

Customer Breakout Session II: Prioritizing and defining problems for research

Wednesday May 14, 2008

Group:	Reducing Agricultural Emissions to the Atmosphere A—Colorado Rm I
Facilitator:	Brian Wienhold
Recorder:	Ted Zobeck/Cathleen Hapeman
Presenter:	Tom McDonald

1a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for long-term research? Why?

1. Emissions of PM, GHG, VOCs, NH₃, NO_x, etc– long term
 - a. Evaluation of instruments for PM sampler bias
 - b. Develop emission factors and fluxes for agricultural emissions
 - c. Impact of fugitive PM relative to point source PM on AG emissions
 - d. Develop abatement BMP
 - e. fate and transport of pollutants and impact of off-site impacts

2. Carbon/GHG balance/footprint - long term
 - a. Global warming potential of different agroecosystems systems such as cropping, livestock, forestry, etc,
 - b. Determine effects of intensification of these systems
 - c. Impact of enhanced efficiency fertilizer technology and equipment advances – Direct and indirect
 - d. Does erosion always result in soil carbon loss? (Scale issue
 - e. Determine impact of mgt practices such as fertilizers, tillage, crops etc. on the ability of the mycorrhizal fungi community to sequester carbon?

3. Biomass to biofuels Long term
 - a. Develop efficient technologies to produce energy from agricultural biomass and by-products
 - b. Determine impacts of biomass conversion technologies on soil/air/water/environmental quality
 - sustainability needs to be considered

Tech transfer – seems to be important issue. How do we find it? Needs to be in a useable form.

Issue of scale (Temporal and Spatial) applies to both priorities

Expansion of GraceNet supported.

Name ideas: Global Climate Change, Air Quality and Soil Management

3) Describe a positive research partnership/collaboration that you know of. Why was the outcome positive?

Work with Ft. Collins with Ardell Halvorson and Ron Newman. Contributed several articles in IPNI newsletter to thousands worldwide describing work for crop consultants. These articles were not peer reviewed but considered very important by stakeholders.

KSU works with Bushland to develop CRADAs, share resources and leverage resources. Also works with Grain Marketing and Production Research Center.

Bushland has done research on irrigation effects and wheat and sorghum breeding for drought tolerance.

Collaboration with Weslaco to study effects of fertilizers on fruits. Contributed several articles and information.

Another stakeholder appreciated work with

Group:	Reducing Agricultural Emissions to the Atmosphere B—Colorado Rm II
Facilitator:	Al Rotz
Recorder:	Doug Karlen (computer); Greg Holt (chart)
Presenter:	Harold Reetz

1a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for long-term research? Why?

Quantification of emissions/particulates is #1 – if can't measure it we can't solve it; need metrics to evaluate all effects of management practices – mathematical modeling for pollutants, GHG, and sequestration (marketing of C credits)

NEED:

- Measurement tools, methods, mathematical representation (short-term)
- Modeling emission – end result verified based on measured results
- Modeling dispersion patterns – where do emissions go?

Priority Emissions from Agriculture needing quantification: PM (TSP, PM₁₀, PM_{2.5}) -- #1; VOC – not only pesticides, also silage emissions -- #2; NO_x -- #2a; CO₂ -- #3; NH₃ -- #4; N₂O and CH₄ -- #5;

Life-cycle analysis is #2; long-term, part of global climate change monitoring; includes “footprints” for C and other constituents; includes biomass impact questions;

- C and N balances – key focus for life-cycle analysis
- Need economic information NOW
- What are the real environmental impacts – how long to measure effects

Identify and prioritize BMPs #3 (all in relation to all above emissions) – can't wait for perfect final answer; need to know quickly whether or not producers are on the right track or not; both new technology and current tools;

Timing, application equipment, management, on-farm testing for local adaption; regional requirements; novel technologies; RTK (precision technology);

Need to quantify actual emissions from biofuels – unbiased (non-industry) generated numbers

Communication!

Group:	Reducing Agricultural Emissions to the Atmosphere C—Colorado Rm III
Facilitator:	Jane Johnson
Recorder:	Jerry Hatfield
Presenter:	Bill Norman

1a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for long-term research? Why?

Use GRACEnet to assess GHG impacts of cropping systems or alternative systems

How can GRACEnet be used for policy decisions regarding soil C? New sensors? Modeling/measurement questions?

