Big Data
Applications for research and production agriculture

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“Big data is an accumulation of data too large and complex for processing by traditional data base management tools.” (It was first defined in 1980.)

Meriam Webster
USERS – i.e. EVERYONE

- Research
- Agriculture
- Business
- Military
- Medicine
- Engineering
- Education
- Government
Users are (have) accumulated 100’s of terabytes of data
Requires new storage capacity
Requires new processing systems
Must be merged
Must be managed
ATTRIBUTES

- Volume
- Velocity
- Variety
- Variability
- Veracity
- Complexity
BIG DATA MANAGEMENT OPPORTUNITIES

- Improves accuracy of performance characterization
- Increases precision of targeting specific regions of interest
- Enables more relevant power for decision making – smart systems and dashboards
- Provides intelligence for future actions/projects
- Captures potential IP
BIG DATA MANAGEMENT ISSUES

- Data consistency and validation
- Release of confidential information
- Protection of generated IP
- Valuation of and compensation for IP
- Security of data acquisition and management systems
- Liability for inadvertent release
- Users don’t want to be IT managers
AGRILIFE’S INTEREST

- **Research** (Corporate and Govt. requirement for data man.)
  - Genomics
  - Phenomics
  - Agronomics
  - Precision/prescription ag

- **Extension** (Producer interest in applications and privacy)
  - Precision ag
  - Prescription ag
Salmon Restoration and PIT Tags: Big Data from a Small Device

One of the biggest tools in salmon restoration is about the size of a grain of rice.

Salmon runs are threatened or endangered throughout much of the Pacific Northwest, and scientists have been working for decades to bring them back from the brink. That can involve removing dams or adding fish passages to them, rehabilitating streams, and reducing sedimentation. Whatever strategy they use, scientists need to keep track of salmon—where and when they’re migrating, and how many survive each stage of their lifecycle. That’s the only way to measure how well restoration strategies are working.

Scientists have several tools to choose from for keeping track of fish, but one of the simplest and most effective is a tiny device called a Passive Integrated Transponder, or PIT tag.

NOAA biologist Earl Prentice first heard about this technology in the early 1980s, when a story came on the radio about a Colorado rancher with a startup business selling PIT tags for livestock. Instead of
Adapting to climate change through increased use of prescribed fire and community-based partnerships

Long-term climate variability, land-use history and altered fire regimes have impacted vegetation and biochemical cycles of grasslands in the southwestern United States. Recent research suggests that the incorporation of prescribed burning and the restoration of a higher proportion of grasses and shrubs can help mitigate climate change impacts, improve soil carbon storage, reduce wildfire risk, and improve ecosystem function. This presentation will discuss the benefits of prescribed burning, its potential to mitigate climate change, and the role of community-based partnerships in implementing prescribed burning programs. The presentation will also introduce the Texas A&M AgriLife Research Extension - TRIMS project, which aims to support land conservation and habitat restoration decisions in the Trinity River Basin. TRIMS was prepared in cooperation with the Texas Commission on Environmental Quality and Trinity River Authority of Texas. The preparation of this website was supported by funding from the Texas A&M AgriLife Research Extension - TRIMS project.
Mine the DATA

An Iowa cooperative offers its members the opportunity to analyze aggregate crop-production information to help them make management decisions.

By Des Keller

When Mike Anderson reviews precision-farming data this winter, he won't just be reviewing what happened on the operation he runs with his father-in-law, Andy Russell. He'll be able by individual producers, consulting groups, cooperatives and

Mike Anderson says group data he's had the chance to analyze has helped him increase yields on his northwest Iowa farm by 15 to 20% in the past four years. PHOTO: DES KELLER
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February 2015 Progressive Farmer
GROWER INFORMATION SERVICES COOPERATIVE (GISC)

Goals
- Store
- Safeguard
- Disseminate

farm-generated data on behalf of its members

- Over several 1000s farmer members
- In 24 states

- The Exchange – a platform to be launched summer 2015 by which members can access data or allow other vendors to access data.
**Education:** Grower education is valuable to ensure clarity between all parties and stakeholders. Grower organizations and industry should work to develop programs, which help to create educated customers who understand their rights and responsibilities. ATPs should strive to draft contracts using simple, easy to understand language.

