

Optimizing Human Health and Nutrition: From Soil to Society

Ripple Effects Mapping Report February 2025

Background

In 2021, the United States Department of Agriculture National Institute of Food and Agriculture (USDA-NIFA) provided funding for Washington State University (WSU) and its partners for an Agriculture and Food Research Initiative (AFRI) Sustainable Agricultural Systems (SAS) project, *Optimizing Human Health and Nutrition: From Soil to Society* (herein referred to as the AFRI SAS Soil to Society [S2S] project). According to the project's proposal, the long-term goals are to create more nutritious, affordable, and accessible whole grain-based foods through: (1) investigation of the contribution of novel, biofortified crop varieties and food products to human health through clinical and epidemiological evaluations; and (2) development and deployment of nutritious food products made from improved crop varieties grown within sustainable cropping systems.

This multi-institutional and transdisciplinary project employs a Soil to Society pipeline strategy that addresses gaps in current knowledge and traces the flow of nutrients from agricultural systems and food production to human consumption. The strategy will culminate in the synthesis of more sustainable agricultural management strategies and healthy, affordable food products to meet the needs of diverse individuals and communities.

To address short-, medium-, and long-term goals, the project's key objectives are to:

1. Understand and apply the roles of environment, soil, and cropping system management on soil health, farm economics, and the nutritional content of grain for each target crop (Soil Management and Cropping Systems).
2. Develop new varieties of barley, wheat, peas, lentils, quinoa, and buckwheat with enhanced health and nutritive value (Plant Breeding and Genetics).
3. Confirm the impact of nutritionally enhanced varieties on key indicators of human health and assess acceptance using consumer panels (Human Health and Nutrition).
4. Develop a diverse and innovative suite of flavorful, affordable, and nutritious food products that will be accessible to consumers from all income levels (Food Science and Product Development).
5. Conduct population studies to explore impacts on dietary quality by increasing target crop consumption in US diets and assess consumer acceptance and valuation of whole grain- and legume-based foods (Community-based Health and Nutrition).
6. Focus educational capacity on secondary student instruction, teacher professional development, and farmer training (Education).
7. Disseminate knowledge gained and products developed to stakeholders across agriculture; food and health sciences; and communities, schools, and underserved populations through a wide-reaching extension effort (Extension).

Purpose

As part of the project evaluation, the AFRI SAS S2S project leadership contracted with the Office of Educational Innovation and Evaluation (OEIE) to conduct evaluation activities that assess the progress, implementation, and impacts of the project. OEIE conducted a ripple effects mapping (REM) exercise to gain team member input and perspectives related to the direct, indirect, expected, and emergent impacts of the S2S project.

Methods

On October 17th, 2024, OEIE conducted a REM activity on the first day of the S2S annual meeting with an estimated 38 team members present. The activity was conducted in person, so those team members who participated in the meeting virtually were unable to participate in the REM activity. OEIE staff completed a brief presentation on REM and provided attendees with written instructions (Appendix A). Attendees had 30 minutes to write comments, either directly on the map or using Post-it notes provided for the purpose. Attendees were also provided with stickers that could be used to agree with a statement already written on the map. Attendees were also encouraged to draw lines and arrows between content that had been posted or written on the map to indicate perceived relationships between items. The REM activity was conducted on a single large sheet of paper, with a central node of “Soil to Society \$\$\$\$” to represent the grant funding, which was hung on the meeting room wall. The map was left on the wall for the remainder of the annual meeting, giving attendees the opportunity to review and add to the map as desired. Ripple effects mapping guidance can be found in Appendix A.

Analysis

OEIE analyzed the REM data by reviewing comments and using grounded theory to identify key concepts or themes that emerged from those responses. The original REM map created by the project team can be found on page 3 (Figure 1) and a digitized version (via translating responses into a digital version on Canva) on page 4 (Figure 2). The group conversation produced 41 unique comments (does not include starred/repeated comments) that were coded into 11 themes and linked to 16 logic model categories (e.g., inputs, activities, outcomes). Responses were coded to multiple themes as appropriate (see page 5, Figure 3). The numerical value for each theme in Figure 3 corresponds to the number of comments that are contained within it. On page 7, Figure 4 highlights the ripple effect comments that received the most agreement from other team members (≥ 3 indicators of agreement), demonstrating higher levels of consensus on those items. An impact map that links project activities, outputs, and outcomes to the project’s theory of change can be found on page 8 (Figure 5). See Appendix B for a complete list of comments, number of times a comment received an indication of agreement (e.g., star, sticker), themes and logic model categories (i.e., activity, output, outcome).