Biofuels – C sequestration, GHG emissions, ammonia emissions, nutrient inputs, air & water quality impacts, land use change component, animal waste component, currently no life cycle analysis (short and long term needs) – costs of inputs, transportation – need holistic analysis of cost/benefit

Decision support systems – development; C impacts - how to manage C; disease/insect effects; crops - rotations

Particulates

GHG\Soil Plant Atmo interactions

Climate

Animal issues

Process oriented models – refining based on management

Need holistic approach

Decision Matrix

Uncertainty: low – high

Scale (importance): small to large

Time (when is info needed): immediate to long

*should take into account resources available

Ex. PM = uncertainty high; scale small to intermediate (depending upon source and component – cotton gin vs. CAFO; PM2.5 vs PM10); time immediate

b) What partnerships and collaborations are needed to solve the long-term problems and deliver solutions to users?

NRCS – determine BMPs/assess emissions from these – alternatives

Need to sit down with NRCS to determine what are current BMPs and assess what are emissions from these/ can these be lowered?

- FSA - CRP
- DOE/ Energy industries
- EPA
- Industry – Commodity Orgs/ Producers
- NGOs
- Environmental Groups/Conservation Groups
- NOAA
- USGS
- State, as well as Fed level agencies
- Need international collab (e.g., take GRACEnet overseas) ARS office of International Programs, fellowships, State Dept. ; IPCC
- NSF funds collab efforts/networks among Fed agencies for N fluxes etc.

2a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for immediate/short-term research? Why?

Problem: Lack of knowledge

There is a lack of knowledge and ability to accurately assess PM and other gas emissions to understand processes in order to determine impacts of abatement efforts.

Address questions related to pending regulations (state) affecting ag air emissions (PM_{2.5}, N₂O, ammonia, CH₄)

What is ag's contribution?

Ability to accurately measure (esp. PM)?

Need characterization of emissions across landscapes/soils. etc. before we can detect abatement impacts.

Concurrent with id - alternative management strategies

Animal systems – emissions/manure management etc.

- **Process oriented models – research needed to develop/refine**
- **Abatement options – alternative systems**
- **Measuring C vs. level of accuracy desired (models vs. field measurements)**
- **Reduce uncertainty associated with current emissions measurements**

Prob: Lack of info on measurement protocols that can define uncertainties in estimates - @ multiple scales (farm, watershed, region, national) Need water quality measurements, as well as air (GHG. etc)

Evaluation of alternative methods to quantify uncertainty in GHGs and link to verification and audit tools

Biofuels

b) What partnerships and collaborations are needed to solve the immediate/short-term problems and deliver solutions to users?

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EPA

Industry – Commodity Orgs

NOAA

USGS

State, as well as Fed level agencies

Need international collab (e.g., take GRACEnet overseas) ARS office of International Programs, fellowships, State Dept.,

NSF funds collab efforts/networks among Fed agencies for N fluxes etc.

New Name of NP212

- Climate Research on Natural Resources Across the Landscape
- Agricultural - Air Quality - Soil Interactions
- Interactions of Agricultural Resource Management and Climate Change
- Climate Interactions with Agricultural Resource Management

Group:	Reducing Agricultural Emissions to the Atmosphere D—Executive Rm. A
Facilitator:	Scott Yates
Recorder:	Laura McConnell and John Baker
Presenter:	Ed Barnes

Suggestions for National Program

- Agricultural Land and Atmosphere Resource Management
- Soil Air and Carbon Management
- Key Words for Name: Carbon, Ecosystems, Soils, Climate, Land, Atmosphere

1a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for long-term research? Why?

- Life cycle analysis of greenhouse gases for crop production systems
- Establish standard measurements for establishing carbon sequestration on farms for average farmers to use for carbon trading. (sampling and analysis methods)
- Provide balanced improved information on carbon sequestration and greenhouse gas emissions for crops, animal production.
- Examining N losses holistically – all sources simultaneously to provide data to validate models.

2a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for immediate/short-term research? Why?

- Is PM2.5 an agricultural problem? Perhaps only PM10?
- Validate reliability of currently used PM2.5 samplers.
- ARS must improve communication with regulatory community

Group:	Adapting Agriculture to Global Changes A—Conference Rm. 727
Facilitator:	Greg Wilson
Recorder:	Rod Venterea
Presenter:	Joe Domeier

1a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for long-term research? Why?

