Workflow of POLYSYS for ARMADA Project

POLYSYS is written in FORTRAN and we are transitioning to Julia, we may have it at the end of the calendar year.

1. Data to setup POLYSYS, not scenario specific.
   1. USDA 10 year national baseline projections [USDA Baseline Projections](https://www.usda.gov/about-usda/general-information/staff-offices/office-chief-economist/world-agricultural-outlook-board/baseline-projections)
   2. County level acreage and production data from [USDA-NASS](https://www.google.com/url?sa=t&source=web&rct=j&opi=89978449&url=https://www.nass.usda.gov/Quick_Stats/&ved=2ahUKEwj86tee0tCOAxULhYkEHc9YB_UQjJEMegQIAhAB&usg=AOvVaw3iG5--F1fv6qRfgdURRYvi) and [USDA-NASS Crop Data Layer](https://www.nass.usda.gov/Research_and_Science/Cropland/SARS1a.php)
   3. Cost of production by crop from [USDA Survey](https://www.ers.usda.gov/data-products/commodity-costs-and-returns).
   4. Downscale cost of production to county level using Kriging method
   5. ORNL Budget Generator provides budgets for energy crops at county level
2. Setting-up baseline run or BAU scenario
   1. Align POLYSYS to 10-year USDA baseline
   2. Expand the baseline beyond the 10 years by exogenously introducing rate of changes in yields (supply) and population (demand); POLYSYS will endogenously solve for land use, supply, prices, demands, and income.
   3. Align the county level baseline to the national USDA Baseline Projections.
   4. Downscale the baseline land use from county to 30x30 meters resolution based on [USDA-NASS Crop Data Layer](https://www.nass.usda.gov/Research_and_Science/Cropland/SARS1a.php) and downscale script in python. Hand downscale results to Watershed Hydrological model.
3. Scenario processing
   1. Get from Matisse the location and footprint of energy sites.
   2. Identify and quantify the land use crop displacement using the downscale baseline and identify acreage reductions by county.
   3. Introduce this acreage reductions in POLYSYS to estimate market impacts and subsequent changes in land use if appropriate.
   4. The model runs annually to account for the dynamic effects of markets account of the timing of the development of the Matisse energy sites.
4. Model Output
   1. POLYSYS output generates land use, production, farm income changes by county and national prices and demands; all the output is by year for up to 50 years.
   2. Regional land use output is downscale to 30x30 meters resolution and results send to Watershed Hydrological model.
   3. Output data is processed using general or specific scripts to produce relevant results for the project and/or linkages to other models, i.e. IMPLAN.