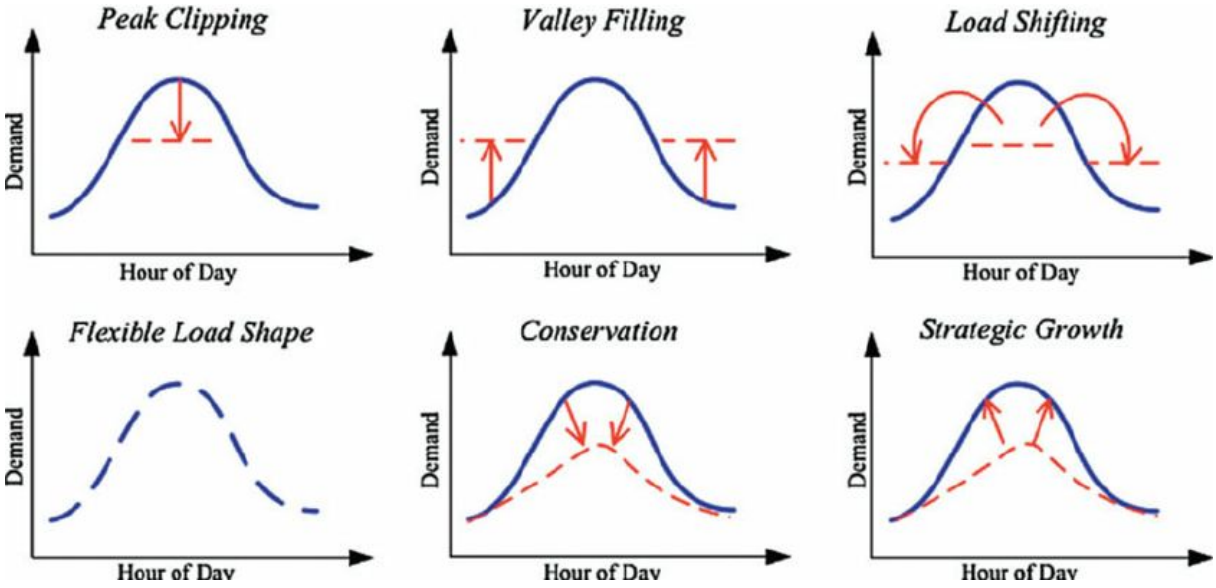
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Quadracci
SUSTAINABLE
ENGINEERING
LAB.

CLIMATE CHANGE:

MANAGING ENERGY SUPPLY & DEMAND



MODULE I: ENERGY MODELS FOR PUMPING AT DISTRICT SCALE

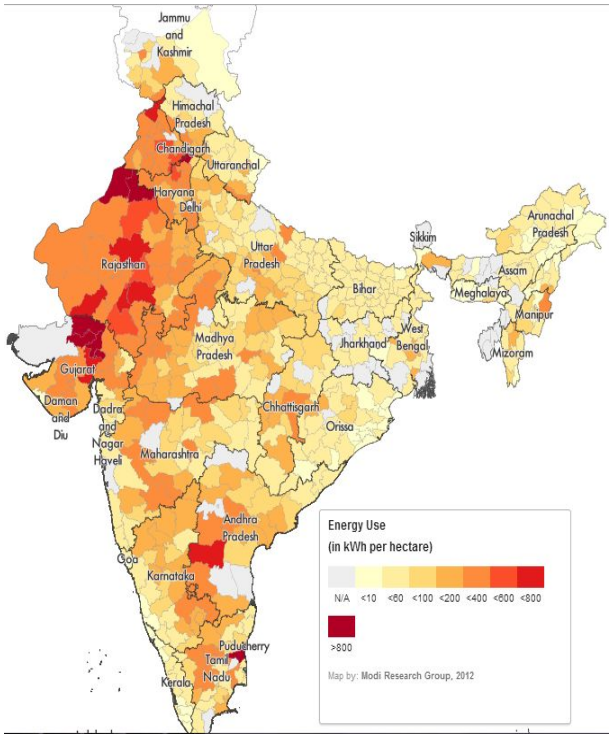
The Energy Calculations are done in the following way

1) Cumulative seasonal deficit (in meters) for the district for all the crops = Sum (median deficit of the crop (m) * crop water requirements for the crop).
2) Dividing by Gross cropped area (GCA) provides with the seasonal deficit (in meters) per hectare which is pumped out of groundwater.
3) The energy required for pumping can be computed by measuring the potential energy (mass*gravity*height) of the seasonal deficit of groundwater.
4) Converting the calculations into KWH/hectare to pump out the water.
   Energy Requirements in KWH/hectare = Seasonal deficit (m) per Energy

