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# PLANTING DATE IDENTIFICATION<sup>BETA</sup>

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*API Documentation*  
*2020*

## Service Overview

The Ag-Analytics® Planting Date API uses machine learning models to give an estimate of the date that a certain crop was planted. This is a back-filling model meaning that it is used for determination of planting date for past years in fields where the true planting data is not known.

## Model Specifications

The planting date model relies on several factors to determine the date. The current model inputs are information about location, soil characteristics, satellite imagery, and past weather data. By training a neural network on several thousand planting records obtained from farmers across the United States, the model achieves a high level of accuracy when tested against out-of-sample data. Future versions of the model will utilize greater amounts of acreage and more specific sets of variables as the driving factors are determined through research and testing.

Further testing will determine the level of importance of each variable used to train the model, but the current variables are effective in estimation of planting date.

1. Location: the location of the field can provide insight into the geospatial dependence on factors like climate and other local farming practices.
2. Soil characteristics: data from both POLARIS and SSURGO are used as predictors of the planting date. The idea is that different soil types may correlate with the type of crops grown and when they are best planted.
3. Satellite imagery: by using the Ag-Analytics® Harmonized Landsat Sentinel Service, the model obtains a wide array of multispectral bands for a growing season. Currently, short-wave infrared 1 and 2, RGB, and near-infrared bands are included in an 18-week window.
4. Weather conditions: historical weather conditions are critical in determination of planting date because of the influence on field conditions. Extreme heat or cold and rain or drought can delay planting significantly, which changes the output of the model.



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## POST Request

### Header Parameters

Execute Type: POST

content-type: "application/json"

## API Specifications

### Request Parameters

Parameter	Data Type	Required?	Default	Options	Description
SHAPE	Geometry, file/text	Yes	-	Geojson	Desired area-of-interest. See Fig. 1 for example.
ModelType	Text String	No	Neural Network	"NN" (Neural Network) "TREE" (Decision Tree)	Type of model to use for prediction. Default is neural network. Not necessary to specify for most cases.
CropSeason	Text	Yes	-	2013 -2019	The year of interest to retrieve the crop type information. Ex. "2018"

## Response Parameters

Parameter	Type	Description
feature_averages	List	Averages of the bi-week remote sensing data and monthly weather data of the area-of-interest: <ol style="list-style-type: none"> <li>I. <b>Greenweek#</b>: Green band value on the # week of the year</li> <li>II. <b>Blueweek#</b>: Blue band value on the # week of the year</li> <li>III. <b>Redweek#</b>: Red band value on the # week of the year</li> <li>IV. <b>NIRweek#</b>: Near Infrared band value on the # week of the year</li> <li>V. <b>SWIR1week#</b>: Shortwave Infrared band 1 value on the # week of the year</li> <li>VI. <b>SWIR2week#</b>: Shortwave Infrared band 2 value on the # week of the year</li> <li>VII. <b>GDD#</b>: Monthly growing degree days</li> <li>VIII. <b>Precipitation#</b>: Monthly precipitation</li> </ol>
raster_filename	-	URL to download result raster (.tif) file.
rasterinfo.attributes.CellSize	Resolution	Resolution of result Geotiff file in meters.
rasterinfo.attributes.CoordinateSystem	-	Information about the projection of the raster.
rasterinfo.attributes.Extent	-	Extents of the result raster. Specifies the bottom left and top right corners of the field raster in degrees.
rasterinfo.attributes.Legend	List	Legend gives the following details for each range of values: <ol style="list-style-type: none"> <li>I. <b>Area</b>: Area covered</li> <li>II. <b>Count</b>: # of pixels from the result raster in that range</li> <li>III. <b>CountAllPixels</b>: Total # of pixels in the result raster</li> <li>IV. <b>Max</b>: Max value in the range</li> <li>V. <b>Min</b>: Minimum value in the range</li> <li>VI. <b>Mean</b>: Mean value in the range</li> <li>VII. <b>Color</b>: Hex color used for the crop type</li> </ol>
rasterinfo.attributes.Matrix	List	Row and columns, containing attributes below.
rasterinfo.attributes.Max	Number	Maximum value from the result raster.
rasterinfo.attributes.Min	Number	Minimum value from the result raster.
rasterinfo.attributes.Mean	Number	Average value from the result raster.
rasterinfo.attributes.Percentile5	Number	5 <sup>th</sup> percentile value from the result raster.
rasterinfo.attributes.Percentile95	Number	95 <sup>th</sup> percentile value from the result raster.
rasterinfo.attributes.pngb64	Link	Base64png image of the result raster with legend entries.