**Ownership:** We believe farmers own information generated on their farming operations. However, it is the responsibility of the farmer to agree upon data use and sharing with the other stakeholders with an economic interest, such as the tenant, landowner, cooperative, owner of the precision agriculture system hardware, and/or ATP etc. The farmer contracting with the ATP is responsible for ensuring that only the data they own or have permission to use is included in the account with the ATP.
Collection, Access and Control: An ATP’s collection, access and use of farm data should be granted only with the affirmative and explicit consent of the farmer. This will be by contract agreements, whether signed or digital. Notice: Farmers must be notified that their data is being collected and about how the farm data will be disclosed and used. This notice must be provided in an easily located and readily accessible format.

Transparency and Consistency: ATPs shall notify farmers about the purposes for which they collect and use farm data. They should provide information about how farmers can contact the ATP with any inquiries or complaints, the types of third parties to which they disclose the data and the choices the ATP offers for limiting its use and disclosure. An ATP’s principles, policies and practices should be transparent and fully consistent with the terms and conditions in their legal contracts. An ATP will not change the customer’s contract without his or her agreement.
**Choice:** ATPs should explain the effects and abilities of a farmer’s decision to opt in, opt out or disable the availability of services and features offered by the ATP. If multiple options are offered, farmers should be able to choose some, all, or none of the options offered. ATPs should provide farmers with a clear understanding of what services and features may or may not be enabled when they make certain choices.

**Portability:** Within the context of the agreement and retention policy, farmers should be able to retrieve their data for storage or use in other systems, with the exception of the data that has been made anonymous or aggregated and is no longer specifically identifiable. Non-anonymized or non-aggregated data should be easy for farmers to receive their data back at their discretion.
Terms and Definitions: Farmers should know with whom they are contracting if the ATP contract involves sharing with third parties, partners, business partners, ATP partners, or affiliates. ATPs should clearly explain the following definitions in a consistent manner in all of their respective agreements: (1) farm data; (2) third party; (3) partner; (4) business partner; (5) ATP partners; (6) affiliate; (7) data account holder; (8) original customer data. If these definitions are not used, ATPs should define each alternative term in the contract and privacy policy. ATPs should strive to use clear language for their terms, conditions and agreements.
Disclosure, Use and Sale Limitation:
An ATP will not sell and/or disclose non-aggregated farm data to a third party without first securing a legally binding commitment to be bound by the same terms and conditions as the ATP has with the farmer. Farmers must be notified if such a sale is going to take place and have the option to opt out or have their data removed prior to that sale. An ATP will not share or disclose original farm data with a third party in any manner that is inconsistent with the contract with the farmer. If the agreement with the third party is not the same as the agreement with the ATP, farmers must be presented with the third party’s terms for agreement or rejection.

Data Retention and Availability: Each ATP should provide for the removal, secure destruction and return of original farm data from the farmer’s account upon the request of the farmer or after a pre-agreed period of time. The ATP should include a requirement that farmers have access to the data that an ATP holds during that data retention period. ATPs should document personally identifiable data retention and availability policies and disposal procedures, and specify requirements of data under policies and procedures.
**Contract Termination:** Farmers should be allowed to discontinue a service or halt the collection of data at any time subject to appropriate ongoing obligations. Procedures for termination of services should be clearly defined in the contract.

**Unlawful or Anti-Competitive Activities:** ATPs should not use the data for unlawful or anticompetitive activities, such as a prohibition on the use of farm data by the ATP to speculate in commodity markets.

**Liability & Security Safeguards:** The ATP should clearly define terms of liability. Farm data should be protected with reasonable security safeguards against risks such as loss or unauthorized access, destruction, use, modification or disclosure. Policies for notification and response in the event of a breach should be established.
ATP Signatories
American Farm Bureau Federation ® [www.fb.org]
American Soybean Association
Beck’s Hybrids
Dow AgroSciences LLC
DuPont Pioneer
John Deere
National Association of Wheat Growers
National Corn Growers Association
National Farmers Union
Raven Industries
The Climate Corporation – a division of Monsanto
USA Rice Federation