- Feeding a growing world population sustainably.
- More emphasis on economic and social feasibility of management practices (applies to many or most items)
- Land use change and biofuel production effects on GHG emissions
- Implications of bringing marginal land into production
- Climate change impact on feed and food quality
- Biomass harvesting effects on soil C cycling and soil quality
- Life cycle analysis of GHGs for crop production systems
- Improved communications among ARS and other agencies and producers
- Management practices for improved water use efficiency and reduced water consumption
- Simultaneous effects of multiple effects and stressors
- Improved N fertilizer management: How much do we put, where, when and how?
- Integrate production and agronomic information with environmental impacts

b) What partnerships and collaborations are needed to solve the long-term problems and deliver solutions to users?

- University & Extension Service
- Partnerships for vertical integration: other fed agencies (NASA, NOAA, DOE, USGS, US Army Corps, ERS, CSREES, EPA), International agencies
- Producer-lead research organizations
- Local consulting firms
- Regional groups, e.g., State Agencies (e.g. IL State water survey; local soil and water conservation districts)
- Commodity Groups (funding)
- Conservation Groups (e.g. Ducks Unlimited); funding & outreach
- Industry (e.g. fertilizer and equipment manufacturers, ag and non-ag, any industry interested in C credits)
- NGOs (IPNI/FAR, TFI, Gates Foundation)
- Banking industry

2a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for immediate/short-term research? Why?

- Better integration, synthesis, and meta-analysis of existing information on topics of interest, including better evaluation of variability
- Complete data collection from GRACEnet group (example of above)
- Extend and expand GRACEnet

b) What partnerships and collaborations are needed to solve the immediate/short-term problems and deliver solutions to users?

- Whoever has the information that needs to be integrated.
- Universities.
- Other groups who have done integrative studies (e.g. EPA).

3) Describe a positive research partnership/collaboration that you know of. Why was the outcome positive?

- Project with USGS and ARS-Morris to evaluate prairie potholes for their potential for soil C sequestration; Facilitated by personal contacts and knowledge of ARS's expertise and specialized analytical capabilities.
- Fertilizer company (Agrium) working with NGO (IPNI/FAR) and multiple ARS GRACEnet locations; Facilitated by personal relationship between industry and ARS-Fort Collins representatives developed over several years; common interests; and knowledge of ARS's expertise
- Monsanto, Univ of Illinois and ARS-Urbana looking at ozone effects on soybeans facilitated by personal contacts.

Group:	Adapting Agriculture to Global Changes B—Conference Rm. 927
Facilitator:	Michael Abbey
Recorder:	Raymond Hunt
Presenter:	Scott Murrell

1a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for long-term research? Why?

b) What partnerships and collaborations are needed to solve the long-term problems and deliver solutions to users?

- Nitrogen use efficiency – nitrogen fertilizer is very expensive and excess N contributes to N₂O [III] **Partnerships and Collaborations?** Fertilizer companies (timed release & inhibitors for short term), plant breeders, university scientists/soil testers for making N recommendations – put into context to farmers
- Testing marginal lands – these lands will be used for increasing production but could lead to more environmental problems (erosion) **Partnerships and Collaborations?** NRCS, DOI, implications for wildlife what is the threshold for determining marginal lands/definition of marginal lands
- Selecting crop lines to mitigate climate change (temperature and drought) for both food and energy and reduce emissions by matching cultivars for crop practices [II] **Partnerships and Collaborations?** Breeders, amplify current research, most breeders use conventional tillage, need to use reduced tillage systems. Colder temperatures affect germination and early growth rate. US-wide coverage.
- Get carbon into deeper soil layers so it is less likely to be released as CO₂ – get below tillage depth **Partnerships and Collaborations?**
- Greater understanding of N₂O emissions and soil chemistry (other management strategies to reduce emissions other than increasing NUE) **Partnerships and Collaborations?**
- How much should ARS focus on biofuels (current emphasis is related to government mandates and programs, if support goes away would negatively impact farmers, policy is not science) **Partnerships and Collaborations?** China (sweet sorghum), bioenergy from algae, sugar cane, colder climates, sugar beets.
- Life cycle analysis (cradle to grave) for production systems (including biofuels) **Partnerships and Collaborations?**
- Need to have carbon/water/nitrogen cycle models for animal, fiber production as well, what are the processes that we can manage **Partnerships and Collaborations?**
- Can we intensify agricultural production to address future requirements for food, fiber etc, limits will be imposed N/C/H₂O cycles **Partnerships and Collaborations?**