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## GET Request

### Header Parameters

Execute Type: GET

content-type: "application/json"

## API Specifications

### Request Parameters

Parameter	Data Type	Required	Default	Options	Description
Filename	Text	Yes	-	.tif file	Filename that is returned by the initial POST request. Ex: "result_plantingdateraster_20191126_175158_3291.tif"

### Response Parameters

Parameter	Data Type	Description
File	.tif	Tiff file will be download to the computer of the caller with the name that was used to call the API.

## Appendix

Figure 1 – Shape Example, GeoJSON

Figure 2 – POST Request Example

Figure 3 – POST Response Example

Figure 4 – GET request example

### Figure 1.

*Shape Example - GeoJSON*

```
"{"type":"Feature","properties":{},"geometry":{"type":"Polygon","coordinates":[[[-100.953840994,38.5946753571],[-100.953832008,38.5948720599],[-100.953876941,38.5952162884],[-100.953957821,38.5955324152],[-100.953984781,38.5955745654],[-100.954029714,38.5957361407],[-100.954245394,38.5961716896],[-100.954452087,38.5964807873],[-100.95473966,38.5968179832],[-100.954910406,38.596965506],[-100.954910406,38.5969795557],[-100.954982299,38.5970287299],[-100.954982299,38.5970427797],[-100.955359739,38.5973378239],[-100.955377712,38.5973378239],[-100.955629338,38.5975134449],[-100.956042724,38.5977312143],[-100.956357257,38.5978646856],[-100.956707736,38.5979911318],[-100.957175042,38.598110553],[-100.957615388,38.5981878255],[-100.958055734,38.598229974],[-100.958514053,38.5982369988],[-100.958963386,38.5982088998],[-100.959412719,38.5981456769],[-100.959906984,38.5980332805],[-100.96023949,38.5979279087],[-100.960598957,38.5977874128],[-100.960976396,38.5976047676],[-100.961281942,38.597422122],[-100.961560528,38.5972113765],[-100.961578502,38.5972113765],[-100.961848101,38.5969865806],[-100.961982901,38.5968390579],[-100.962018848,38.5968179832],[-100.962189594,38.5966283107],[-100.962315407,38.5964526876],[-100.962405274,38.5964526876],[-100.962405274,38.5963894631],[-100.962369327,38.5963754133],[-100.962513113,38.5961716896],[-100.96262994,38.5959539155],[-100.962800686,38.5955324152],[-100.962908526,38.595054712],[-100.962926499,38.5948580097],[-100.962890553,38.5948509846],[-100.962962446,38.5948650348],[-100.963025352,38.5947947839],[-100.962998393,38.5947877588],[-100.962989406,38.5947666835],[-100.962917513,38.5947526333],[-100.962935486,38.5947245329],[-100.962926499,38.5946894073],[-100.962881566,38.5947034575],[-100.962665886,38.5946823822],[-100.958541013,38.5946753571],[-100.9584152,38.5947175077],[-100.958316347,38.5947175077],[-100.958298374,38.5947034575],[-100.958154587,38.5946753571],[-100.953840994,38.5946753571]]]}}
```

