**Integrating Emerging Technology’s Data for Beginning Farmer Sustainability**

**1) Introduction**

This project’s long term goal is to provide technology data usage education coupled with financial education and training through practical objectives and outcomes designed to enhance the sustainability of beginning farmers in the northern two-thirds of Minnesota. This will be accomplished through a partnership of Central Lakes College (CLC), Ridgewater College, Northland Community and Technical College (NCTC) and AgCentric, the Minnesota State Colleges and Universities (MnSCU) Northern Center of Excellence for Agriculture in Minnesota. This partnership will network with organizations and state and federal agencies

Midwest Machinery, a regional John Deere dealer, will provide field equipment at minimal leaser rates with the latest precision agriculture technology and assist with beginning farmer connections. The Minnesota Department of Agriculture will provide beginning farm scholarships to support this project. The Minnesota Farmers Union, a farmer-based organization, will provide input for curriculum review and evaluation. The University of Minnesota Center for Farm Financial Management (CFFM) will gather data from the Minnesota FBM database and provide updated financial management software to track the financial impact of this project.

Other organizations include: Central Minnesota Irrigators Association (CMIC), Minnesota Corn Growers, Farm Business Management (FBM) beginning farmer students, and USDA Farm Service Agency (FSA) offices.

The priority topics for fiscal year (FY) 2015 which are targeted in the project include: livestock and crop farming practices, financial and risk management training, curriculum development, and farm financial benchmarking.

Both curriculum development and delivery will be a part of this project. Precision agriculture is an emerging technology in production agriculture. The use of Global Positioning Systems (GPS), Global Information Systems (GIS) and farm mapping software are being integrated into crop and livestock farming operations. Recent advancements with Unmanned Aerial Systems (UAS) will result in the use of that technology becoming more common as well. There is also an expansion in the use of robotics in Dairy operations. These rapid advances in technology generate large amounts of data to process, analyze, and interpret.

With the significant increase in the amount of data being generated from the various precision agriculture practices, farmers need outside educational support. The term big data is being used to describe this phenomenon. JABIL defines big data as “a massive and complex collection of data sets that are too large to be managed in traditional ways” (“Big Data and Drones”). They suggest that “this data is driving the new concept of precision agriculture – the analysis of a complex web of information, at all levels of the agricultural lifecycle, which can help farmers make smarter socio-environmental and market conscious decisions”. According to JABIL, agricultural big data combines weather reports, commodity market conditions, crop dynamics and other associated data into predictive analytics that farmers can use to make informed decisions.

Increased knowledge, skills, and tools to interpret the ever increasing amount of data are needed to analyze options which impact the longevity of the business. Financial analysis, including the trending of yield and cost of production, is critical to the sustainability of a farm business as the industry moves forward with precision agriculture. Access to more data, without the skill to effectively use it to make informed decisions, can impact the business negatively.

Beginning farmers have an especially challenging situation because the experience to fully comprehend the data is yet to come and the investment in equipment may, on the surface, appear high to the individual farm. Additionally, beginning farmers must first develop a viable business which provides a sustainable income during the early years of the business. Those barriers can be addressed by providing relevant and timely education that targets interpretation of precision agriculture data and an understanding of quality business records and analysis.

This project will be incorporated into the MnSCU Farm Business Management (FBM ) program, offered by the three community colleges, CLC, Ridgewater, and NCTC. This program has a 62 year history of delivering current and practical education to active farmers at their businesses. FBM instructors work one-on-one with farmers, at their place of business, to provide education on business management, enterprise evaluation, cash flow, business planning, and analysis. The MNFBM programs provide data from over 2,000 farm businesses for the state FBM database. This comprehensive database is the largest of its kind in the United States.

In 2014, 805 records were included in the state database from FBM students in the proposed three-college partnership. Of that group, 197 (24.5%) were from farmers with less than 10 years of experience. Those 197 beginning farmers had an average age of 32.7 years, 5.4 years of farming experience, and $29,225 in nonfarm income. They averaged a gross income of $367,615, a net worth of $416,865, and cropped an average of 465 acres. This only touches the surface of the data available and indicates that this database provides the opportunity to identify specific needs and the opportunity to direct this project to areas of greatest need.

These 197 farmers provide the critical mass needed for a project of this nature. The FBM program adds value to this project. When curriculum materials are developed for beginning farmers in northern MN, the collaboration between FBM programs and project partners enables effective sharing of materials to support beginning farmer students, not only in northern MN, but across the state. Statewide there are 443 farmers with less than 10 years of experience in the MN FBM database.