- Developing new germplasm to adapt agriculture –quality of the crops
Partnerships and Collaborations?
- Invasive species (plants, animals, insects, pathogens) understand biology and mechanisms and models (for decision support) to predict which species will become problems in the future **Partnerships and Collaborations?**
- Developing new cultural/tillage practices to improve soil quality and carbon sequestration **Partnerships and Collaborations?**

2a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for immediate/short-term research? Why?

b) What partnerships and collaborations are needed to solve the immediate/short-term problems and deliver solutions to users?

- How are we going to grow crops with less water (reduction of snow pack in Sierra Nevada and Colorado Front Range), [II] **Partnerships and Collaborations?** Short term priority, NRCS, Bureau of Reclamation, Urban areas, lawyers to change historical water rights for more efficient sharing between cities and agriculture, ARS can work on developing more drought resistant crops.
- Modeling carbon/nitrogen/water cycles – basic understanding of processes that can be incorporated into decision support models, incorporate other nutrients too [III] **Partnerships and Collaborations?** Universities/international/DOE/NASA CCE and Applications programs, integrating modeling efforts, data to test models (Gracenet)
- Carbon sequestration – relationship to crop production practices (enhance soil quality and reduce emissions, make farms more sustainable) [III] **Partnerships and Collaborations?** Better ARS/farm collaboration, working relationship with ethanol industry/DOE/EPA/No-till organizations/CCX-aggregators. Continue current investigations, been a major component of global change program
- How to build healthy soils (what is the definition of soil health) - because good soil health reduces pests (green manure and nematodes) **Partnerships and Collaborations?** NRCS soil condition index (SOC, soil erosion) short term continuation of existing research SMAF model (?)
- Crop residue management – conventional tillage/no-till/burning **Partnerships and Collaborations?** Producers, communications, breeders to get root mass below tillage depth, put nutrients deep into soil to encourage deeper roots – fertilizer industry
- Determining effects of land use change and management practices on emissions of GHG at regional scales (bioenergy demands, land for housing, marginal lands into cultivation) **Partnerships and Collaborations?** Federal agencies (air quality NOAA, NASA, DOE field campaigns) short term priority

Group:	Adapting Agriculture to Global Changes C—Grand Ballroom III
Facilitator:	Tim Gish
Recorder:	Bill Bernard, Lew Ziska
Presenter:	Ron Jirava

Topic We Added From Other Break Out Groups:

- 1) Developing soil management strategies to sustain food and fiber with climate change.
- 2) Adaptive management to deal with rapid changes in arctic and alpine ecosystems that impact off for native peoples
- 3) Adapting to changes in fire regions and impact on food and fiber production
- 4) developing new strategies to combat invasive species with greater resistance to herbicides
- 5) manage food and fuel security (only a limited amt of land)
- 6) How do we increase the efficiency of crops i.e. biofuel conversion.
- 7) Communicate science to \$\$\$ donors
- 8) Global vulnerability to food security

- 1) how does cc affect pharmaceutical industry
- 2) developing technologies to increase H2O conservation
- 3) CC impacts on supply and demand for natural resources
- 4) Scaling plots to regional and global
- 5) Communication strategy working with economists to estimate cost of cc impacts

Top 10 Issues for Long term (likely not to be solved in 5 years)

- 1) Future ag water demand for irrigated land in the US (ERS, BOR, EPA, NRCS, CSREES, USGS, NOAA, FS, Irrigation Districts, NASS)
- 2) Data sets for carbon sequestration (cs) that address economic impact for producers (DMI, ERS, NASS, DOE, Production Boards)
- 3) Manage food vs. fuel security (only so much land) (DoD, DOE, DoC, ERS, NGO, DHS)
- 4) Communication strategy working with economists to estimate costs of climate change impact (ERS, NGO, Corporate Boards)
- 5) What are world food supply responses to climate change. (DoD, NGO, UN, FAO, NAFTA, World Bank, IMF,)
- 6) Watershed response scenarios to climate change (supply) (BLM, FS, USGS, NRCS, WaterMgmtDistricts, Tribes, BOR, NOAA)
- 7) Develop large scale methodological systems to study response of ag to climate change (appropriate methods) (NOAA, NASA, Universities,)
- 8) Develop technologies to increase water conservation (NRCS, USGS, FS, WMDs,