REM Theme Details

The 41 unique statements generated during the REM activity were coded into 11 theme groups, which are detailed in this section. Team members had the opportunity to indicate agreement with ripple effects already documented on the map. Ripple effects that received the most agreement from teammates (three or more indicators of agreement) can be found in Figure 3, while all comments, organized by theme, can be found in Figure 4. In Figure 5, the themes have been placed in a network to demonstrate the relationships between the themes found. Comments have been lightly edited to enhance readability.

Figure 1. Original REM map created during the Year 4 (2024) S2S Annual Meeting

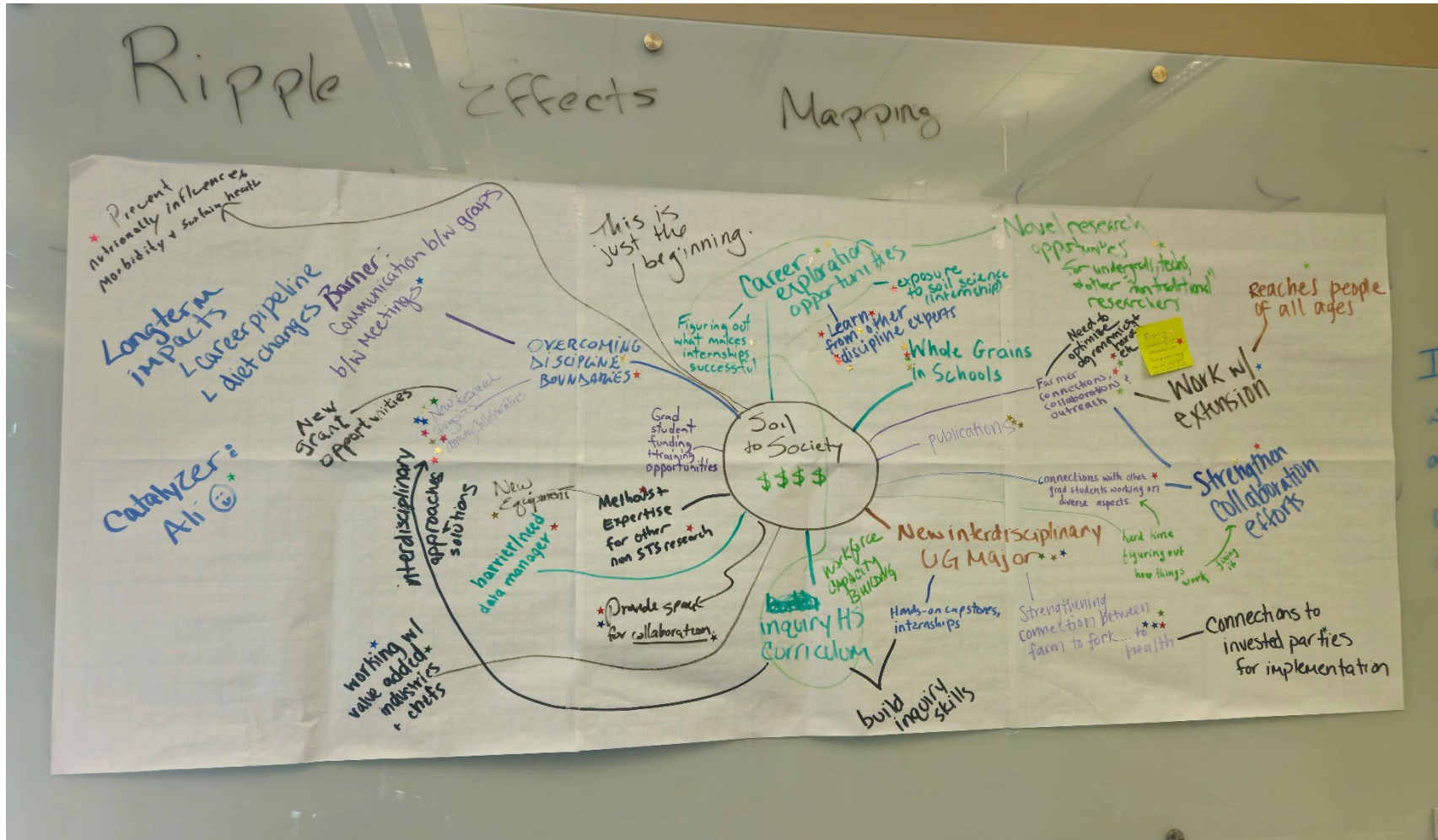
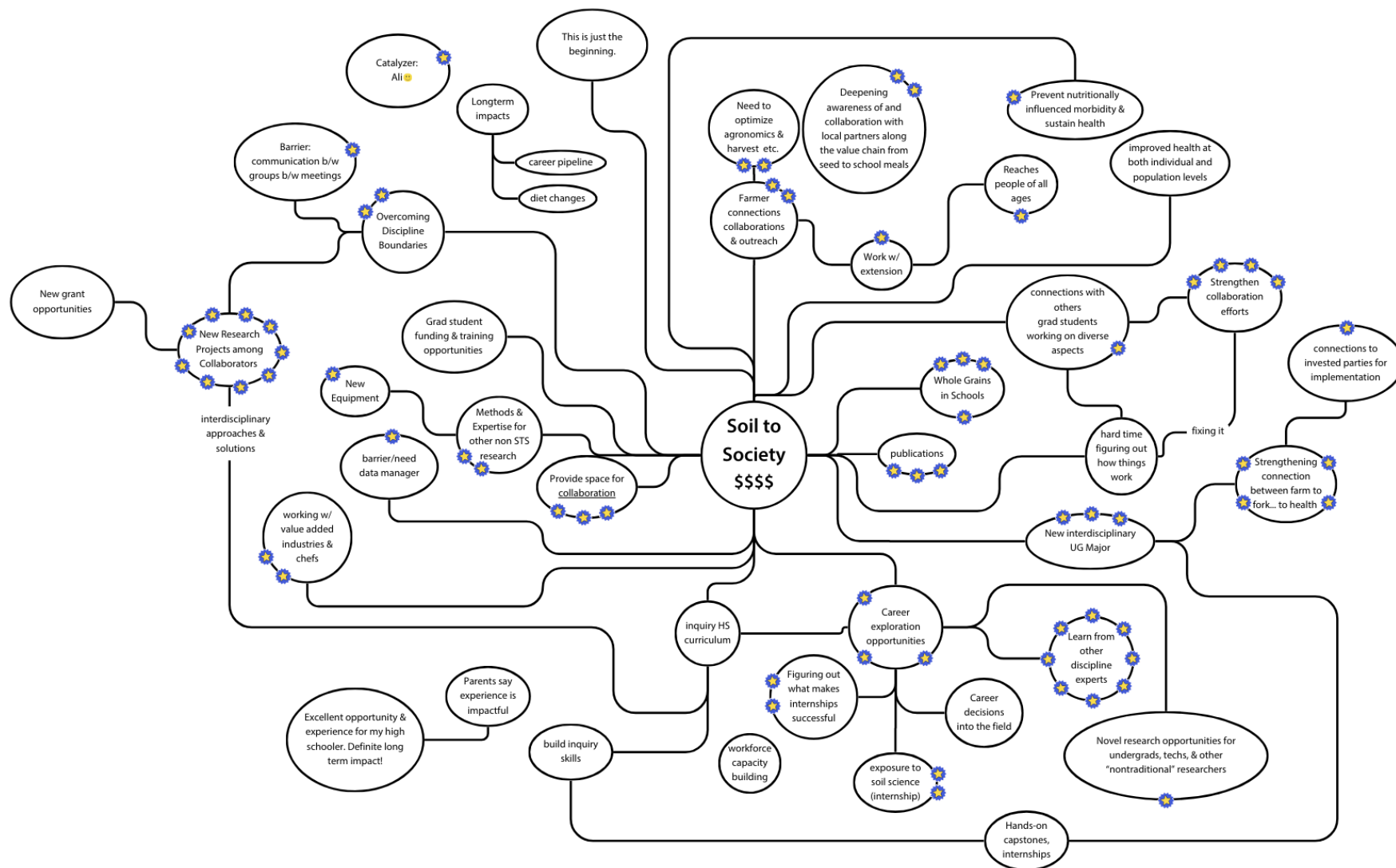


