**Crop yield prediction using machine learning model**

By Swastik Das,

B.Tech in Electrical Engineering,

3rd year, University of Calcutta

under the guidance of

**Ankit Lodh**

Associate Research Engineer,

IDEAS TIH, ISI Kolkata

Period of Internship: 14th Jan 2025 - 30th April 2025

Report submitted to: IDEAS – Institute of Data Engineering, Analytics and Science Foundation, ISI Kolkata

Crop Wise Yield Forecasts

Wheat

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **States** | **Random Forest Regressor Model** | | | | **XGBoost Regressor Model** | | | |
| **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** | **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** |
| Andhra Pradesh | 1.164821 | 1.22034 | 0.056263 | 1.220340 | 0.7603 | 1.22034 | 0.4601 | 0.6888 |
| Chhattisgarh | 1.663958 | 1.65277 | 0.033082 | 1.485740 | 0.9246 | 1.65277 | 0.7281 | 1.2159 |
| Gujarat | 3.150335 | 3.17436 | 0.030613 | 3.194714 | 3.0782 | 3.17436 | 0.0961 | 3.0202 |
| Jharkhand | 2.139238 | 2.14552 | 0.013964 | 2.282330 | 1.8818 | 2.14552 | 0.2637 | 1.8820 |
| Karnataka | 1.313258 | 1.37338 | 0.063652 | 1.323599 | 1.2805 | 1.37338 | 0.0929 | 0.8062 |
| Madhya Pradesh | 3.628061 | 3.57601 | 0.052721 | 3.576010 | 3.5856 | 3.57601 | 0.0096 | 3.4418 |
| Maharashtra | 1.892621 | 1.91175 | 0.024516 | 1.902577 | 1.7428 | 1.91175 | 0.1690 | 1.4698 |
| Rajasthan | 3.816574 | 3.76197 | 0.054849 | 3.912650 | 3.5624 | 3.76197 | 0.1995 | 3.2955 |
| Telangana | 2.009130 | 2.07280 | 0.063670 | 2.072800 | 2.0381 | 2.07280 | 0.0347 | 2.5881 |
| Uttar Pradesh | 3.733850 | 3.73492 | 0.001070 | 3.734920 | 3.7439 | 3.73492 | 0.0090 | 3.7352 |
| Uttarakhand | 2.926755 | 2.91634 | 0.013644 | 3.020238 | 3.0117 | 2.91634 | 0.0953 | 2.9424 |
| West Bengal | 3.089674 | 3.08786 | 0.007514 | 3.077030 | 2.9051 | 3.08786 | 0.1828 | 2.9934 |
|  |  |  |  |  |  |  |  |  |

Mustard

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **States** | **Random Forest Regressor Model** | | | | **XGBoost Regressor Model** | | | |
| **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** | **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** |
| Andhra Pradesh | 0.644882 | 0.74224 | 0.097435 | 0.693410 | 0.6310 | 0.7422 | 0.1112 | 0.5741 |
| Chhattisgarh | 0.560802 | 0.56299 | 0.003354 | 0.528000 | 0.3762 | 0.5630 | 0.1867 | 0.5373 |
| Gujarat | 1.975929 | 1.96648 | 0.009559 | 1.975720 | 1.8698 | 1.9665 | 0.0966 | 1.9427 |
| Jharkhand | 0.845896 | 0.83429 | 0.011692 | 0.826754 | 0.8405 | 0.8343 | 0.0062 | 0.8579 |
| Madhya Pradesh | 1.538989 | 1.54036 | 0.011808 | 1.540360 | 1.3254 | 1.5404 | 0.2149 | 1.3173 |
| Rajasthan | 1.521751 | 1.46835 | 0.054413 | 1.614310 | 1.4846 | 1.4684 | 0.0163 | 1.5076 |
| Tamil Nadu | 0.237886 | 0.23823 | 0.000369 | 0.236105 | 0.2375 | 0.2382 | 0.0008 | 0.2404 |
| Uttar Pradesh | 1.482822 | 1.49731 | 0.015813 | 1.437610 | 1.3291 | 1.4973 | 0.1683 | 1.3382 |
| Uttarakhand | 0.945572 | 0.94039 | 0.007000 | 0.901370 | 0.7832 | 0.9404 | 0.1572 | 0.8212 |
| West Bengal | 1.249520 | 1.24336 | 0.006395 | 1.243360 | 1.2116 | 1.2434 | 0.0318 | 1.2114 |
|  |  |  |  |  |  |  |  |  |