The 2012 USDA-NASS Census of Agriculture for Minnesota indicated that there are 74,542 farms in Minnesota. The table below is a brief summary of these data:

|  |  |  |  |
| --- | --- | --- | --- |
| Number of Farms by Gross Farm Income | Up to $9,999 | $10,000 to $99,999 | $100,000 and over |
| 29,787 | 19,764 | 24,991 |
|  | | | |
| Number of Farms by Farm Size in Acres | Up to 50 Acres | 50 to 499 Acres | 500 Acres and over |
| 18,780 | 42,203 | 13,559 |
|  | | | |
| Number of Farms by Years Operating any farm | Less than 5 years | 5 to 9 years | 10 years or more |
| 3,508 | 6,629 | 64,405 |

These data indicate that 10,137 farmers in MN have less than 10 years of experience in farm management and operations. This project will target the northern portion of the state, which would account for half of that total. Long term the proposed project outcomes would have relevance statewide, as well as beyond Minnesota with the online component of the curriculum.

Effectively providing education and training that ensures sustainability in a farming operation requires two areas of critical thinking. One is for the producers to have realistic business and personal goals to guide decision making. The second is quality farm and personal financial records to provide accurate and timely data for analysis of the business which will drive informed decision making. Management decisions resulting from increased knowledge and skills in other areas of the business depend on goals and comprehensive financial data in order to provide a beginning farmer with his or her best opportunity for longevity in the business.

This project will result in the development of essential curriculum and educational opportunities for beginning farmers. In the initial three-years of the project, 240 to 300 beginning farmers will participate in the project. The project has the expertise of 20 FBM instructors who have experience developing and delivering customized education on an individualized basis to active farmers. Instructors work with 50-60 farmers throughout the year and see first-hand the impact of volumes of technology data. Postsecondary instructors, in two-year technical programs, provide years of experience in both crop and livestock education, which includes precision agriculture and robotic components at an introductory level. The project director has over a 20 year history of instruction in Agricultural Education, including FBM in Minnesota.

**2) Objectives and Outcomes**

This project will target the knowledge gap between information generated from various agricultural equipment utilizing data from GPS, GIS, UAS, and robotics and the integration of this information to guide management decisions. Currently, the generation of precision agricultural data is far ahead of the analysis and output to farmers in a manageable format. This project will reduce this ‘bottleneck’ of big data by the development of curriculum that will provide a framework to address the educational and training needs of beginning farmers.

Beginning farmers, to be successful with emerging technologies of today, will need to have the management skills to integrate information and data on a real-time basis to effectively utilize big data in decision making. In addition, there is a need for understanding the financial implications to the total business when making those data-related decisions.

Increased knowledge in financial management will assist beginning farmers in demonstrating competence when securing funding for precision agriculture technology and enhance their self-confidence in making the decision to implement the technology. With improved efficiency in the crop enterprises and a sound understanding of the financial impact of related technology-based decisions, the farmers should enhance the sustainability of their business.

Within the overarching goal, the following are specific goals which clearly identify the process for its attainment:

Goal #1: Develop a curriculum outline based on the financial and technology requirements for crop and livestock farm business operations of beginning farmers in Minnesota.

Objective #1: Collect and analyze business data to identify the needs of beginning farmers.

Outcome #1: A list of 21 financial standards for the average beginning farmer compared to other beginning farmers in MN.

Outcome #2: A listing of 15 key crop and livestock enterprise factors for the average beginning farmer compared to other beginning farmers in MN.

Outcome #3: A categorized outline of financial and enterprise needs, specific to beginning farmers in MN, for use with curriculum development.

Objective #2: Interview and survey 40 beginning farmers and 40 postsecondary Agriculture Production students to determine technology needs for an education plan.

Outcome #1: A summary of the technology available to beginning farmers, including owned equipment, leased equipment, and near-term planned purchases.

Outcome #2: A summary of the technology needs of beginning farmers, including specific equipment, access to credit, amount of credit needed.

Outcome #3: A categorized outline of technology needs, specific to beginning farmers in MN, for use with curriculum development.

Goal #2: Develop curriculum and farm plan guidelines based on needs of beginning farmers.

Objective #1: Prepare a plan for curriculum development

Outcome #1: Four individuals identified to work as a team to write the curriculum.