Figure 2. Digitized version of S2S REM map



Note. Blue and gold stars indicate that another project member has emphasized/agreed with the item.

Figure 3. Hierarchy treemap chart of REM themes with relevant comments

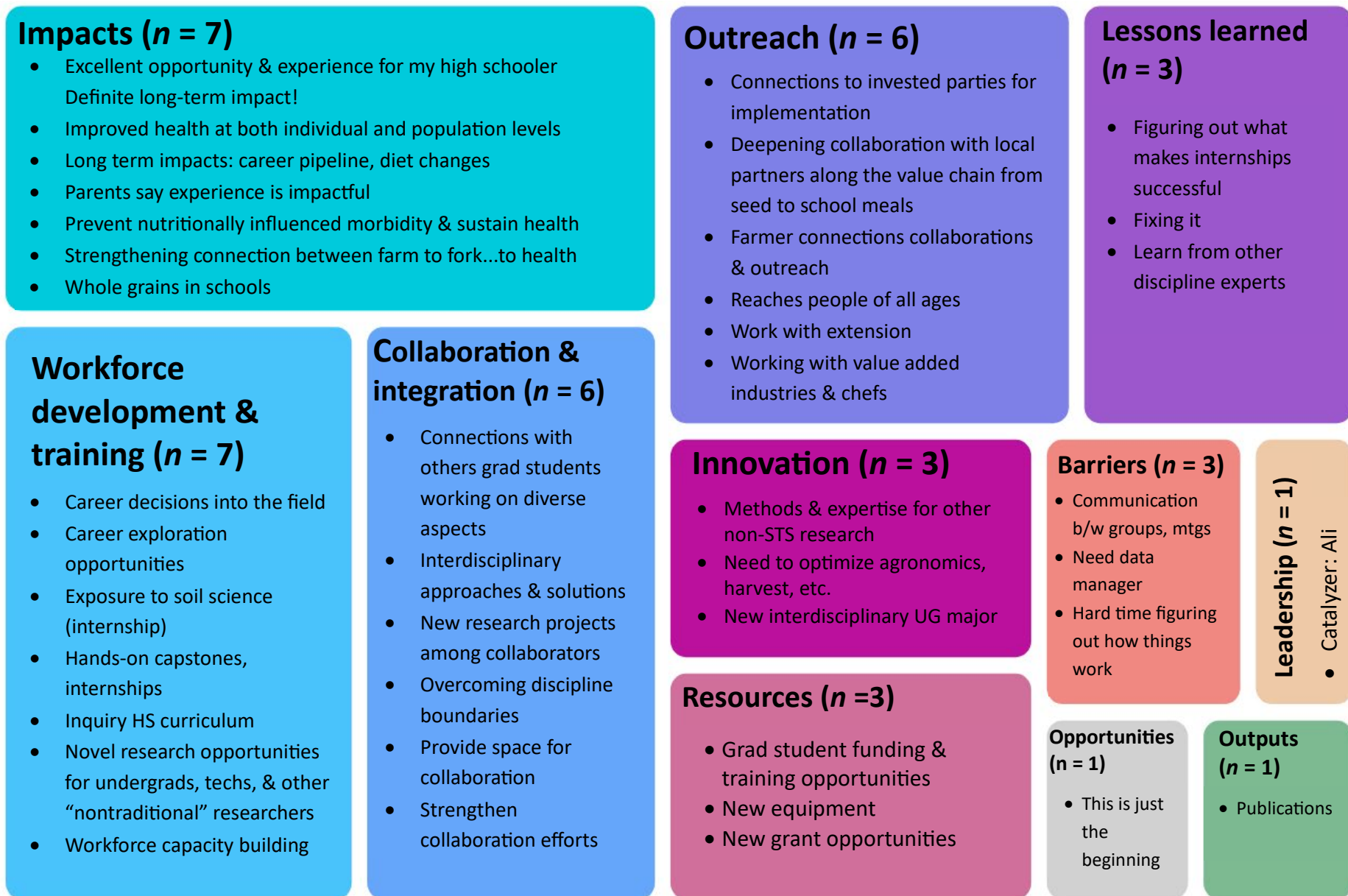
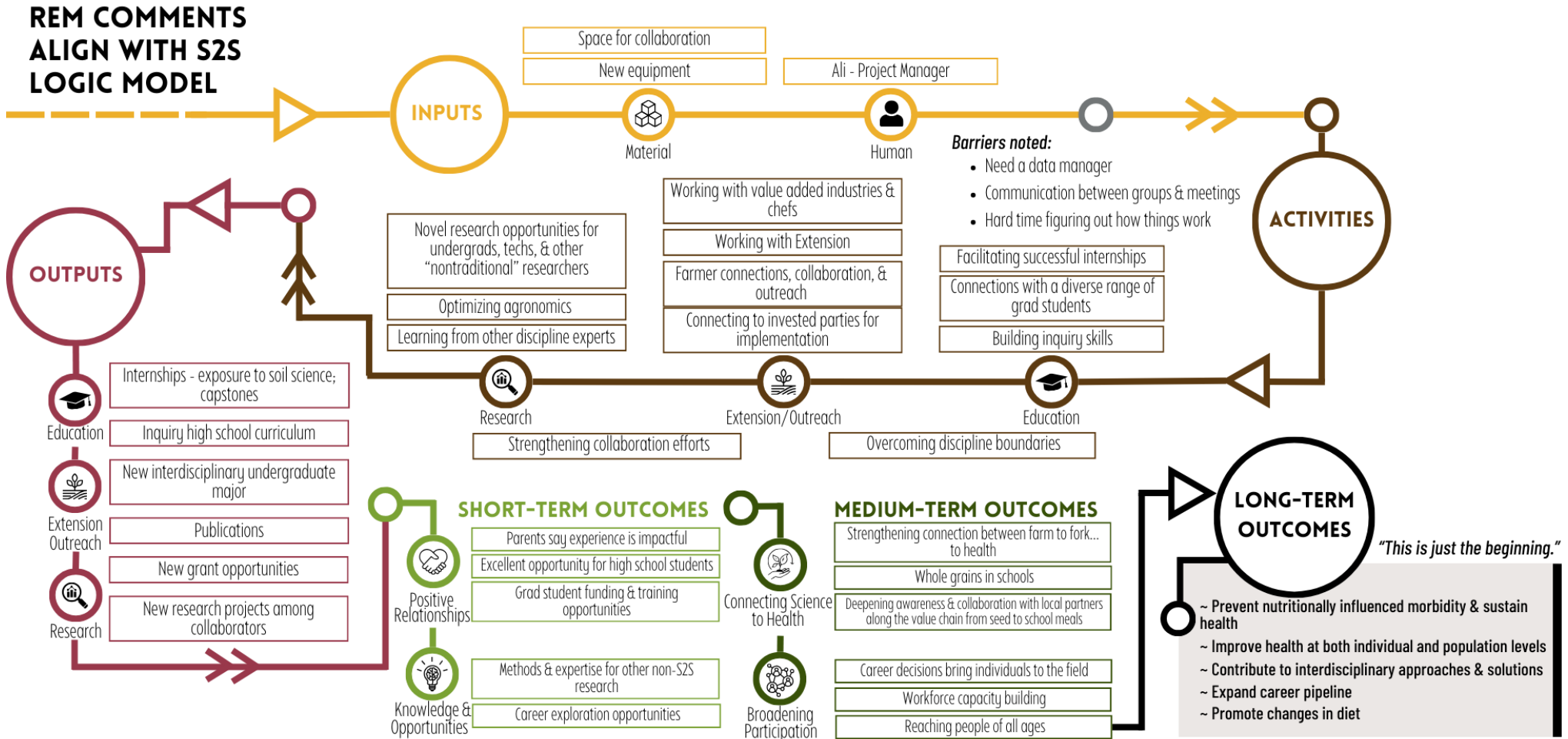


