USDA-ARS Agricultural System Competitiveness & Sustainability
Customer Workshop
February 22, 2012

<u>TOPIC QUESTION 1:</u> What knowledge or technology would improve our abilities to produce an agronomic crop in systems that are profitable and will ensure environmental stewardship?

Facilitator: Reagan Heese
Recorder: Beth Redlin

Please capture what you feel is important to share with the group in post-breakout report & discussion.

Summary of topics below:

Maintain large harvest index (grain /above ground biomass) for wheat and other crops in intensive semi-arid, rain-fed, cropping systems.

Crop (cereals, oilseeds and pulses) planning software – regionalized to cultivars, varieties, linked to crop protection products with rotational restrictions, residual herbicide benefits, ability to identify cost and potential return from a producer machinery.

Understanding, measuring, and evaluating microbiological soil health on farm and how soil biology benefits from no-till and incorporating field cover crops/green manures. Low-cost alternative to conventional soil quality test

Adapting cover crops/cocktails to work in an arid/semi-arid area crop rotation.

Wheat:

1. ID health-promoting and nutritional components missing in modern wheat which exist in ancient (heirloom) wheat.
2. ID components in modern wheat causing health problems or sensitivities in the general population which do not exist in ancient (heirloom) wheat.
3. Focus new breeding programs on nutrition and health – take out the bad stuff and put in the good stuff.

Resistance / tolerance of heat stress for photosynthesis and yield formation processes.

Soil health: Designing cropping systems reducing fertilization and maintaining profitability.

Soil health: Rotational effects of various cropping systems on soil nutrition, soil quality, etc.

Soil health: Quantifying benefits of systems that improve soil health/biology.

Look at introduction of land races (a mix of strains and varieties) to increase diversity and stability of crop. Mimic native soil biological profiles and plant diversity. Diversifying the genetic basis of our crops.

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<u>TOPIC QUESTION 2:</u> What knowledge or technology would improve our abilities to produce specialty crops in systems that are profitable and will ensure environmental stewardship?

Facilitator: Reagan Heese
Recorder: Beth Redlin

Please capture what you feel is important to share with the group in post-breakout report & discussion.

Summary of topics below:

Identify crops with high nutritional benefits to substitute for expensive drugs or reduce the need for them in the first place. High oleic safflower for heart health, waxy barley for beta glucans to lower cholesterol. Look at wild and exotic plants.

Micronutrient cycling and dynamics (ph) under different cropping systems including effects on yield and quality.

The importance of diversity in:

1. The role of diversity including specialty crops in building soil health.

2. Highly diverse crop rotations effects on soil health, yield, diseases, weed populations.

3. What crops will grow where, many out there haven't been tested locally.

Develop directory: Seed availability, brokers, processing facilities with regional information. Ex: similar to MOSES (Midwest Organic …) directory.

How to improve soil health in a crop rotation which includes root crops, i.e. sugar beets, potatoes.

Knowledge of synergies and trade-offs of cover crops in crop systems – pest incidence, water productivity, soil responses.

Inclusion of BOTH pulse crops/legumes and oilseeds (sunflower, canola, safflower, cover crops) in increasingly diverse rotation with agronomic crops. Impacts of longer term rotations on system productivity and system profitability.

Investigate variations between no-till and minimum-till to facilitate inclusion of specialty crops that have limited herbicide options. Effects on soil structure/quality. Do we need STRICT no-till?

"Value" of GMO/RoundUp-ready to ecosystem services.

Impacts of the water cycle when specialty crops with different water requirements are added to rotations. Find opportunities in all regions.

Nutritional improvements through breeding of speciality crops – protein, fiber, micronutrients.

How can we quickly rebuild soil structure following harvest of a root/tuber crop (potatoes/sugarbeet).

Help establish local dryland vegetables and low-water fruit production on the Great Plains.

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<u>TOPIC QUESTION 3:</u> What knowledge or technology would improve our abilities to produce crops and livestock from integrated systems that are profitable and will ensure environmental stewardship?

Facilitator: Reagan Heese
Recorder: Beth Redlin

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Summary of topics below:

Comprehensive Water Balance Study on landscape or regional scale – Decision making tool as a final product:
Water in (streamflow, precip) – Water used/exported (municipal use, plant consumption, industrial use, stream flow out) = Change in storage (recharge in aquifer – sustainable use number)
Areas of refinement:
Plant populations
Tillage practices
Species mix
Grazing practices
Energy use
More?

If practice increases recharge by 1/16” acre over 1 million acres = 62,500 af/yr – average use of 300 wells. Ave. household of 4 = 400 gal/da=28,000 households (112,000 people). ¼” increase = 500,000 people. Info gained can be used to implement long term sustainable procedures. If land can be managed to increase aquifer recharge by ¼” over 1 million acres, this could increase water supply equivalent to 500,000 people.

Grazing cover crops: crop type, soil health, sys incorporation, timing and amount of grazing

Incorporating livestock diversity with crop diversity to build soil health and enhance profit.

Effects of ruminants grazing cover crops on soil compaction, seed bank, nutrient cycling, GHG dynamics.

Focus on developing better crops which can provide both fuel and food (i.e. hi oleic safflower where mash goes to cattle) and help develop a local system for farmers to grow and process their own fuel (reclaimed from food market)

Impact of different grazing densities on water recharge.

Develop techniques for no-till organic system.

How often does a cover crop need to be rotated in to sustain wheat/legume/cover crop system.

Develop simple on-farm composting systems to handle all animal wastes. Also working with cities to return nutrients to the land through composting.

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TOPIC QUESTION 4: Wildcard for each Area.

Facilitator: Reagan Heese
Recorder: Beth Redlin

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Summary of topics below:

True and full costs of farm bill

- Risk management that incentivizes bad agronomic decisions
- Societal value of good land management/reduced erosion
- Societal value of long-term view of ag support
- Balance between cheap safe food and environmental costs.

Soil health: How does the increase in water holding capacity contribute to flood control in a watershed?

Better/new definition of environmental stewardship. Good definition of working lands for public policy discussions.

Define soil health - drives everything, for example plant, animal and human health.

Improve information output to producers. Many producers have no knowledge of the great tools and info that ARS creates even exists.

Soil health on rangelands, tame pasture – How does it change by soil type / what is the potential, how do you change it, especially large pasture (or fields) scenarios (3,000+ ac pastures).

Help farmers reduce inputs by growing their own fertilizer. Develop rotations which can substitute for herbicides and pesticides.

Various tests to measure soil health – other than conventional soil tests which don't take into account soil biology.

More outside the box thinking from researchers.

Reduce lag time between on-farm practice and research. Use animal impact to seed annual cash crops.

How to define soil health? NPKS and micros and MICROBIOLOGY in soil on OM, CEC, C, etc.

Need to document the numbers - soil health implications.

Soil salinity – additional tolerant species or new strategies.

Research benefits of pasture cropping relating to soil improvement as well as grasses. Ex: Australia

Easy to use tools, software, etc. for producers' decision-making process.

How do we get warm season cover crop benefits in a cool season world?

Rather than focus on cost of food 20% to 10% (of ave income) last 50 years. Let's consider cost of health care (especially caused by poor health) 10% to 20% (of ave. income in last 50 years.) Consider if food with higher nutrition would reduce health care costs – and give farmers some of the health care savings by paying them more for higher nutrient valued food i.e. substitute high yield cheap food and poor health for high value high nutrition food and improved health.

Interspecies competition of cover crops to convert or enhance crested wheat grass pastures.

Seeding multi species cash crops together and harvesting them at the same time.

The effects of cover crops on beneficial insects.