### Figure 2

*POST Request Example – application/json*



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application/json

```
{
  "SHAPE":
  {
    "type": "Feature",
    "properties": {},
    "geometry": {
      "type": "Polygon",
      "coordinates": [
        [
          [-100.953840994, 38.5946753571], [-100.953832008, 38.5948720599], [-
          100.953876941, 38.5952162884], [-100.953957821, 38.5955324152], [-
          100.953984781, 38.5955745654], [-100.954029714, 38.5957361407], [-
          100.954245394, 38.5961716896], [-100.954452087, 38.5964807873], [-
          100.95473966, 38.5968179832], [-100.954910406, 38.596965506], [-
          100.954910406, 38.5969795557], [-100.954982299, 38.5970287299], [-
          100.954982299, 38.5970427797], [-100.955359739, 38.5973378239], [-
          100.955377712, 38.5973378239], [-100.955629338, 38.5975134449], [-
          100.956042724, 38.5977312143], [-100.956357257, 38.5978646856], [-
          100.956707736, 38.5979911318], [-100.957175042, 38.598110553], [-
          100.957615388, 38.5981878255], [-100.958055734, 38.598229974], [-
          100.958514053, 38.5982369988], [-100.958963386, 38.5982088998], [-
          100.959412719, 38.5981456769], [-100.959906984, 38.5980332805], [-
          100.96023949, 38.5979279087], [-100.960598957, 38.5977874128], [-
          100.960976396, 38.5976047676], [-100.961281942, 38.597422122], [-
          100.961560528, 38.5972113765], [-100.961578502, 38.5972113765], [-
          100.961848101, 38.5969865806], [-100.961982901, 38.5968390579], [-
          100.962018848, 38.5968179832], [-100.962189594, 38.5966283107], [-
          100.962315407, 38.5964526876], [-100.962405274, 38.5964526876], [-
          100.962405274, 38.5963894631], [-100.962369327, 38.5963894631], [-
          100.962369327, 38.5963754133], [-100.962513113, 38.5961716896], [-
          100.96262994, 38.5959539155], [-100.962800686, 38.5955324152], [-
          100.962908526, 38.595054712], [-100.962926499, 38.5948580097], [-
          100.962890553, 38.5948509846], [-100.962962446, 38.5948650348], [-
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          100.962989406, 38.5947666835], [-100.962917513, 38.5947526333], [-
          100.962935486, 38.5947245329], [-100.962926499, 38.5946894073], [-
          100.962881566, 38.5947034575], [-100.962665886, 38.5946823822], [-
          100.958541013, 38.5946753571], [-100.9584152, 38.5947175077], [-
          100.958316347, 38.5947175077], [-100.958298374, 38.5947034575], [-
          100.958154587, 38.5946753571], [-100.953840994, 38.5946753571]]]
        ]
      }
    },
    "ScalarVariables": {
      "CropSeason": "2018"
    },
    "ModelType": "NN"
  }
}
```

Figure 3

POST Response – application/json

```
f
"feature_averages": [
  {"Key": "Greenweek18", "Value": 1218.6882460676118},
  {"Key": "Redweek18", "Value": 1276.7237154230897},
  {"Key": "SWIR2week18", "Value": 50.21536849730397},
  {"Key": "SWIR1week18", "Value": 2366.0455730402196},
  {"Key": "NIRweek18", "Value": 2819.818161154887},
  {"Key": "Blueweek18", "Value": 1599.2762531927453},
  {"Key": "Greenweek20", "Value": 957.1687156481621},
  {"Key": "Redweek20", "Value": 980.6943679720338},
  {"Key": "SWIR2week20", "Value": 997.2153896961564},
  {"Key": "SWIR1week20", "Value": 1559.769602306673},
  {"Key": "NIRweek20", "Value": 2616.383912450711},
  {"Key": "Blueweek20", "Value": 662.1803611724483},
  {"Key": "Greenweek22", "Value": 865.8829308328359},
  {"Key": "Redweek22", "Value": 895.5443958071401},
  {"Key": "SWIR2week22", "Value": 1306.0237171209133},
  {"Key": "SWIR1week22", "Value": 1848.4805423326445},
  {"Key": "NIRweek22", "Value": 2665.3743359990017},
  {"Key": "Blueweek22", "Value": 599.7110449794816},
  {"Key": "Greenweek24", "Value": 4469.372969613223},
  {"Key": "Redweek24", "Value": 4543.523878522247},
  {"Key": "SWIR2week24", "Value": 3726.222820849983},
  {"Key": "SWIR1week24", "Value": 6503.78555606734},
  {"Key": "NIRweek24", "Value": 6454.815507608226},
  {"Key": "Blueweek24", "Value": 3658.3995564435445},
  {"Key": "Greenweek26", "Value": 1508.828147157162},
  {"Key": "Redweek26", "Value": 1522.5964741037603},
  {"Key": "SWIR2week26", "Value": 11.014840519379991},
  {"Key": "SWIR1week26", "Value": 432.26650756358885},
  {"Key": "NIRweek26", "Value": 3462.8701202282755},
  {"Key": "Blueweek26", "Value": 1283.8910904532877},
  {"Key": "Greenweek28", "Value": 897.9982080017721},
  {"Key": "Redweek28", "Value": 931.8507324987523},
  {"Key": "SWIR1week28", "Value": 1571.3495378790276},
  {"Key": "SWIR2week28", "Value": 1027.1511365545261},
  {"Key": "NIRweek28", "Value": 2740.6613500734948},
  {"Key": "Blueweek28", "Value": 644.8779364279997},
  {"Key": "Greenweek30", "Value": 5864.923760534673},
  {"Key": "Redweek30", "Value": 795.3165483552489},
  {"Key": "SWIR2week30", "Value": 13.257439456487957},
  {"Key": "SWIR1week30", "Value": 767.7595418620314},
  {"Key": "NIRweek30", "Value": 5732.150236664299},
  {"Key": "Blueweek30", "Value": 8131.229142339392},
  {"Key": "Greenweek32", "Value": 731.9143641948485},
  {"Key": "Redweek32", "Value": 807.0480643287201},
  {"Key": "SWIR2week32", "Value": 10.802104931021402},
```



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```
{
  "Key": "SWIR1week32", "Value": 472.45490145887067},
  "Key": "NIRweek32", "Value": 2515.4616126482197},
  "Key": "Blueweek32", "Value": 533.4108390157562},
  "Key": "Greenweek34", "Value": 896.549034849674},
  "Key": "Redweek34", "Value": 959.7777929988146},
  "Key": "SWIR2week34", "Value": 1502.5244706428862},
  "Key": "SWIR1week34", "Value": 2038.150860812607},
  "Key": "NIRweek34", "Value": 2408.0119739829343},
  "Key": "Blueweek34", "Value": 763.9157193529676},
  "Key": "Greenweek36", "Value": 918.9698085947933},
  "Key": "Redweek36", "Value": 984.9548189503837},
  "Key": "SWIR2week36", "Value": 1299.9700718861252},
  "Key": "SWIR1week36", "Value": 1977.4707248154064},
  "Key": "NIRweek36", "Value": 2628.78016105923},
  "Key": "Blueweek36", "Value": 696.3513398537269},
  "Key": "GDD3", "Value": 0.0},
  "Key": "Precipitation3", "Value": 67.55299999999998},
  "Key": "GDD4", "Value": 51.91649999999999},
  "Key": "Precipitation4", "Value": 34.26099999999999},
  "Key": "GDD5", "Value": 591.183},
  "Key": "Precipitation5", "Value": 120.82300000000002},
  "Key": "GDD6", "Value": 736.1180999999997},
  "Key": "Precipitation6", "Value": 196.54299999999992},
  "Key": "GDD7", "Value": 206.43119999999996},
  "Key": "Precipitation7", "Value": 109.73999999999998},
  "Key": "GDD8", "Value": 0.0},
  "Key": "Precipitation8", "Value": 0.0}
],
"raster_filename": "result_cropidrafter_20191127_202623_9621.tif",
"rasterinfo": [
  {
    "attributes": {
      "CellSize": [
        0.0001,
        -0.0001
      ],
      "CoordinateSystem": "GEOGCS[\"WGS 84\", DATUM[\"WGS_1984\", SPHEROID[\"WGS 84\", 6378137, 298.257223563, AUTHORITY[\"EPSG\", \"7030\"]], AUTHORITY[\"EPSG\", \"6326\"], PRIMEM[\"Greenwich\", 0], UNIT[\"degree\", 0.0174532925199433], AUTHORITY[\"EPSG\", \"4326\"]]",
      "Extent": "-93.7759549449, 41.6147830947, -93.77465494489999, 41.6513830947",
      "Legend": [
        {
          "Area": "1.44 %",
          "Count": 64,
          "CountAllPixels": 4446,
          "Max": 119.84002962820219,
          "Mean": 99.1953509709138,
          "Min": 78.5506723136254,
```