Outcome #2: A listing of outside personnel from project partners and collaborators to assist and support curriculum development.

Outcome #3: A listing of curriculum objectives prepared by lead group.

Outcome #4: A final, specific timeline for curriculum completion and implementation.

Objective #2: Plan for resource needs to support the development of the curriculum.

Outcome #1: An advisory committee of network members identified.

Outcome #2: A listing of stakeholders willing to assist with specific sections of the curriculum and equipment or software donations as necessary.

Objective #3: Develop curriculum for 64 hours of delivery time.

Outcome #1: A complete curriculum including instructional and student learning guides for a minimum of a 44 hour delivery in an individualized, one-on-one basis and a maximum of 20 hours for on-line delivery.

Outcome #2: Approval from CLC, Ridgewater and NCTC for the curriculum plan.

Objective #4: Incorporate approved practices in business planning.

Outcome #1: A guide to identify action steps in a farm technology plan.

Outcome #2: A guide to identify action steps in a farm business plan.

Goal #3: Train instructors, deliver curriculum, and modify as needed.

Objective #1: Provide training to 20 FBM instructors on use of the curriculum.

Outcome #1: Each instructor will identify and enroll, 3-5 beginning farmer students to deliver and evaluate beginning farmer curriculum.

Outcome #2: 60 to 100 beginning farmers will receive instruction over 24 months.

Objective #2: Identify strengths and weaknesses to aid in curriculum modification.

Outcome #1: Each instructor will survey students each semester.

Outcome #2: A list of strengths and weaknesses, with instructor recommendations.

Outcome #3: Within 6 months, an updated curriculum will be available.

Goal #4: Evaluate benefits to student participants.

Objective #1: Report on progress of students enrolled in the program.

Outcome #1: Summary report of student learning assessment materials.

Outcome #2: 60% of students will have developed a farm technology plan.

Outcome #3: 60% of students that have developed a full farm business plan.

Outcome #4: 40% of students will have implemented a farm technology plan.

Outcome #5: 40% of students that have implemented a full farm business plan.

Outcome #6: Comparison data of relative profitability to other beginning farmers.

Goal #5: Incorporate updated curriculum in delivery of MN FBM education.

Objective: Promote updated beginning farmer curriculum statewide.

Outcome #1: Instruction provided at two Minnesota Association of Agricultural Educators (MAAE) conferences and at regional and state FBM conferences.

Outcome #2: Communication sent to major agricultural community stakeholders informing them of the availability of the curriculum.

**3) Approach**

Goal #1: Develop a curriculum outline based on the financial and technology requirements for crop and livestock farm business operations of beginning farmers in Minnesota.

Objective #1: Collect and analyze business data to identify the needs of beginning farmers.

Description of Activities:

General information will be gathered from the United States Department of Agriculture. One source is the 2012 USDA-NASS Census of Agriculture website (USDA Census of Ag). The second is the Minnesota Agricultural Statistics Service website (NASS). Comparative demographic data will be provided by these searches.

Specific information related to financial standards and key enterprise factors will be gathered through a review of the MN FBM Database and the Farm Financial Management Database website maintained by the U of MN Center for Farm Management (FINBIN).

A report of 21 financial standards will be prepared using the factors identified by the Farm Financial Standards Council. These standards are a nationally recognized listing of recommended financial measures common to all sectors of agriculture. These measures target the areas of: liquidity, solvency, profitability, repayment capacity, and efficiency. All of these measures require a base understanding by producers in order to fully interpret the current status of their business and the impact of future investments. Customized queries will be prepared based on benchmarking recommendations identified in collaboration with the U of MN Center for Farm Financial Management (CFFM).

Enterprise data in the MN FBM database and FINBIN will be summarized using 15 key enterprise factors. These factors will include items related to: production, income, direct and allocated costs, and efficiency factors for crop and livestock enterprises. Data will be gathered from the 2010-2014 calendar years. Comparison data are expected from more than 2,000 farmers, with over 440 of these beginning farmers.

Data will be summarized from the use of Midwest Machinery leased precision agriculture equipment at the CLC Ag and Energy Center. The Ag and Energy Center includes a 1500 acre farm operated by CLC. This information will assist in guiding curriculum discussions. Data from this equipment will be used throughout the project.

Based on the demographic, financial, and enterprise data trends will be recorded and included in the curriculum development process.

