DRAFT – Precision Agriculture Recommendations

Recommendation 1: The federal government should consider subsidizing the use of IoT in farms.

Description:

The federal government should consider programs to help growers and producers adopt IoT technologies. This should include subsidies around connectivity, sensors, and digital applications. The programs could be similar to other subsidies that the USDA has for farmers around agricultural inputs or climate smart agriculture. The use of IoT in agriculture will benefit all stakeholders, including the farmer, the policy makers, the agricultural companies, and the consumer.

Justification:

- The upfront cost of IoT typically limits the adoption of data-driven agriculture
- Subsidies can help scale the technology, which will drive down costs.

Implementation Considerations:

- Public/private/academia partnership
- This should leverage Ag Extension Centers as well
- Marginalized farmers and smallholder farmers might need more help to leverage this technology
- Should we make it specific to applications of IoT in Ag, e.g. for Water, Climate, Carbon

Potential implementation barriers:

- Limited expertise in the market and industry; resources and expertise may be difficult to secure

Possible participating agencies:

As agriculture impacts sustainability and water, and biofuels, it cuts across the scope of multiple federal agencies, there should be participation, support and coordination from multiple agencies, including:

- Department of Energy (biofuels, carbon emissions, etc.)
- Department of Commerce/NIST (standards, cybersecurity, GCTC, regulatory, etc.)
- USDA, FSA (NIFA grants, extensions, etc.)
- NRCS (Natural Resource Conservation Services)

Federal considerations:

- Role of states should be defined. In particular, some BIL and IRA funding may be given to states to manage and allocate.
- This could make a good addition to the Farm Bill of 2023

Recommendation 2: The federal government should consider fully funding the deployment of a "farm of the future" setup in every land grant university nationwide. This nationwide test-farm IoT network should span different forms of agriculture, including, but not limited to broadacre, horticulture, livestock, and aquaculture.

Description:

The proposed initiative advocates for the federal government to allocate sufficient funding to implement a "farm of the future" setup in all land grant universities across the United States. This would involve creating a comprehensive IoT network that spans various forms of agriculture, such as broadacre, horticulture, livestock, and aquaculture. By establishing a nationwide test-farm IoT network, the government can significantly enhance agricultural productivity, while also promoting sustainable

agricultural practices. The implementation of this initiative will require substantial financial investments from the federal government. However, the benefits of having a comprehensive agricultural data network in place will likely lead to better decision-making, increased efficiency, and improved sustainability across the agricultural sector.

Justification:

The implementation of a nationwide "farm of the future" IoT network in land grant universities would be tremendously useful in several ways.

- First, it would become a showcase for farmers in the region on how to collect and analyze data from their farms. This will enable farmers to collect and analyze vast amount of real-time data about crops, livestock, and farm operations. This would allow them to monitor the health and growth of their plants and animals more closely, identify issues early on, and make informed decisions about how to optimize their yield and reduce waste.
- Second, the data collected by the IoT network could be used to develop and refine machine learning algorithms, which could help farmers predict future crop yields and identify potential issues before they occur. This would enable farmers to be more proactive in their approach to crop management, leading to more efficient use of resources, reduced costs, and improved sustainability.
- Third, the nationwide "farm of the future" IoT network would enable universities to share data and insights with each other more easily, fostering a collaborative approach to agriculture. This could lead to the development of new best practices, improved knowledge sharing, and a more cohesive and sustainable agricultural industry overall.
- Finally, the implementation of a nationwide IoT network in land grant universities could help to advance research and development in agriculture, leading to the creation of new technologies and practices that could benefit farmers and consumers alike. This could include everything from new crop varieties that are more resilient to climate change, to new precision farming tools that enable farmers to more accurately target their use of resources.

Implementation considerations:

- While it is easy to say “you shall incorporate IoT technologies”, it is more difficult to specify what IoT technologies should be acceptable to be used. Some concrete and specific IoT applications should be defined for inclusion in the project and funding requirements, based on project types. This may require coordination with other federal agencies in alignment with their objectives.
- Different land grant universities might pose different challenges with respect to implementation, including connectivity, tech readiness, etc.
- It is important to include every university, including the HBCUs.

Potential implementation barriers:

- Project owners may have limited IoT awareness of knowledge
- Limited expertise and resources in marketplace to support IoT in the projects
- How much will it cost? [connected combine + aquaculture] e.g. 100 land grant universities

Possible participating agencies

- All federal agencies that provide grants and funding for projects where IoT may be incorporated, including the USDA, DOE (for biofuels)

Federal considerations:

- IoT may introduce cybersecurity vulnerabilities into the project or system, so some minimal requirements for cybersecurity should be defined and specified for the IoT and smart technologies to be incorporated.

Recommendation 3: The federal government should consider funding models for sustaining and support beyond the initial acquisition and building of new projects.

Recommendation 4: The federal government should consider increasing funding and accelerating implementation of broadband deployment across rural America.

Description:

The federal government currently offers limited funding and grants (ex. Department of Agriculture – Community Connect Grant Program) to help fund broadband deployment in rural communities, however, these opportunities have not advanced quickly enough to provide broadband coverage for certain areas of rural America. Increasing the broadband infrastructure across the U.S. will be a critical component for IoT connectivity in agriculture.

Justification:

- A recent USDA report reported that 60% of US farmland doesn't have good Internet connectivity
- Point to point solutions, or satellite-based connectivity, quickly become expensive, and do not get connectivity to the middle of the farm

Implementation Considerations:

- Mandate broadband infrastructure deployment across rural areas until U.S. coverage is complete.
- Current federal funding operates across several programs making it difficult to identify and find the opportunities available to specific areas. Although there are initiatives to increase awareness of the funding, the processes need to be simplified to accelerate implementation.
- Funding may include options for supplying energy sources such as solar power, wind power, or micro-hydro power where access to reliable electricity is limited.
- Taking advantage of modern communications tech, such as 5G MBB, fixed wireless, LEO satellites to the farm
- Agricultural specific needs, e.g. more uplink than downlink

Potential implementation barriers:

- May be limited to eligible service providers in certain areas

Possible participating agencies:

- All federal agencies that provide grants and funding for projects where IoT may be incorporated, including the USDA, DOE (for biofuels)

Federal considerations:

- How to improve the already available broadband funding in order for connectivity across rural America to keep up with technology advancement for IoT.
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Other:

- **Labor shortage**
- **automation**