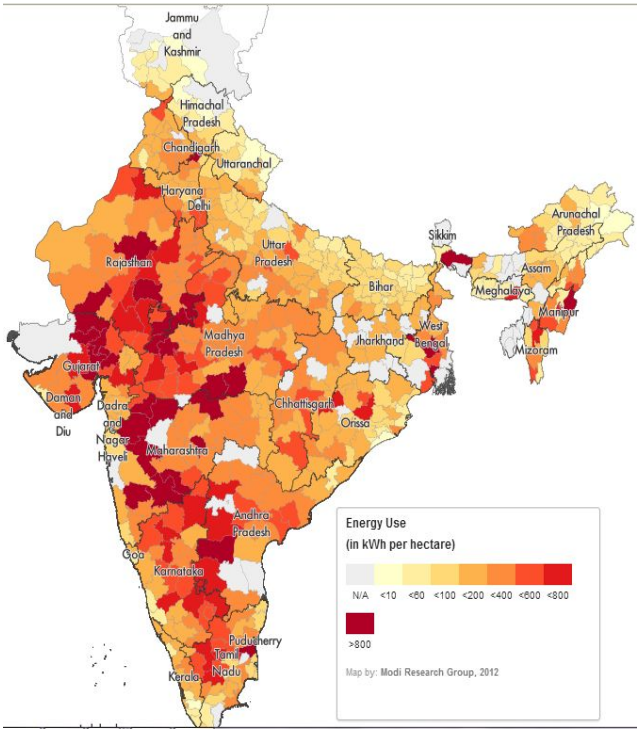
Requirements in KWH/hectare = Seasonal deficit (m) per hectare * average groundwater depth * 10(gravity) * 10000/3600.

The following maps shows the energy demand for agriculture in different districts of India.

KHARIF SEASON

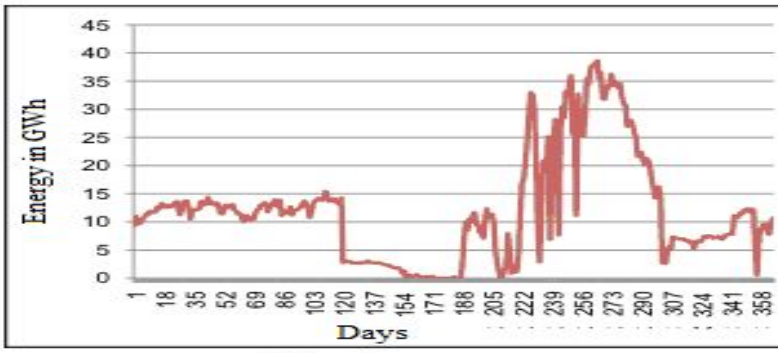


RABI SEASON

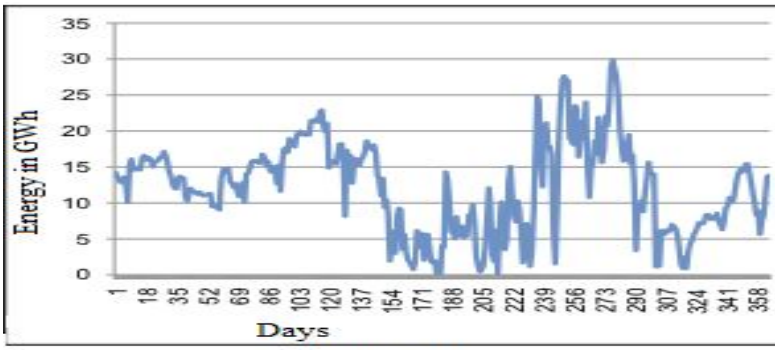


MODULE II: ENERGY MODELS AT STATE SCALE

- Energy Model is run at the state scale
- This could help the state design demand side management techniques.
- State can plan investment into grids based on the following parameters