9) What will climate change do to traditional cropping systems (NRCS, DOE NASA

10) Climate change impacts on supply and demand for other natural resources BLM, FS,NASA, NOAA, USGS

Short Term (5 years or less)

1) Assimilation of existing data on cc in form understandable to general public (USDA, ARS)

2) Meta analysis of existing data on cc and cs (USDA- ARS)

3) A repository of information that can be accessed by public (USDA- ARS)

4) Interpretative summary on cc and ARS accomplishments that is user friendly (more visual) (USDA- ARS)

5) Assessment of biofuels (which crops are more beneficial) (FS, BLM, USGS, EPA)

6) Impact of climate Change on food and feed quality and quantity (EPA, NIH, USDA, FDA , FAS)

7) Nutrient management to increase carbon sequestration in a changing climate (USDA, ARS, NRCS, University,

8) Are C/N models accurate enough to work under cc scenarios (NRCS, University)

New Names

- Climate Change and Sustainability
- Natural Resources Sustainability & Climate Change
- Global Change and Sustainability

Group:	Adapting Agriculture to Global Changes D—Grand Ballroom IV
Facilitator:	John Schmidt
Recorder:	Dan Blumenthal
Presenter:	Bill Knight

1a) Given the problems identified in the first breakout and general reporting session, what priority should be given to problems identified for long-term research? Why?

QUESTION TO POSE TO THE GROUP. IS ARS PROPERLY STAGED TO MEET THE CHALLENGES OF THE FUTURE. TWO KEY ISSUES

1. STRUCTURE – PROGRAM DIVISION – WE WANT TO HAVE SEPARATE, STAND-ALONG GLOBAL CHANGE NATIONAL PROGRAM TO IDENTIFY ITS PRIORITY, GET FUNDING, AND INCREASE NATIONAL RECOGNITION.
2. RESEARCH NEEDS TO BE CONDUCTED WITHIN THE OVERALL CONTEXT OF GLOBAL CHANGE – NOT PIECEMEAL
3. KEY TO REACH LARGER AUDIENCE – TO GET MORE CLOUT, FUNDING

IMPACT OF CLIMATE CHANGE

- How do you prove you have made a difference in C sequestration? There is no answer- no data. This is needed to help SSI. What kind of plants and land sequester C the best? Trees, estuaries, we don't know. Open space design requires knowledge of what actions, materials, or resources are needed.
 - RESEARCH – HIGH. PARTNERS INCLUDE USFS, EPA, STATE AGENCIES
- Lack of information on role of phenology in controlling response of agricultural species and populations to GCC; includes interactions with other species (invasives, pests, disease, and plant pollinators). IMPACT ON LAND – HIGH
- Impacts of potential climate change on ag and range systems, above and below ground systems. ARS is naturally good at this. Urge ARS to focus on empirical investigations and impacts, and model outcomes of this (atmospheric circulation, phenophase and plant community composition shifts). – IMPACT ON LANDS - RESEARCH – HIGH
- Scaling up issues: predicting larger scales and extrapolation. IMPACT ON LANDS - RESEARCH - HIGH
- What's the impact on soil quality attributes and agriculture of climate change from external effects of society at large? IMPACT ON LANDS - RESEARCH – HIGH
- How has GCC affect interaction between crops, native ecosystems and invasive species (i.e. aspects species biology, spread, ag

systems, management). – IMPACT ON LANDS – RESEARCH - HIGH

- How will GCC affect the management of natural ecosystems? An example of this is global human relocation. What is the impact of interaction between crops and invasive species? IMPACT ON LANDS - HIGH
- Loss of biodiversity important to natural systems and future ag systems (Focus on keystone species, also medicinal plants). Research is needed to identify how a rise in atmospheric C will alter natural ecosystems. What do we need to do to maintain biodiversity? This is important for maintaining critical taxa for having future needed germ-plasm. IMPACT ON LANDS – HIGH
- Lack of understanding of multiple stressors. IMPACTS ON LANDS - HIGH
- How do we store more scarce water and use it more efficiently? RESEARCH – HIGH.