Figure 4. Hierarchy chart of REM themes and their most agreed upon statements



Note: The number under each statement reflects the number of times another team member indicated agreement with that statement. Size roughly correlates to the density of agreements.

Figure 5. REM Impact Map



Observations & Recommendations

The evidence collected during the REM activity at the project's third annual meeting demonstrates that the project is making progress toward expected short-, medium- and long-term objectives laid out in the project proposal. S2S has also impacted the broader community by affecting families of high school student interns (knowledge transfer and exposure to STEM), reaching people of all ages, and working with extension to develop outreach to farmers, schools, chefs/culinary professionals, and other community groups.

Team members most frequently referenced impacts, workforce development and training, collaboration and integration, and outreach efforts when mapping ripple effects. The statements that received the most agreement from participating team members follow the same pattern, as they relate to new research projects developing from project-related collaborations and the opportunity to learn from interdisciplinary experts.

These findings reflect the S2S team's commitment to engaging in interdisciplinary collaboration to address complex problems along the soil to society pipeline. Knowledge and resources are shared among team members and objectives, such as new equipment and new grant opportunities. Through these efforts, team members have gained skills and knowledge beyond project-specific research, such as learning to navigate interdisciplinary team research and determining what makes undergraduate internships successful. **This work has led to innovations, including the development of methods and expertise that will be useful beyond the scope of the S2S project, research into optimizing agronomics, and a new interdisciplinary undergraduate major.** Project work has included outreach efforts to share project findings beyond the academic circle by developing connections with farmers, people in the food industry, and other partners along the seed to school pipeline. Team member comments on ripple effects demonstrate that these efforts are having immediate impacts on undergraduate and graduate students by providing experience and opportunities, are introducing whole grains into schools through outreach work, and are progressing longer term goals related to improved health at individual and population levels.

Team member perceptions of project efforts align with the project's stated goals, objectives, and intended broader impacts. Comments left by team members indicate that project leadership is facilitating the team's work through providing resources, such as space for collaboration efforts, supporting connections between and among researchers and graduate students, and serving to catalyze project efforts.

Recommendations

OEIE recommends that the project leadership continue to support the team's research through the aforementioned mechanisms (encouraging and facilitating interdisciplinary collaboration, sharing resources and knowledge, providing new equipment, providing internships for students, connecting with farmers, schools, and other partners, etc.), as well as reviewing the barriers indicated by team members during the REM activity. Team members noted specific barriers to project work, such as the need for a data manager and challenges with communication between groups and between meetings. OEIE suggests that the project leadership review the feasibility of hiring a data manager, both for immediate project needs and to support the production of project research and research outputs later in the project cycle. Understanding that hiring may not be feasible due to limited budgets, another suggestion would be consider consulting with a data management professional or service to identify data solutions that could be implemented by project leadership in the absence of dedicated personnel. Project team members may be able to offer recommendations or references to such services or professionals.

To address the barrier of communication challenges, OEIE recommends that project leadership consider setting aside a block of time during an upcoming team meeting to discuss current communication strategies and needs. Team members may have specific strategies to suggest that would facilitate communication with or among their objective. If leadership is able to implement the previous recommendation for finding appropriate software, tools, or a specific individual dedicated to data management, it is suggested that leadership determine how the management system can be centralized and potentially serve as an internal communication platform, if such features are available.