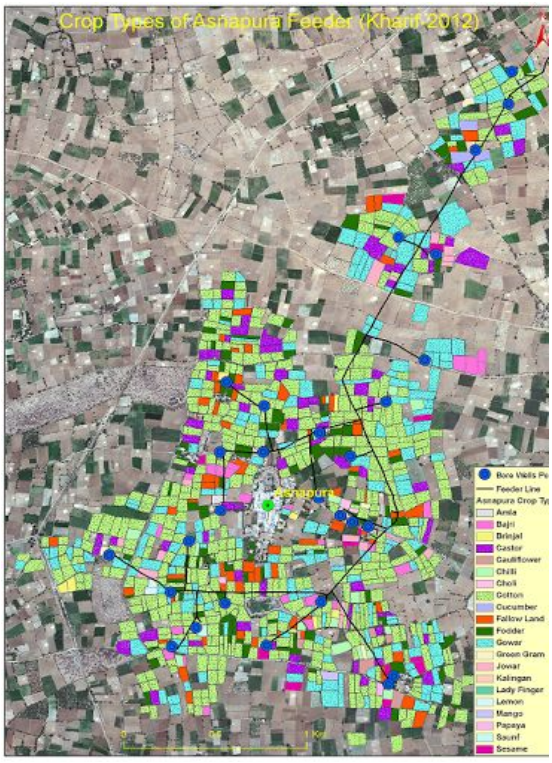
Gujarat

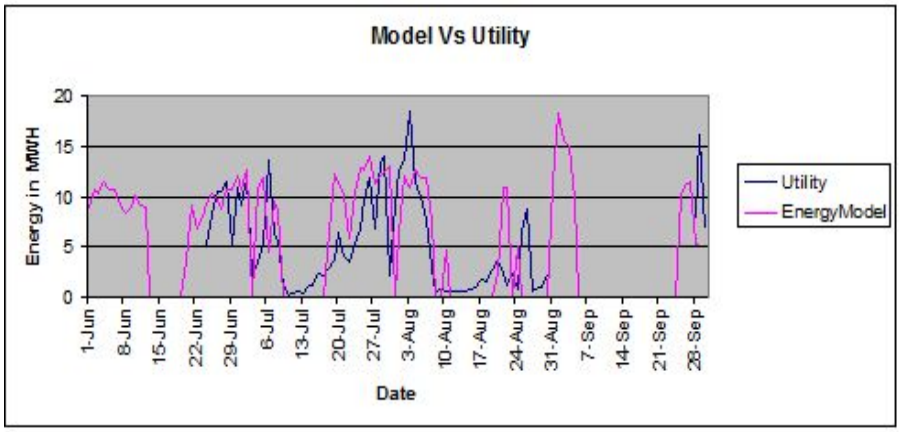


Andhra Pradesh

MODULE III: ENERGY MODELS AT FEEDER SCALE

- Energy Model is run at the feeder scale
- This could help the feeder design demand side management.
- This could help plan save water

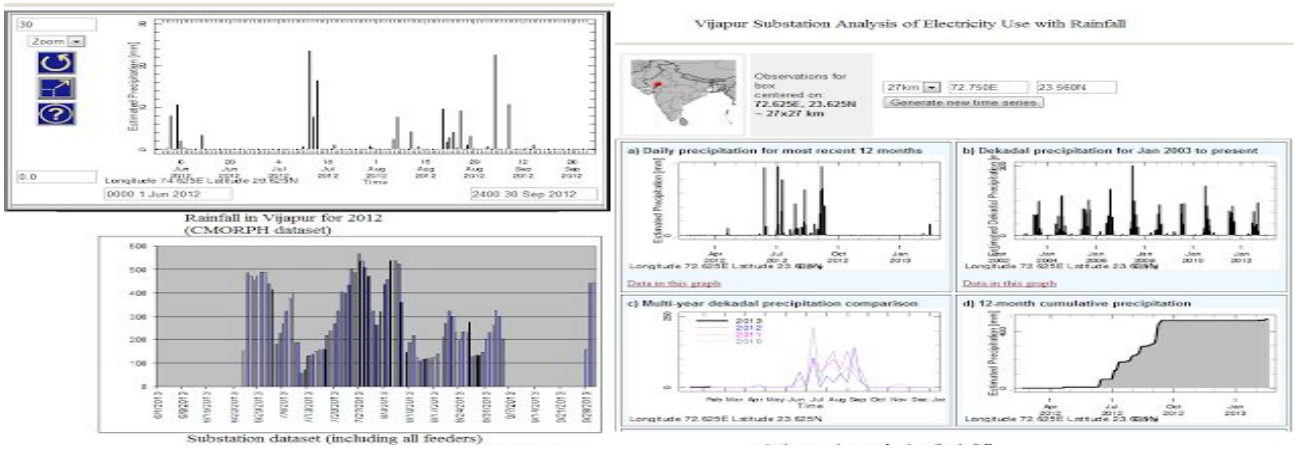




MODULE IV: SIZING THE SOLAR PANELS FOR IRRIGATION

Energy generation, irradiance and insolation data from the 1MW power plant installed using poly and thin films was studied

Understanding the cloud cover and the solar radiation received over the region, the pattern for the grid was calculated.



MODULE V: ENERGY OPTIMIZATION TO REDUCE DEMANDS

Technique: Shift to tomorrow as much as the surplus of tomorrow. Although we put a constraint on the postponed demand, this constraint does not guarantee that we can not shift more than 1 day.

UTILITY READINGS = 4.43MW.

OPTIMIZATION RESULT= 3.30663 MW

