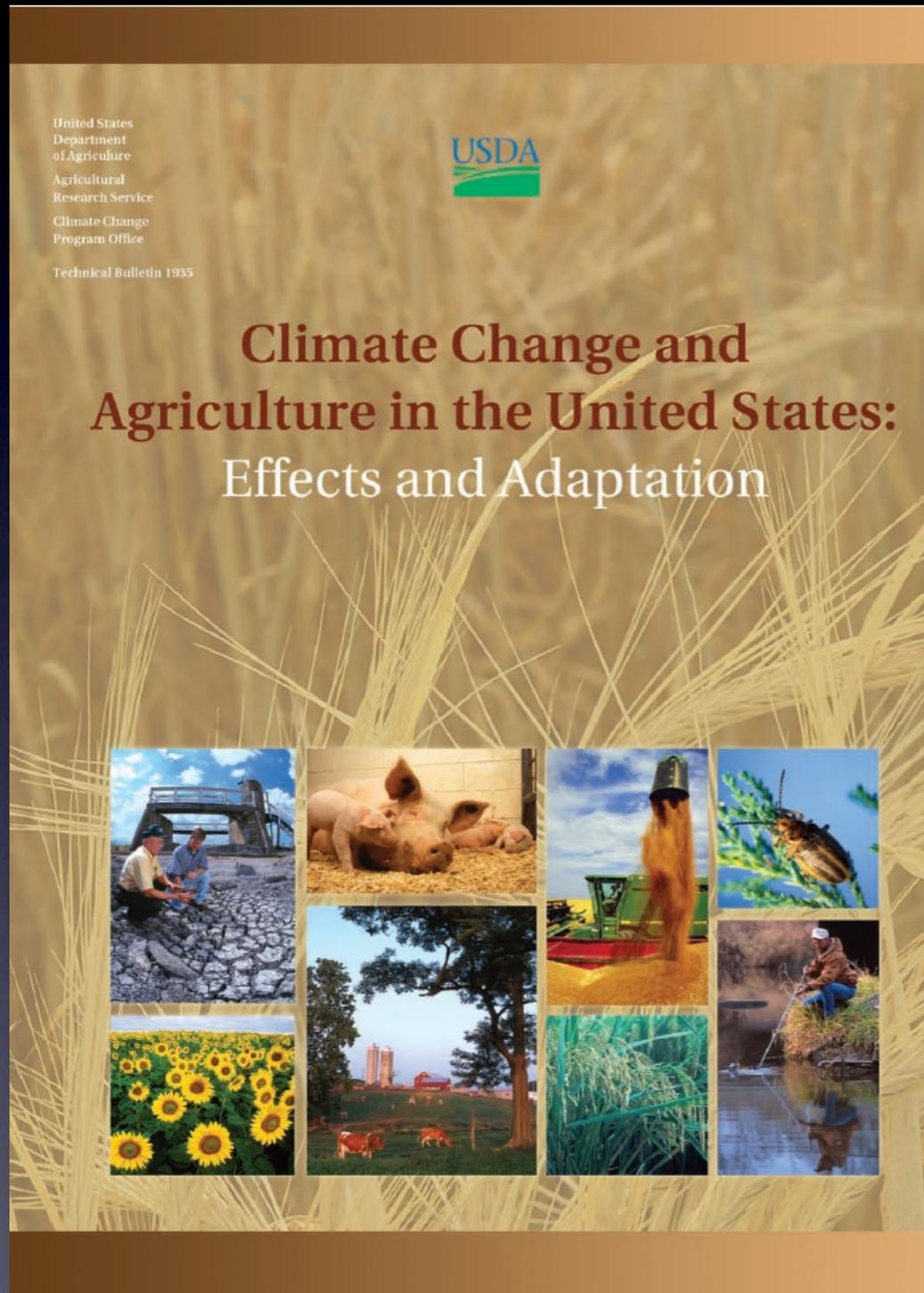
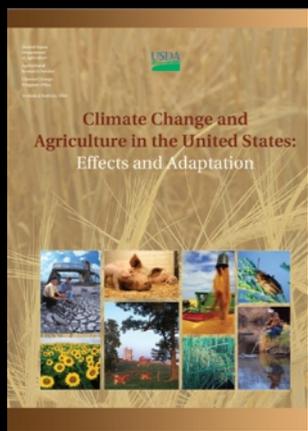


U.S. Agriculture: \$300B/year commodities

- Climate change poses unprecedented challenges to the U.S. agriculture industry.
- Without significant adaptation measures, costs and losses will rise dramatically.
- Food security will be threatened worldwide.