OEIE also suggests that project leadership and objective leads review outreach strategies to invested parties, such as producers, food industry personnel, and school personnel to ensure that dissemination strategies include materials tailored to each group to maximize impact of dissemination and outreach efforts. Unique and engaging outreach materials could encourage invested parties to share awareness of the project among their network through word-of-mouth. Objective leads could consider involving graduate students more closely in outreach work, such as having students develop non-traditional research outputs (i.e., videos, podcasts, comics, blogs) to both promote the development of innovative dissemination materials and improve student skills in scientific communication to non-scientific audiences. Project leadership could consider asking for a volunteer among the project team to coordinate development and dissemination of these outreach materials on social media and at upcoming events.

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Year 4 Ripple Effects Mapping Report

Appendix A – Copy of instructions and guidance

Ripple Effect Mapping Instructions and Guidance

What is Ripple Effect Mapping?

Ripple Effect Mapping (REM) is an evaluation tool used to better understand the intended and unintended impacts of a project. It is particularly helpful when evaluating complex initiatives that both influence and are impacted by the surrounding environment. REM is a facilitated discussion with project teams and invested parties that creates a visual “mind map” during the discussion that shows the linkages between project activities and resulting changes. This approach is intended to help demonstrate the project’s impacts more holistically and to describe the degree to which different types of impacts are observed by project staff and invested parties (Stuber, 2015).

Ripple Mapping Questions (adapted from Washburn et al., 2020):

1. Think about an achievement or success you are proud to share from the S2S project.
 - a. What made this success possible?
2. What has happened in your university and community as a result of the program?
3. What have been the major impacts from the S2S project?
 - a. New resources or opportunities available (in communities, in the state)?
 - b. Changes in attitudes or behaviors among others (growers/producers, consumers/community members, researchers, students, other invested parties) from your work with the project?
5. What new connections did you make with other people or organizations?
 - a. What connections would you like to make before the end of the project?
6. What barriers did you encounter in your work with the project and what did you do about them?
7. What catalyzers and best practices made the project successful and how?
8. What else should people know about the S2S project?

Using the paper and pens provided, add your responses to these questions to the map.

As you add your responses, please include the numbers of the questions above to note which items you are addressing.

Think of each ripple as a “so what?” and this activity as a chance to consider impacts and effects of the project more broadly. Our questions during this mapping exercise are intended to help draw out and categorize different types of “ripples,” such as new knowledge or skills, new relationships or connections, strengthened or new activities, strengthened or new efforts, new financial or economic opportunities, or new or improved facilities. Also think about negative consequences of the project and responses to these.

Effects of the “ripples”

Ripples are interconnected and supported by social science theory. Different types of ripples may represent transactional changes/individual impact, transitional changes/interpersonal impact, and transformational change/community level impact.

Guidelines for a good map

- Includes comments and insights from many project-related sources on the map.
- At first, comments on the map will appear “all over the place.” Over time, the map will get clearer as connections begin to develop.

Reflection

- What stands out to you from this map? Is it what you would have expected, based on your knowledge of the project and project activities?
- Are there any “next steps” that this mapping activity suggests to you?
- Are there any gaps that you can see in the program from this mapping activity?
- How can these ripples help S2S tell a story about project impacts to invested parties?
- What one word best describes the impact of the project?

Today’s map is only a rough draft. After the session, we will review and organize the map, in consultation with the project team.

References:

- Chazdon, Scott; Emery, Mary; Hansen, Debra; Higgins, Lorie; Sero, Rebecca. (2017). A Field Guide to Ripple Effects Mapping. University of Minnesota Libraries Publishing. Retrieved from the University of Minnesota Digital Conservancy, <https://hdl.handle.net/11299/190639>.
- Stuber, N. (2015). The American Indian Cancer Foundation, Impacts and Opportunities: Results from A Discussion of the American Indian Cancer Foundation's Health Equity Work. *Health Equity in Prevention*. https://www.wilder.org/sites/default/files/imports/American_Indian_%20Cancer_Foundation_REM_6-15.pdf

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Year 4 Ripple Effects Mapping Report

Appendix B - Compiled Results

REM Theme Details

The 42 statements generated during the REM activity were coded into 11 theme groups and 16 logic model categories, which are detailed in this section. Comments have been assigned to multiple categories as appropriate and have been lightly edited to enhance readability. The number of agreements refers to the number of starred stickers other team members applied to a pre-existing comment/idea that indicate their agreement of said comment/idea.