Timeline:

October 1 – December 31, 2015: All data will be gathered during this time period.

Objective #2: Interview and survey 40 beginning farmers and 40 postsecondary Agriculture Production students to determine technology needs for an education plan.

Description of Activities:

Interviews will occur with 40 FBM students (20% of the total number in the 2013 database) enrolled at the partnership colleges and 40 postsecondary Farm Operations and Management students who are completing their second and final year of the program offered by Ridgewater and NCTC. The postsecondary students will be selected based on their intent to farm after completion of the two-year technical program. The interviews with the FBM students will occur at the place of business. The interviews with the postsecondary students will occur at the college and focus on their planned farm business model for each student as they near graduation.

During the interview program instructors will also administer a survey. The survey will focus on the individual’s current status, their knowledge of the value of the crop and livestock technology, their potential to invest, and their perception of how technology data can be applied to their operation. In addition, an individualized questionnaire will be used to evaluate credit needs and availability.

The results of the interview/survey process will provide comparative data. Data from these postsecondary students give a view of the status of individuals who have received instruction on technology during their diploma program. Data from the FBM beginning farmers will provide the status of individuals who have not had postsecondary education. This comparison will provide another gauge to assess project outcomes.

In 2012, a statewide survey was completed by farmers regarding educational needs (Joerger). This information came from a combination of FBM students and cross-section of farmers identified by the Minnesota Agricultural Statistics Service. This data is general in nature, but will provide guidance on the overall needs of farmers relating to technology.

A curriculum outline will be developed from the key education needs identified in the interviews, surveys, and 2012 data. This outline will target precision agriculture, Unmanned Aerial Systems (UAS) technology, and robotic technology. The outline will recommend topic areas which will be incorporated into instructional goals, objectives, and outcomes related to the data interpretation needs of beginning farmers.

Timeline:

October 1, 2015 to March 1, 2016

Goal #2: Develop curriculum and farm plan guidelines based on needs of beginning farmers.

Objective #1: Prepare a plan for curriculum development.

Description of Activities:

Because of the speed of development for emerging technologies in Agriculture, it is difficult to find agency or non-profit partners in the region with expertise in interpretation of technology’s data. This partnership will rely on collaborations with key industry representatives and college faculty to support curriculum development.

The project director, working with CLC, Ridgewater, NCTC, and AgCentric will develop a list of criteria needed by the individuals developing the curriculum. A listing of recommended personnel from each college and appropriate collaborators will be developed based on the findings of the data collection and interview/survey process. Interviews will be held to determine the final four individuals to makeup the Curriculum Development Team (CD Team). It is anticipated that the CD Team will be a combination of both FBM and postsecondary Agricultural instructors.

The CD Team will be designed so that each area of the curriculum will be assigned to the strengths of the members. The team will work as one group for a one-day session, work individually to develop the assigned curriculum, participate in periodic webinars for updating, and conclude with a two-day session to finalize the curriculum.

The project director, working with AgCentric, CLC, Ridgewater, and NCTC, will develop a list of key personnel from industry who would be necessary to support the process. The need for these individuals will be based on the results from the first goal. These stakeholders will be asked to provide technical support related to specific equipment manufacturers, input related to updates to technology software, and asked to evaluate sections of the curriculum.

During the development process, team members will evaluate the type of delivery best suited for the subject matter. Historically, the primary method for delivering FBM instruction is to meet with students at their business. With the tremendous assets currently found in online technology and the increased desire for individualized learning via the web, an online delivery presence is imperative. It is anticipated that there is greater potential for online delivery in the beginning phases of the educational plan. A hybrid curriculum, utilizing a combination of customized and online delivery will be targeted. A list of curriculum objectives will be prepared based on initial findings and the delivery analysis.

Generally, the optimal time for curriculum development efforts for both instructor groups is in the late spring, summer, and early fall time period.

Timeline:

January 1 to March 1, 2016: Identify the Curriculum Development Team

January 1 to March 1, 2016: Develop finalize the plan for writing curriculum

Objective #2: Plan for resource needs to support the development of the curriculum.

Description of Activities:

This project will have an Advisory Committee that will actively participate in guiding the overall project and providing feedback during the three-year term. The Advisory Committee will be comprised of: a representative from each college; representatives from 3-5 project partners; three industry leaders in precision agriculture, UAS technology, and robotic technology; and a U of MN Center for Farm Management (CFFM) representative. The committee will meet on a semi-annual basis.