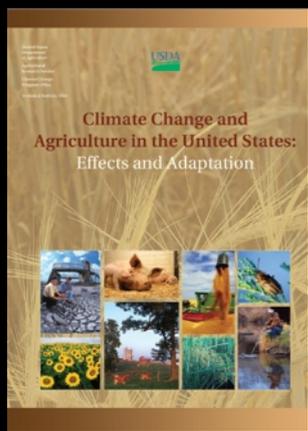




Climate Change and Agriculture in US : Research needs



- **Improve projections of future climate conditions for time scales of seasons to multiple decades;** change and duration of average and extreme temperatures, precipitation , and related variables (e.g., evapotranspiration, soil moisture).
- **Evaluate and develop process level understanding** of the sensitivity of plant and animal production systems, including insect, weed, pathogen, soil and water components, to key direct, indirect and interacting effects of climate change effects
- **Develop and extend the knowledge, management strategies and tools needed by US agricultural stakeholders** to enhance the adaptive capacity of plant and animal production to climate variability and extremes. While existing management and agronomic options have demonstrated significant capacity for expanding adaptation opportunities, new adaptive management strategies, robust risk management approaches, and breeding and genetic advances offer much potential, but have yet to be evaluated.



Climate Change and Agriculture in US : Research needs

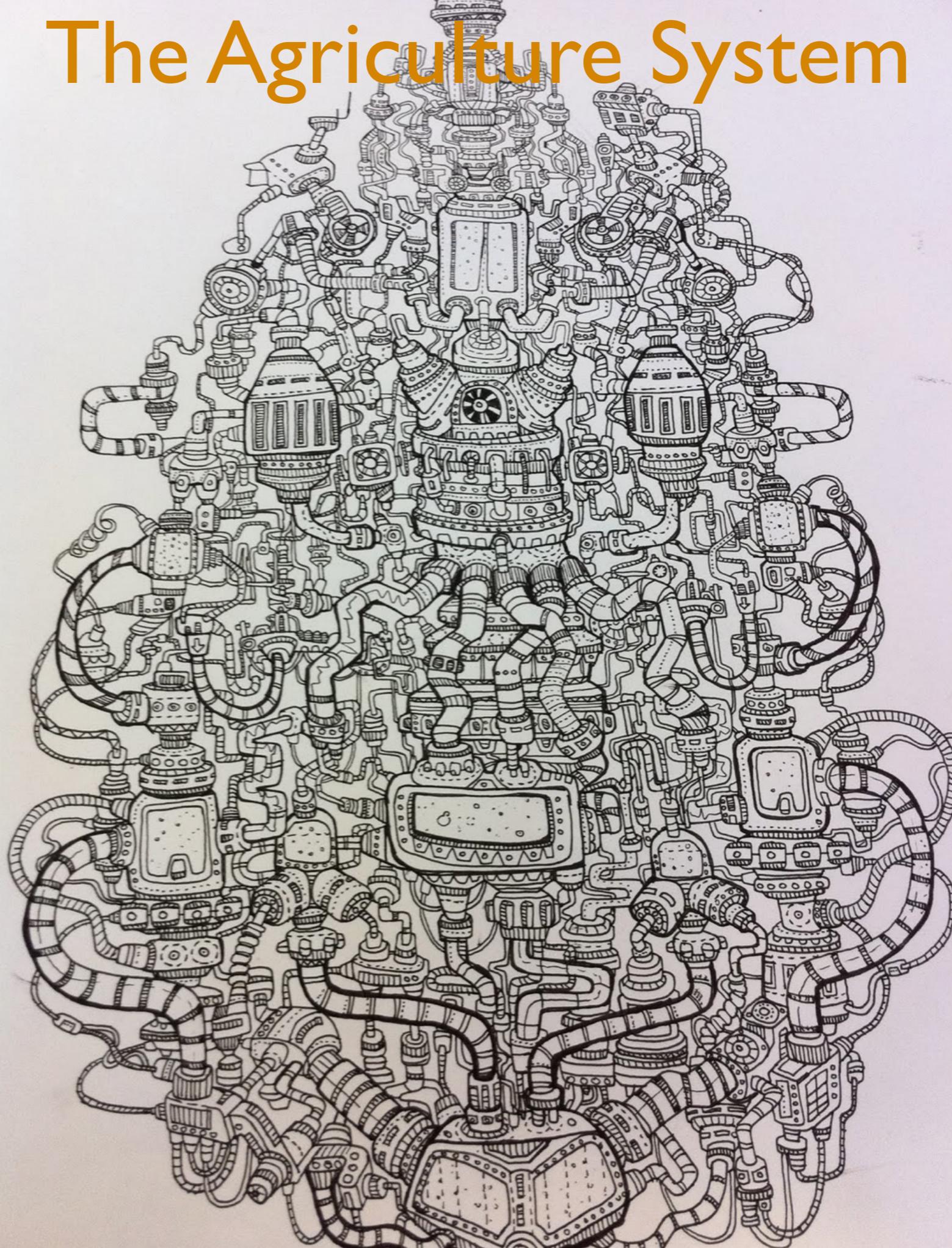
Data

*Indices / Target
for Evaluation*

*Translation
Guidance*

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The Agriculture System



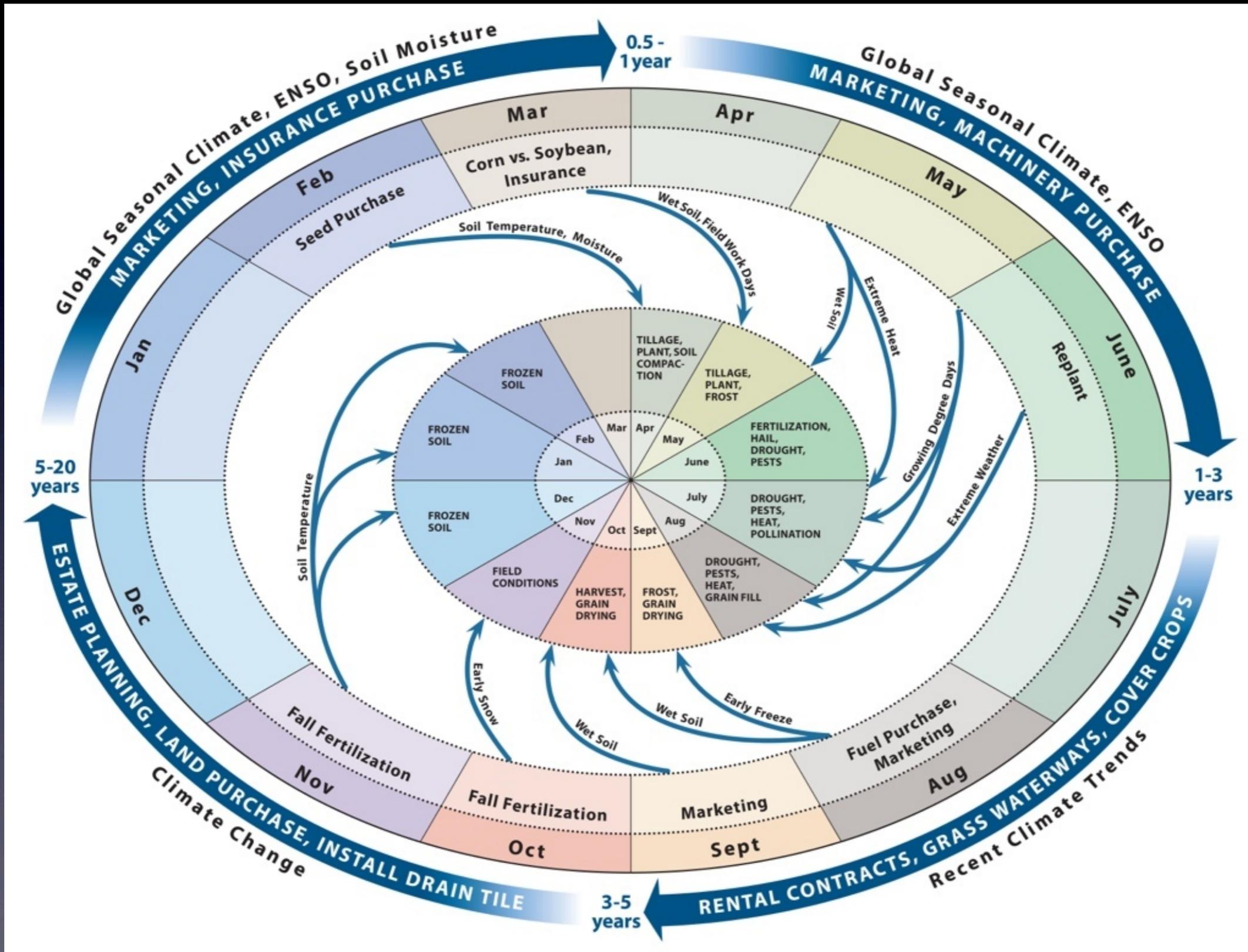


Agriculture Working Group

- Agriculture is a **highly managed system**, thus adaptive actions can reduce vulnerability substantially
- Strong connection to the **seasonal cycle** with changing needs that are different for each crop, soil and climate
- Very different needs for **different members** of the agricultural value chain
- Procedures are difficult to fit into specific templates, yet information and guidance on products, expanded flexibility and trend vs variability, cumulative and frequency indices, as well as connections between them are very welcome

Agricultural Annual Decision Cycle

at the seasonal scale: Seasonal Forecast!





