Breakout Session Two: Strategic Research Needs
General comments and research needs (not necessarily in ranked order) within each of the five topic areas.

Symposium attendees self-selected the topic area of greatest interest to them.

Facilitators and Recorders for the 5 sessions were:
- Fungicide Trials-North: Facilitator-James Kurle, University of Minnesota; Recorder-Loren Giesler, University of Nebraska
- Fungicide Trials-South: Facilitator-Jim Marois, University of Florida; Recorder-Don Hershman, University of Kentucky
- Application Technology: Facilitator-Monte Miles, USDA-ARS, University of Illinois; Recorder-Marty Draper, South Dakota State University
- Germplasm Enhancement: Facilitator-Erik Stromberg, Virginia Polytechnic Institute and State University; Recorder-Craig Grau, University of Wisconsin
- Pathogen Biology: Facilitator-Reid Fredrick, USDA-ARS, Ft. Detrick; Recorder-James English, University of Missouri

Fungicide Trials: Northern and Southern Production Regions
General Comments
- For the South, the second, late planted test worked really well and this may be a good tactic to use for fungicide testing.
- For the North, there seems to be a highly variable response to fungicide application. Many times this does not pay.
- NCDC-202 (formerly NC504) Regional committee on soybean rust is summarizing results of trials from the northern production zones in 2005.
- Evaluate how the trials are conducted to detect the differences in yield. Small plot trials vs. strip trials.

Needs for the Future
- Uniform fungicide trial testing was suggested for both southern and northern production regions.
    - EMBRAPA has uniform fungicide tests in Brazil
    - Growth stage should be used for application timing standard testing.
    - Environmental monitoring at trial locations was suggested to identify relationships.
    - Comparisons of indeterminate vs. determinate soybeans.
    - First priority is to identify product efficacy.
    - Evaluate application technology interactions with product efficacy.
    - Application timing studies.
    - Optimization of product performance.
    - If standard protocol is used – then can break data into geographic areas for reports and some changes in protocol may change.
    - Examples of current uniform fungicide trials include cotton defoliation trials and head scab trials –standard protocols are used and these are headed up by university and extension educators.
    - Suggested to have common region as first split in standard protocol.

Application Technology

General comments, questions, and perceived issues:

- Where is the target on the soybean plant?
- How much spray coverage is enough?
- Interaction of coverage and efficacy?
- Surfactants and deposition aids effect on droplet size?
- Coverage in row spacing and cropping systems?
- What is the proper boom height for each nozzle?
- Nozzle orifice, GPA, ground speed, and pressure?
- Ground vs. air?
- Reduced, low and ULV application (air and ground)?
- What is the effect of nozzle type and orientation?
- What is the interaction of canopy density and droplet size?
- Environmental conditions at application?
- Tank mixes with other products/compatibility?
- Sprayer type (electrostatic, hydraulic, air assist)? Apathy
- Producer/applicator education?
- Logistics of coverage over large acreages
- Enough sprayers
- Tendering
- Hitting proper crop stage
- Off target movement?
- Certification reciprocity for certified applicators
- Nozzle spacing
- Product specific application/Correlating plot spray data to farm scale equipment

Germplasm Enhancement

General Discussion

- How can industry develop soybean varieties with effective resistance to soybean rust?
- One potentially successful field trial is in Georgia to evaluate soybean germ plasm for rust resistance (USDA-ARS, Hartman).
- Transfer host resistance and nonhost resistance genes from other legume species into soybean.
- 800 lines ranging from MG 0 to MG 10 are currently being evaluated.
- New rust resistant lines from southern China (Fujian Province) where natural epidemics occur each year. In the Jiangsu Province, plants are inoculated. Lines ranging from MG 0 to MG II are being tested in China.
- USDA germplasm is also being evaluated in Viet Nam. Soybean lines with partial resistance were identified. Local soybean lines are being used as checks in trials. Area under disease progress curve data is collected and being used as an evaluation of resistance levels.
- Faster release of data on reaction of soybean germ plasm to rust.
- Questions on which sources of resistance should be used. Sole use of *Rpp* 4 is questioned as a wise strategy.

- Greenhouse methods are needed to identify partial and complete resistance. Identification of QTL dependent on methods to characterize phenotypes.
- Public breeders should evaluate all lines in rust environments. Must not assume all US germplasm is susceptible. This mindset has been perpetuated but most likely is false.
- Tolerance was suggested as a trait to pursue, but how identify. Yield in presence of severe rust on large scale, but response to fungicides for smaller trials.

2006 Activities

- Identify what is the baseline for resistance in US commercial germplasm.
- Determine list of elite varieties/ lines
- Determine methods to evaluate northern germplasm in the southern states. Exploring planting date for example, as a variable to manipulate for fall nurseries. Possibly use of portable lights. Must be careful not to disrupt over crops such as snap beans.

Pathogen Biology

The following general gaps in knowledge were identified, but they were not prioritized for the coming years.

- Isolate (population) variability
- Pathogen marker selection and stability
  - For utility in assessing population attributes
  - For utility in assessing epidemiological questions –e.g. contribution of kudzu-derived inoculum on soy rust epidemics
  - For utility in assessing pathogen clonality and sexual reproduction
- Spore survival
- Life cycle details
  - Survival
  - Sexual reproduction, etc.
- Alternate hosts
- Yield loss information
- Inoculum efficiency
- Soybean growth stage vs. susceptibility and assessment of disease response
- Kudzu biology vs. susceptibility and role in epidemic development
- Development of differential sets of soybean genotypes
- Kudzu biocontrol