COMMUNICATION

- Relationship of agriculture to city dwellers; ARS research needs to relate to cities; land is the issue and how it is treated; green buildings program developed last 6-mo- farms must be a part of “Sustainable Sites Initiative”.
 - COMMUNICATION PRIORITY - HIGH – MANY URBAN PARTNERS. MORE OF A COMMUNICATIONS ISSUE THAN A RESEARCH QUESTION
- Special interest groups do not know about ARS research. Framework used to establish climate change initiatives is done by special interests groups and have no idea of ARS framework of research. Huge disconnect between urban oriented special interest groups and agencies like ARS who have been researching global climate change and know how. Getting these two groups together is a big deal. States, local municipalities, and special interest groups don't know of ARS research capabilities that are uniquely qualified to answer GCC questions.
 - Seek good definition of multiple objectives. What is the best land and use: perennial grass a best solution. What are the community objectives for land use?
 - No one knows how to accurately measure fate of C in plant production systems.
 - Urban/rural link. Special interest groups do not know about what ARS is doing.
 - We don't know the appropriate land uses for C sequestration.
 - COMMUNICATION – COMBINE WITH FIRST BULLET
- Information dissemination through climate change extension programs-would be good if they had connections with ARS. - COMMUNICATION
- COMMUNICATION - Integrated management data systems for ARS information easily available to public.

- COMMUNICATION - Warehousing and disseminating info to a broader audience, including other govt agencies. Current website ineffective.

FOOD SECURITY

- WEATHER THRESHOLDS
 - What are the critical weather thresholds on agricultural systems? Consider other things besides weather variability. Extract from ARS what are the critical weather thresholds now that would negatively effect production systems. Where can we grow particular crops? How will natural ecosystems respond. Climate sensitivities. Constantly re-adjust boundaries to climatic changes. Transitional periods are now occurring. RESEARCH (FOOD SECURITY) – HIGH
- OTHER THRESHOLDS
 - Identify what we don't know what we need to know to make appropriate land use decisions. Under what conditions will SOM build up or decline, microbial populations change, influence C dynamics, or cause soil borne diseases with respect to elevated atmospheric C? What changes might occur to know how to protect soils? Lack of data to verify GCC model predictions (soil quality, soil nutrient cycling, etc.) and produce cost-effective models. FOOD SECURITY – RESEARCH - HIGH
- CULTIVARS
 - How do we id strategies to adapt to GCC? I.e. non-invasive cultivars of food plants that will thrive (i.e. wild germplasm) in new conditions and deal with drought, etc. FOOD SECURITY – HIGH

INHERENT TO ALL RESEARCH

- What is the baseline from which we gauge change? What is the natural range of spatio-temporal variability? How far have we departed? - HIGH

FUNDING

- Lack of serious funds for ARS. – FUNDING - HIGH

ORGANIZATION - NEEDED PROGRAMS

- GLOBAL CHANGE AS A SEPARATE NATIONAL PROGRAM
 - NAMES
 - PREFERRED – “GLOBAL CHANGE” AS ONE PROGRAM, “SOILS AND AIR QUALITY” AS ANOTHER
 - NON-PREFERRED – “GLOBAL CHANGE AND AGRICUTLURAL RESOURCE MANAGEMENT”
- URBAN SPRAWL – CREATE PROGRAM
- Biosystematics crisis. Lack trained scientists, lack of intellectual exchange. Assure work on systematics of the species affected by climate change. Create ARS systematics unit – CREATE PROGRAMS – RESEARCH

2a) For this component discussion, what are **short-term**/immediate problems that ARS needs to address with its research?

- IMPACT
 - Take first step of long-term. Certain components of the long-term problems have short-term aspects that need to be addressed first.
 - Cost effective means of quantifying C sequestration and know with certainty that there is an improvement. Establishing baselines of the natural range of variability. – IMPACT – HIGH
- COMMUNICATION
 - Help nurseries and urban people understand that they can help with solutions to climate change. – COMMUNICATIONS
 - Synthesis of existing experimental data. - HIGH
 - Letting certain ag industries (i.e. sod) get away with negatively impacting the environment. – COMMUNICATION
 - Use by housing developers of ag lands that are contaminated with old pesticides (including those no longer used). Regulation needed of research required of developers prior to approval (including, for example, detailed soils work). – NEEDS TO BE COMMUNICATED TO EPA AND APHIS.
- FUNDING
 - Lack of serious funding for ARS to conduct GCC research. FUNDING - HIGH