

Regional Version of POLYSYS

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POLYSYS has been modified to simulate regional markets for bioenergy feedstock production.

The user can determine up to 10 unique regions (the number of regions could be expanded if ever needed). In each region, a yearly ethanol demand can be stipulated and the model will determine feedstock price needed to incentivize farmers to produce enough feedstocks to fill the regional demand.

Up to 10 regions will run simultaneously. Simultaneity is necessary because land use pressures in one region will, in the next year, put commodity price pressures on all regions. For example a large demand for biofuels in the upper Midwest that displaces corn and soybean lands will increase national corn and soybean prices. The higher corn and soybean prices will impact land use decisions in all regions, such as the southeast, and will impact the price and amount of feedstocks to meet southeastern ethanol demand.

To run the model, in the SIM.INS, make sure index(119) is set to 1;

1<- 0 IF NO REGIONAL DEMANDS; 1 IF SETTING REGIONAL DEMAND LEVELS IN WHATIF AND WHATIFCTY [119]

Then, create two whatifs; one stipulating the regional demand (**whatif.XXXYYY**). Here, the 'K' column must identify the # region.(for national runs this is always zero). Make sure the region numbers start with region #1.

| YEAR | MTX | J | K | M | VALUE |
|------|-----|---|---|---|-------|
| 2018 | BP | 2 | 1 | V | 0.01 |
| 2019 | BP | 2 | 1 | V | 0.04 |
| 2020 | BP | 2 | 1 | V | 0.06 |
| 2021 | BP | 2 | 1 | V | 0.08 |
| 2022 | BP | 2 | 1 | V | 0.09 |
| 2023 | BP | 2 | 1 | V | 0.12 |
| 2024 | BP | 2 | 1 | V | 0.12 |
| 2025 | BP | 2 | 1 | V | 0.12 |
| 2026 | BP | 2 | 1 | V | 0.12 |
| 2027 | BP | 2 | 1 | V | 0.12 |
| 2028 | BP | 2 | 1 | V | 0.12 |
| 2029 | BP | 2 | 1 | V | 0.12 |
| 2030 | BP | 2 | 1 | V | 0.12 |
| 2018 | BP | 2 | 2 | V | 0.008 |
| 2019 | BP | 2 | 2 | V | 0.02 |
| 2020 | BP | 2 | 2 | V | 0.04 |
| 2021 | BP | 2 | 2 | V | 0.06 |
| 2022 | BP | 2 | 2 | V | 0.08 |
| 2023 | BP | 2 | 2 | V | 0.1 |
| 2024 | BP | 2 | 2 | V | 0.12 |

Next, the user must recreate a whatif statement stipulating the counties that comprise each demand region (**whatifcty.XXXYYY**). Here, list the demand region, and then the county numbers (1 thru 3109) that comprise the demand region.

```
*****
P O L Y S Y S - COUNTY V A R I A B L E S
*****
-> THIS IS A LIST OF COUNTIES AND THE 'DEMAND REGION NUMBER' FOR BIOMASS
->
->
-----
BIOREG CTY
-----
1 874
1 884
1 886
1 887
1 890
1 896
1 901
1 909
1 922
1 923
1 927
1 928
1 931
1 936
1 937
1 944
1 952
```

Then run the model. The output will list results by region:

