001a), 'Socio-economic Impacts of Climate Change on Indian Agriculture', *International Review for Environmental Strategies*.

2) Kavi, Kumar and Parikh, J. (2001b), "Indian Agriculture and Climate Sensitivity", *Global Environmental Change.* 11(2): 147-154.

3) Asthana V. (1995), *Climate Change in Asia*, (ed) Asian Development Bank.

4) Dasgupta, P. (2008), 'Discounting Climate Change', *Journal of Risk & Uncertainty*.

5) DES, (2004), *'Agricultural Statistics at a glance'*, Directorate of Economics and Statistics, Government of India, New Delhi,

6) ENVIS Centre Maharashtra. (2015), '*Climate Change and Maharashtra State.'* Environment, Forestry, Water and Gas Central Ministry New Delhi.

7) IPCC, (2007), Intergovernmental Panel on Climate Change, *Climate Change 2007: synthesis Report: summary for policymakers (IPCC, Geneva, 2007).*