User Profiles

- Professional



- Intermediate

- Basic



User Profiles

- Professional



- Intermediate



- Basic



User Profiles

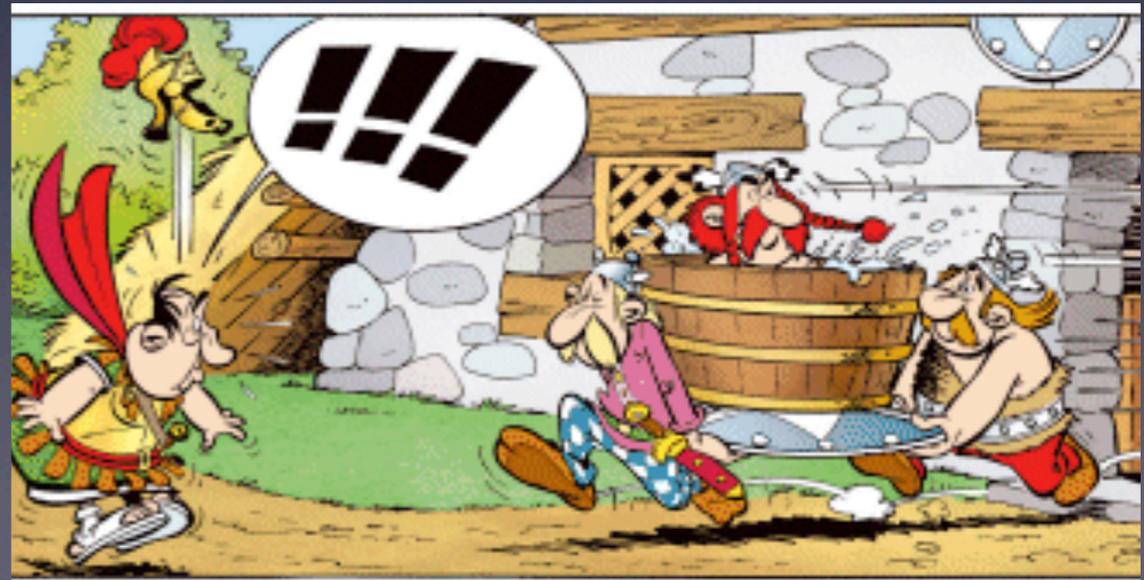
- Professional



- Intermediate



- Basic



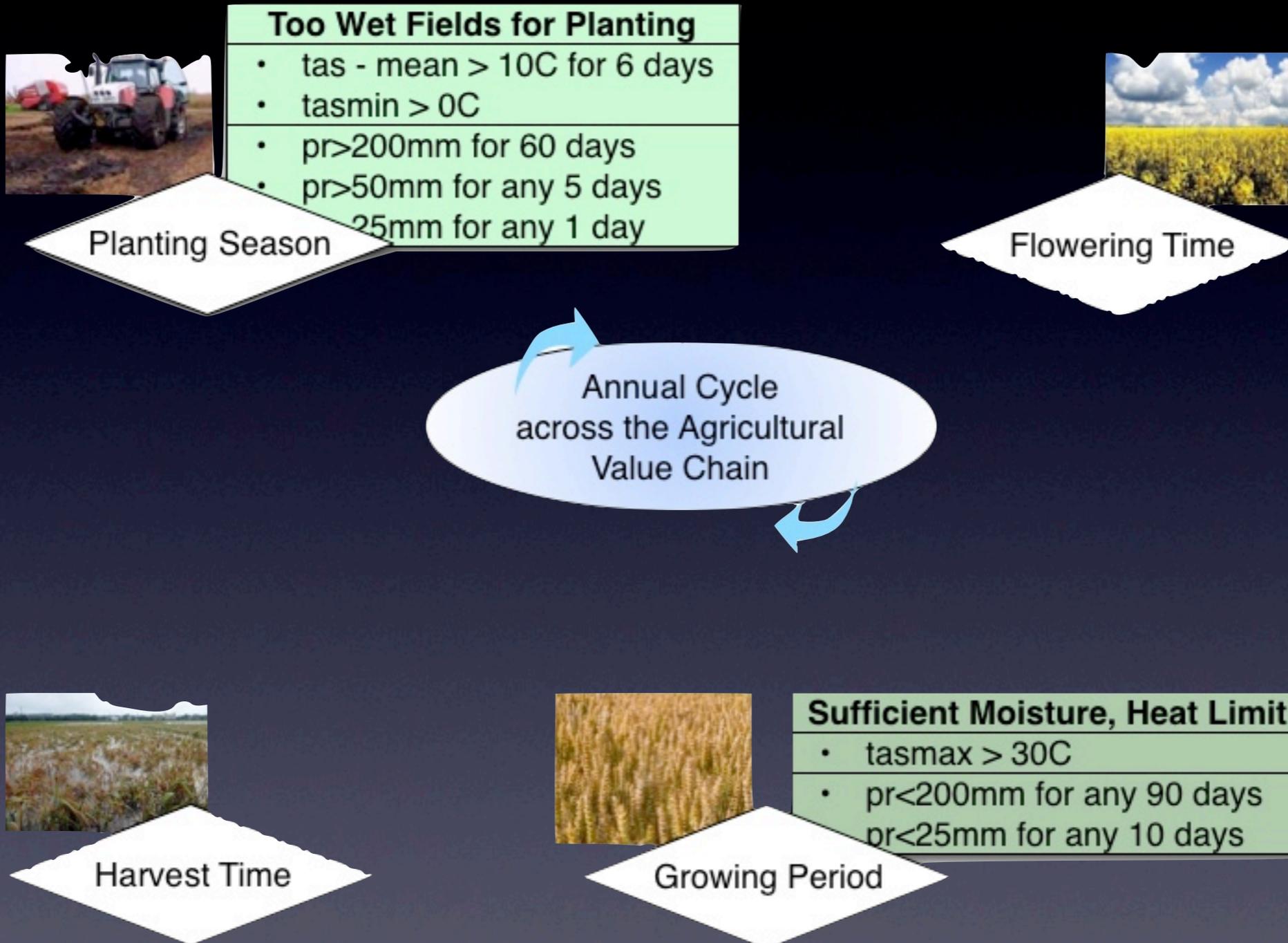


Technical Capabilities

augment the climatological indices with:

- trend and variability information
- frequency indices / metrics
- cumulative index capabilities
- condition and/or timed indices with flexible parameters







Too Wet Fields for Planting

- tas - mean > 10C for 6 days
- tasmin > 0C
- pr>200mm for 60 days

- Observations, incl. stations and reanalysis
- ...
- Timing of start of growing season
- variability of timing from year to year
- connection of variability to large scale circulation
- trend vs variability in timing
- ...
- cross-variable consistency of data
- spatial consistency and variability
- ...
- ...



- pr<200mm for any 90 days
- pr<25mm for any 10 days

g Period



Agriculture Summary



- NCPD should connect to **seasonal forecast** activities and offer ...
- Define different **user profiles** across the agricultural value chain: (e.g. Extension Services, RISAs/RCCs, USDA-Regional Hubs, Crop Insurance, Food Security activities ...)
- **Offer general guidance** on properties of different data sources
- **Expand capabilities** of indices to include trend, variability, cumulative and frequency-oriented, flexible (possibly phenology or multivariate conditioned) index tools and metrics
- Use a question-based approach to connect guidance and capabilities to groups that jointly bring translation to the application for the development of guidance