Potato

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **States** | **Random Forest Regressor Model** | | | | **XGBoost Regressor Model** | | | |
| **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** | **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** |
| Andhra Pradesh | 21.437272 | 20.54348 | 0.902931 | 20.54348 | 23.628201 | 20.54348 | 3.0847 | 23.628201 |
| Chhattisgarh | 7.140603 | 7.21700 | 0.077164 | 7.14352 | 5.994200 | 7.21700 | 1.2228 | 5.118100 |
| Karnataka | 18.070643 | 17.81122 | 0.318664 | 16.98290 | 14.546500 | 17.81122 | 3.2647 | 14.148600 |
| Tamil Nadu | 23.396240 | 24.25584 | 0.859600 | 23.82604 | 25.405001 | 24.25584 | 1.1492 | 22.647100 |
| Telangana | 18.589580 | 20.79912 | 2.228143 | 19.90928 | 18.573500 | 20.79912 | 2.2256 | 18.573500 |
| Uttar Pradesh | 35.000001 | 35.000000 | 0.000001 | 35.00002 | 32.362400 | 35.000000 | 2.6376 | 32.387402 |
| Uttarakhand | 12.689192 | 12.52321 | 0.166778 | 12.52321 | 12.381300 | 12.52321 | 0.1419 | 10.774400 |
| West Bengal | 29.955120 | 29.65787 | 0.347345 | 29.98213 | 25.720400 | 29.65787 | 3.9374 | 31.434700 |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |

Gram

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **States** | **Random Forest Regressor Model** | | | | **XGBoost Regressor Model** | | | |
| **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** | **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** |
| Andhra Pradesh | 1.463553 | 1.4208 | 0.048636 | 1.211067 | 1.0321 | 1.4208 | 0.3887 | 1.2056 |
| Chhattisgarh | 0.872121 | 0.8980 | 0.025990 | 0.836310 | 0.6666 | 0.8980 | 0.2314 | 0.6709 |
| Gujarat | 1.763335 | 1.6991 | 0.065130 | 1.761720 | 1.4183 | 1.6991 | 0.2808 | 1.4641 |
| Jharkhand | 1.166114 | 1.1717 | 0.005690 | 1.197470 | 1.1592 | 1.1717 | 0.0125 | 1.1672 |
| Karnataka | 0.688906 | 0.6799 | 0.009011 | 0.679900 | 0.6811 | 0.6799 | 0.0012 | 0.5722 |
| Madhya Pradesh | 1.661193 | 1.6901 | 0.030082 | 1.591253 | 1.4994 | 1.6901 | 0.1907 | 1.4999 |
| Maharashtra | 1.006258 | 1.0134 | 0.010564 | 1.074370 | 1.0215 | 1.0134 | 0.0081 | 0.9236 |
| Rajasthan | 0.911520 | 0.9336 | 0.026053 | 1.033611 | 0.9185 | 0.9336 | 0.0151 | 0.9161 |
| Tamil Nadu | 0.926036 | 0.9260 | 0.000090 | 0.926190 | 0.9253 | 0.9260 | 0.0007 | 0.6709 |
| Telangana | 1.568860 | 1.5680 | 0.008482 | 1.531780 | 0.8772 | 1.5680 | 0.6908 | 0.7500 |
| Uttar Pradesh | 1.345880 | 1.3493 | 0.003390 | 1.347507 | 1.0942 | 1.3493 | 0.2551 | 1.0442 |
| Uttarakhand | 0.797877 | 0.7995 | 0.002772 | 0.784726 | 0.8227 | 0.7995 | 0.0232 | 0.8232 |
| West Bengal | 1.258276 | 1.2710 | 0.013477 | 1.258880 | 1.2076 | 1.2710 | 0.0634 | 1.2522 |
|  |  |  |  |  |  |  |  |  |

Lentil(Massor)

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **States** | **Random Forest Regressor Model** | | | | **XGBoost Regressor Model** | | | |
| **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** | **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** |
| Chhattisgarh | 0.3626 | 2.0190 | 1.6564 | 0.3053 | 0.403480 | 2.0190 | 1.615490 | 1.405133 |
| Jharkhand | 0.8093 | 0.8154 | 0.0061 | 0.8159 | 0.828333 | 0.8154 | 0.013293 | 0.849180 |
| Madhya Pradesh | 1.1745 | 1.1496 | 0.0249 | 1.1745 | 1.164702 | 1.1496 | 0.015272 | 1.149600 |
| Rajasthan | 1.1586 | 1.3748 | 0.2162 | 1.1579 | 1.375151 | 1.3748 | 0.002865 | 1.347210 |
| Uttar Pradesh | 0.9213 | 0.9498 | 0.0285 | 0.9380 | 0.944470 | 0.9498 | 0.005380 | 0.964330 |
| Uttarakhand | 0.7876 | 0.9252 | 0.1376 | 0.7320 | 0.952582 | 0.9252 | 0.028627 | 0.873504 |
| West Bengal | 0.8579 | 0.9596 | 0.1018 | 0.8555 | 0.959696 | 0.9596 | 0.010850 | 0.909446 |
|  |  |  |  |  |  |  |  |  |

Rice Rabi

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **States** | **Random Forest Regressor Model** | | | | **XGBoost Regressor Model** | | | |
| **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** | **Predicted Yield(2022)** | **Actual Yield(2022)** | **RMSE** | **Predicted Yield(2023)** |
| Andhra Pradesh | 4.746276 | 4.75349 | 0.021032 | 4.608866 | 4.3707 | 4.75349 | 0.3828 | 4.3159 |
| Karnataka | 2.667132 | 2.66302 | 0.007472 | 2.476320 | 2.2898 | 2.66302 | 0.3732 | 2.2849 |
| Telangana | 3.413589 | 3.44465 | 0.032686 | 3.623541 | 3.3264 | 3.44465 | 0.1183 | 3.4226 |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |