

LTAR Cropland Common Experiment Design Workshop
November 18-20, 2015; Minneapolis, MN

Participants: Tala Awada (PR), John Baker (UMRB), Dennis Busch (UMRB), Hal Collins (TG), Steven Del Grosso, Jorge Delgado, Curtis Dell (UCB), Sara Duke (ARS-College Station), Sanford Eigenbrode (CAF), David Huggins (CAF), Abdullah Jaradat (UMRB), Kent Keller (CAF), Sasha Kravchenko (Michigan State), Bob Lerch (CMRB), Martin Locke (LMRB), Steven Mirsky (LCB), Tom Moorman (UMRB), Daniel Moriasi (SP), Mark Liebig (NP), Brekke Peterson (SP), Jane Okalebo (PR), Phil Robertson (KBS), Brenton Sharratt (CAF), Sieg Snapp (KBS), Jean Steiner (SP), Tim Strickland (GACP), Merle Vigil, Mark Walbridge (ARS), Matt Yost (CMRB)

Sites represented: CAF, CMRB, GACP, KBS, LCB, LMRB, NGRPL, PRHPA, SP, TGRP, UCB, UMRB

Sites absent: ECB

Program Committee: Phil Robertson & Mark Liebig (co-chairs), John Baker, Dave Huggins, Kent Keller, Martin Locke.

Reporting: Phil Robertson, Mark Liebig

Overview

The meeting was convened to define the minimum design criteria for the LTAR Common Experiment at cropland sites:

- Size and number of replicates for the primary field-scale experiment
- Size and number of replicates for complementary plot-scale experiment
- Starting dates
- Operational definitions for Business as usual (BAU) and Aspirational (ASP) treatments.

Guiding principles

1. The Common Experiment is not the only experiment to be conducted at LTAR sites, thus it does not need to encapsulate all LTAR research objectives.
2. We seek the simplest possible core design for the Common Experiment in order to maximize participation, longevity, and comparability
 - a. The core design can be supplemented locally as interest and resources permit. Accordingly, additional plot-scale experiments can be implemented at any time to complement the field-scale experiment and explore additional LTAR research interests.
 - b. The minimum core design consists of 2 fully instrumented field-scale treatments at one geographic location per LTAR site (BAU, ASP)
3. The experiment hasn't started yet – thus we are not locked into any pre-existing designs at any site.

Statistical Considerations

Statisticians Sara Duke and Sasha Kravchenko provided an overview of statistical considerations. To provide acceptable power for detecting statistically valid differences and trends, sound statistical designs demand the following:

1. True replication at both field and plot scales,
2. Baseline sampling – both spatial (across the experimental units) and temporal (during a pre-treatment period),

3. Carefully planned blocking on an appropriate environmental attribute, and
4. Relatively consistent plot sizes

Additional desired attributes include:

1. At least 2 replicates per treatment at the field scale,
2. At least 4 replicates per treatment at plot scale,
3. Large plot sizes (>50 x 50m or 0.25ha),
4. Staggered start dates, and
5. All rotation phases present.

Design Discussion

Small group and plenary discussions over the course of the day elicited the following conclusions with respect to major design considerations. Those points without strong consensus on Day 1 were revisited on Day 2 to further discuss and reach consensus (defined as unanimous willingness to support a given design element).

Field Scale Common Experiment

Field Size

- Preferred size is 16 ha – strong consensus
- Minimum size is 10 ha – strong consensus

Number of replicate fields per treatment

- Preferred number is 4-6 – strong consensus
- Minimum number is 1.5– moderate consensus

N.B. 1.5 means one of the two treatment fields is replicated, with treatment choice arbitrary; 2 fields per treatment better.

Complementary Plot Scale Experiment

Plot Size

- Preferred size is 1 ha– strong consensus
- Minimum size is 0.1 ha – strong consensus (on Day 2)

Number of replicate plots per treatment

- Preferred number is 4-6 – strong consensus
- Minimum number is 3 – strong consensus

Start Dates for the Common Experiment

Number of treatment start dates

- Preferred no. of start dates is >1 – moderate consensus
- Minimum number is 1 – strong consensus

Treatment start date

- Preferred start date is after a 1 year baseline period with same crop across all experimental units
- Minimum start date is after a 1 growing season baseline period with same crop across all experimental units

BAU Parameters

Definition of BAU

- Prevailing practices on a predominant cropping system in the LTAR site's area

Source of information for determining BAU management protocol

- Preferred: formal survey of area producers (conducted annually or biannually)
- Minimum: Local experts (crop consultants, extension educators, NASS & satellite databases, farmers)

Types of information and tools used for determining BAU management protocol

- Preferred: for predominant cropping system - tillage, rotation, fertility, pest management, irrigation management, equipment, inputs
- Minimum: same as preferred

How often protocol should be reviewed and potentially changed?

- Preferred: every 3-5 yr based on rolling average of survey results (site-specific)
- Minimum: same as preferred

ASP Parameters

Definition of ASP

- Practices to deliver site-prioritized ecosystem services

Sources of information for determining ASP management protocol

- Primary: Researchers, innovative farmers
- Secondary: stakeholders, federal policy, climate trends and models

Types of information and tools used for determining ASP management protocol

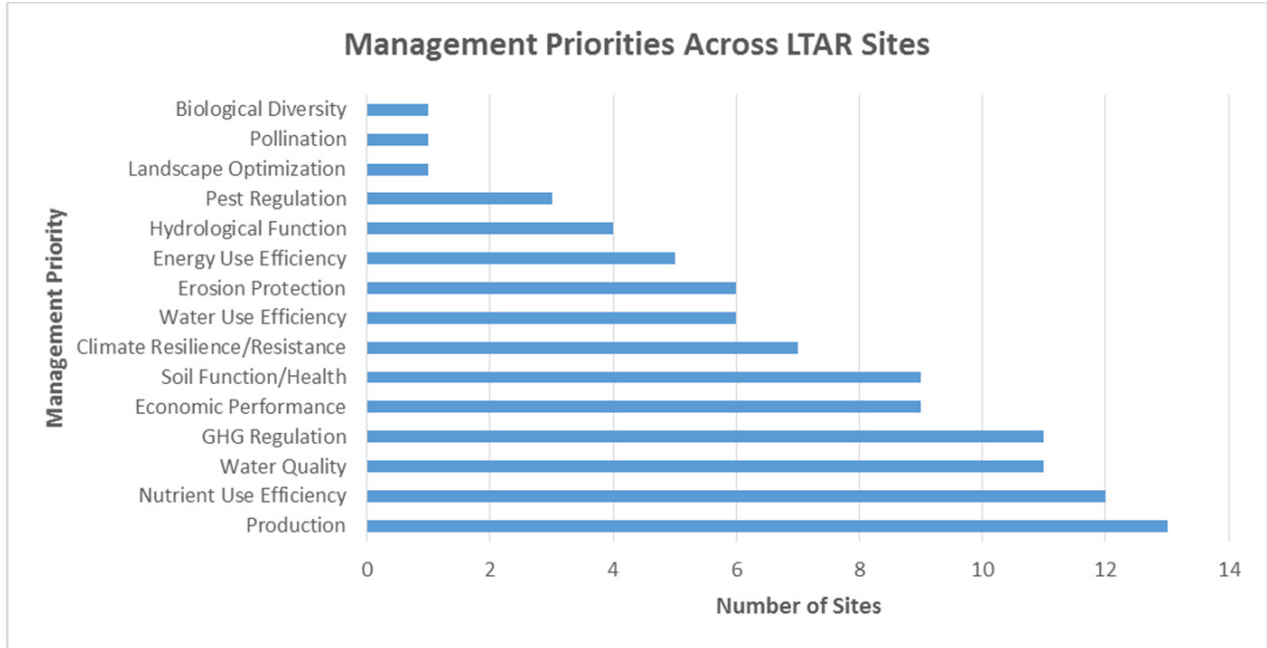
- Primary: Exploratory and complementary plot experiments (action/adaptation science)
- Secondary: Meta-analysis & modeling; analysis of emerging technologies

How often protocol should be reviewed and potentially changed?

- Preferred: Five years, based on rolling 5 yr average informed by BAU adoption, new technology and agronomic innovations, and socioeconomic change (e.g. markets)
- Minimum: same as preferred

ASP Management Priorities

An initial survey of sites' short presentations at the beginning of the workshop identified the following management priorities for the ASP treatment. These are the ecosystem services that individual sites are interested in designing the ASP treatment to deliver. Note that these are not metrics – all services will be assessed at every LTAR site for both the BAU and ASP treatments, by measurement protocols now being developed by different LTAR measurement protocol teams.



Next Steps

1. Sites should finalize their field designs based on minimum and preferred design criteria as designated here.
2. Individual site designs should be vetted by our statisticians Sara Duke and Sasha Kravchenko, who are available for consultation.
3. Final proposed designs should be reported at the February 2016 meeting.
4. All sites should be ready to plant their baseline year crop in Spring 2016, pending available funding, and to initiate baseline sampling activities.
5. In preparation for deployment of BAU and ASP treatments in Fall 2016, funded sites need to define BAU and ASP and finalize management priorities as per information and protocols above.
6. Baseline sampling protocols need development.
7. Experimental sampling protocols need to be finalized.