| BIOPRODUCTS SUMMARY REG 1, 2016-2027 | | | | | | | | | | | | |
|--------------------------------------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Item | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
| -----Price----- | | | | | | | | | | | | |
| Biomass (\$/dt) | 0.00 | 0.00 | 40.00 | 40.00 | 41.00 | 43.00 | 44.00 | 47.00 | 48.00 | 48.00 | 48.00 | 48.00 |
| -----Ethanol----- | | | | | | | | | | | | |
| Demand(bil gal) | 0.00 | 0.00 | 0.01 | 0.04 | 0.06 | 0.08 | 0.09 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| Supply(bil gal) | 0.00 | 0.00 | 0.01 | 0.04 | 0.06 | 0.08 | 0.09 | 0.12 | 0.12 | 0.12 | 0.12 | 0.12 |
| FEEDSTOCKS | | | | | | | | | | | | |
| Corn Stover(mil.dt) | 0.0 | 0.0 | 0.1 | 0.5 | 0.8 | 1.0 | 1.0 | 1.2 | 1.2 | 1.2 | 1.2 | 1.3 |
| Wheat Straw(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.3 | 0.3 | 0.3 | 0.3 | 0.2 |
| Switchgrass(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Miscanthus(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Poplars(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Willows(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SweetSorgh(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| E.Cane(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CRP Harvest(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| -----EXTRA ----- | | | | | | | | | | | | |
| FEEDSTOCKS | | | | | | | | | | | | |
| Corn Stover(mil.dt) | 0.0 | 0.0 | 0.6 | 0.2 | 0.0 | 0.0 | 0.1 | 0.0 | 0.1 | 0.1 | 0.2 | 0.0 |
| Wheat Straw(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Switchgrass(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Miscanthus(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Poplars(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Willows(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| SweetSorgh(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| E.Cane(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| TOT BIOMASS(mil.dt) | 0.0 | 0.0 | 0.7 | 0.7 | 0.8 | 1.0 | 1.2 | 1.5 | 1.6 | 1.7 | 1.7 | 1.5 |
| ----- | | | | | | | | | | | | |
| BIOPRODUCTS SUMMARY REG 2, 2016-2027 | | | | | | | | | | | | |
| Item | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 |
| -----Price----- | | | | | | | | | | | | |
| Biomass (\$/dt) | 0.00 | 0.00 | 40.00 | 42.00 | 45.00 | 47.00 | 52.00 | 61.00 | 63.00 | 63.00 | 63.00 | 63.00 |
| -----Ethanol----- | | | | | | | | | | | | |
| Demand(bil gal) | 0.00 | 0.00 | 0.01 | 0.02 | 0.04 | 0.06 | 0.08 | 0.10 | 0.12 | 0.14 | 0.15 | 0.15 |
| Supply(bil gal) | 0.00 | 0.00 | 0.01 | 0.02 | 0.04 | 0.06 | 0.08 | 0.10 | 0.12 | 0.14 | 0.15 | 0.15 |
| FEEDSTOCKS | | | | | | | | | | | | |
| Corn Stover(mil.dt) | 0.0 | 0.0 | 0.1 | 0.2 | 0.5 | 0.7 | 0.9 | 1.1 | 1.2 | 1.1 | 0.8 | 0.5 |
| Wheat Straw(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.0 |
| Switchgrass(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.3 | 0.3 | 0.3 |
| Miscanthus(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Poplars(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Willows(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.7 | 1.0 |
| SweetSorgh(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| E.Cane(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| CRP Harvest(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| -----EXTRA ----- | | | | | | | | | | | | |
| FEEDSTOCKS | | | | | | | | | | | | |
| Corn Stover(mil.dt) | 0.0 | 0.0 | 0.0 | 0.2 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0.2 | 0.5 | 0.8 |
| Wheat Straw(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.1 |
| Switchgrass(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.2 | 0.4 |
| Miscanthus(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Poplars(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| Willows(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.5 | 1.4 |
| SweetSorgh(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| E.Cane(mil.dt) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| TOT BIOMASS(mil.dt) | 0.0 | 0.0 | 0.1 | 0.4 | 0.5 | 0.8 | 1.0 | 1.3 | 1.6 | 2.0 | 3.2 | 4.5 |
| ----- | | | | | | | | | | | | |

In the regional output files, xxxyyyCTYOUTa[year].txt, the demand region number of each county is listed;

| YEAR;SIM#;COUNTY;DEMAND_REGION;FIPS;POLY;CROP;TILLAGE;YIELD;PLANT;HARVEST;PRODUCTION | | | | | | | | | |
|--------------------------------------------------------------------------------------|---------|------|-----------|------|-----|----|-----------|------------|----------|
| 2017; | aaa555; | 960; | 3;21001.; | 58.; | 18; | 1; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 960; | 3;21001.; | 58.; | 18; | 2; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 960; | 3;21001.; | 58.; | 18; | 3; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 1; | 1; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 1; | 2; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 1; | 3; | 137.6100; | 5378.3052; | 4918.160 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 2; | 1; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 2; | 2; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 2; | 3; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 3; | 1; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 3; | 2; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 3; | 3; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 4; | 1; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 4; | 2; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 4; | 3; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 5; | 1; | 0.0000; | 0.0000; | 0.000 |
| 2017; | aaa555; | 961; | 3;21003.; | 58.; | 5; | 2; | 0.0000; | 0.0000; | 0.000 |