```
"color": "#FF0000",
},
"Area": "9.36 %",
"Count": 416,
"CountAllPixels": 4446,
"Max": 161.12938694277898,
"Mean": 140.48470828549057,
"Min": 119.84002962820219,
"color": "#FF6666"
},
"Area": "89.2 %",
"Count": 3966,
"CountAllPixels": 4446,
"Max": 202.41874425735574,
"Mean": 181.77406560006736,
"Min": 161.12938694277898,
"color": "#FFFF66"
},
"Matrix": [
  366,
  13
],
"Max": 202.41874425735574,
"Mean": 168.44008744627573,
"Min": 78.5506723136254,
"OID": 0,
"Percentile5": 152.23603227084163,
"Percentile95": 172.45018523462116,
"Variety": "NoVariety",
"pngb64": "data:image/png;base64,
iVBORw0KGgoAAAANSUgAAAAAAAFuCAyAAABa/JI8AAACnU1EQVR4n02cYZKDIAyFY6dn1TPJZd0f6go
xIQm2jtr3Znba0n4EMIQAzna0a0r7ibjG7PtA1KXUERG9djdWNE1zwe/iakrMUi/CJdTLN3Ft1eNWXFBNQ/
mz3iay2uRsD5FUvZF9H3d30NvEwNDDXfUwrwpV0i0ZN8uQUwc94tBzcqjsPeZjWseU1tZ2pVS2seqwXNzyD
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Bcj7e02WAAH6eUiPEUTq+IodxC2FNMUIfbgPwjUR0gpguvhzAgQI0N2gaeqnV2QzsLRkH0jIEFEwwgZzvdL
Sj0P2qkbY1Lh4m24NNZ1INlk6BwpvE+d5kwtFLSVSDJSTxNALcg6gtHR4IfkLkLnHEnrVIaA6xN/jw9Sj57
laFRcH8L+ced504hNPjpt6T+yIcMYSzI80TNTnHGM253vnQMj3AAECBEgWTiSPQE/MjQABAgQIECBAGAAABA
gQIECBAGAAABAgQIEL/QdfM/3arpDxgQh6yqLAYQAAAAAE1FTkSuQmCC"
]
}
```



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## Figure 4.

*GET Request Example - URL*

```
https://ag-analytics.azure-  
api.net/Tillage_Model?filename=result_tillageraster_20191126_175158_3291.tif
```



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## Citation



**Spatial Reference Information:**

Universal Transverse Mercator (UTM) Dominant Zone, North American Datum 1983

Please contact [support@analytics.ag](mailto:support@analytics.ag), [josh@ag-analytics.org](mailto:josh@ag-analytics.org), or [woodardjoshua@gmail.com](mailto:woodardjoshua@gmail.com) with any comments or questions.