| REM Comment | Logic Model Category | Theme | No. of agreements |
|--|-------------------------------|-------------------------------------|-------------------|
| Build inquiry skills | Activity - education | Lessons learned | |
| Connections with others grad students working on diverse aspects | Activity - education | Collaboration and integration | |
| Figuring out what makes internships successful | Activity - education | Lessons learned | 2 |
| Connections to invested parties for implementation | Activity - extension/outreach | Outreach | 1 |
| Farmer connections collaborations & outreach | Activity - extension/outreach | Outreach | 2 |
| Strengthen collaboration efforts | Activity - extension/outreach | Collaboration and integration | 4 |
| Work with extension | Activity - extension/outreach | Outreach | |
| Working with value added industries & chefs | Activity – extension/outreach | Outreach | 2 |
| Hard time figuring out how things work | Activity - research | Barrier | |
| Learn from other discipline experts | Activity - research | Lessons learned | 8 |
| Need to optimize agronomics & [have?] etc. | Activity - research | Innovation | 2 |
| Novel research opportunities for undergrads, techs, & other “nontraditional” researchers | Activity - research | Workforce development and trainings | 1 |
| Overcoming discipline boundaries | Activity - research | Collaboration and integration | 2 |
| Provide space for <u>collaboration</u> | Activity - research | Collaboration and integration | 3 |
| Fixing [issues with figuring out how things work] | Activity – research | Lessons learned | |
| Barrier: communication b/w groups b/w meetings | Input - research | Barrier | 1 |
| Barrier: need data manager | Input - research | Barrier | 1 |
| Catalyzer: Ali | Input - research | Leadership/Facilitation | 1 |

| REM Comment | Logic Model Category | Theme | No. of agreements |
|--|--|-------------------------------------|-------------------|
| New Equipment | Input - research | Resources | 1 |
| Long term impacts: career pipeline, diet changes | Long term outcome - extension/outreach Long-term outcome - education | Impact | |
| interdisciplinary approaches & solutions | Long term outcome - research | Collaboration and integration | |
| Prevent nutritionally influenced morbidity & sustain health | Long term outcome -research | Impact | 1 |
| This is just the beginning | Long-term outcome - general | Opportunities | |
| Improved health at both individual and population levels | Long-term outcome - research | Impact | |
| Career decisions into the field | Medium-term outcome - education | Workforce development and trainings | |
| Workforce capacity building | Medium-term outcome - education | Workforce development and trainings | |
| Whole grains in schools | Medium-term outcome - extension/outreach | Impact | 4 |
| Strengthening connection between farm to fork... to health | Medium-term outcome - research | Impact | 4 |
| Deepening awareness of and collaboration with local partners along the value chain from seed to school meals | Medium-term outcome – research Medium-term outcome - extension/outreach | Outreach | 2 |
| Reaches people of all ages | Medium-term outcome -research Medium-term outcome - extension/outreach | Outreach | 1 |
| Exposure to soil science (internship) | Output - education | Workforce development and trainings | 2 |
| Hands-on capstones, internships | Output - education | Workforce development and trainings | |
| Inquiry HS curriculum | Output - education | Workforce development and trainings | |
| New interdisciplinary UG Major | Output - education | Innovation | 3 |
| Publications | Output - extension/outreach | Research output | 3 |
| New grant opportunities | Output - research | Resources | |
| New research projects among collaborators | Output - research | Collaboration and integration | 9 |

| REM Comment | Logic Model Category | Theme | No. of agreements |
|---|--------------------------------|-------------------------------------|-------------------|
| Excellent opportunity & experience for my high schooler. Definite long-term impact! | Short term outcome - education | Impact | |
| Grad student funding & training opportunities | Short term outcome - education | Resources | |
| Parents say experience is impactful | Short term outcome - education | Impact | |
| Methods & expertise for other non-STS research | Short term outcome - research | Innovation | 2 |
| Career exploration opportunities | Short-term outcome - education | Workforce development and trainings | 3 |