As data is collected from the CLC farm using the leased equipment from Midwest Machinery, developers will use current data for case studies. Software provided by Midwest Machinery will also support development by providing instructional materials.

A Minnesota Farmers Union representative will support curriculum development by providing input from the perspective of the organization.

Using the needs outline and the preliminary list of objectives, the Advisory Committee will evaluate the financial implications of the recommendations. The Advisory Committee will prepare a list of stakeholders who may consider a program donation or assist with educational resources needed for the curriculum.

Timeline:

October 1, 2015 to September 30, 2018

Objective #3: Develop Curriculum for 64 hours of total delivery time

Description of Activities:

Using the needs outline and the preliminary list of objectives, the CD Team will detail the instructional goals, objectives, and outcomes related to the needs of beginning farmers. Using personal expertise, instructional resources, input from industry personnel, and feedback from the Advisory Committee the team will develop a series of courses and/or workshops totaling 64 hours of delivery time. The project coordinator will monitor progress and serve as a communication link to the Advisory Committee, industry stakeholders, project director, and senior college administration.

Due to the dual role of the student as farmer and learner, it is important to design the majority of the curriculum as a customized, one-on-one delivery, at the student’s business; with online delivery modules. This provides the most focused instruction to match the learning style of students while enrolled in the program.

The FBM and postsecondary Agriculture programs are credit-based programs within the Minnesota State Colleges and Universities (MnSCU) system. The postsecondary programs provide a Diploma of Occupation Proficiency after two years of technical education. The FBM program provides a Certificate of Proficiency for the equivalent of a two-year program. Because the students are active farmers, the delivery is spread over a 6-7 year period. Both programs provide credit-based programming that provides practical education to either enter the business of farming or to upgrade current knowledge with improved business management skills.

The current FBM program is designed to provide financial management education but has traditionally not incorporated production-based education. The technology-based focus is an expansion of the delivery in FBM. Financial management is all about working with data, so the addition of working with technology’s data is a natural.

Delivery of practical education must be focused on the individual producer and provided over a longer period of time because the student is also operating an active business. This curriculum will be delivered on a part time basis over a two-year period. This enables the student who is currently enrolled in FBM to continue with that program’s typical delivery model and allow the beginning farmer to add the curriculum from this project to his or her educational plan. Beginning farmers not currently enrolled in FBM will be able to enroll specifically for this curriculum if that is their choice. Beginning Farmer Scholarships provided through the Minnesota Department of Agriculture will be available to assist with increased tuition and fees.

Each college in the MnSCU system has a curriculum committee which approves new curriculum. Instructors from each college will be developing this curriculum and will be able to incorporate special features to address local needs. These instructors will present to the local college curriculum committee for approval.

Timeline:

March 1 – December 31, 2016

Objective #4: Incorporate approved practices in business planning.

Description of Activities:

To assess this activity, the identification of action steps must become part of the routine for beginning farmers enrolled in this project. If hesitation exists for incorporating business change, it is often based on lack of both knowledge and the ability to see the final goal due to the lack of a plan. If knowledge is gained, but no action is demonstrated, the value is difficult to quantify. This project will include the development and implementation of both a farm technology plan and a farm business plan.

A guide for developing a farm technology plan will be provided to all students. This plan will include current status, goals for the future, plans for connecting with industry experts to evaluate options, timelines for incorporating new technology, methods for managing the technology data, and financial considerations.

A guide for developing a farm business plan will be provided to all students. This plan will include overall business goals, full business description, operations data, marketing plan, management overview, and a financial plan.

Goal #3: Train instructors, deliver curriculum, and modify as needed.

Objective #1: Provide training to all instructors scheduled to deliver the curriculum.

Description of Activities:

Each FBM instructor will identify 4-5 beginning farmers to be a part of this project. Based on the number of beginning farmers in the northern Minnesota database, each instructor has about 10 beginning farmers. A goal of 40-50% of those individuals participating is realistic because the FBM instructor has an ongoing relationship with these beginning farmers.

The CD Team, along with industry advisors, will provide training to the FBM instructors. A 2-day training session will be held to provide critical information for the initial phase of curriculum delivery. This training will focus on the overall plan for the curriculum, a review of the teaching plan and resources, a review of student learning activities and case studies, a discussion of the assessment plan, a review of technology and business plan expectations, and an overview of the plan for monitoring the delivery of the curriculum.

Once the initial training in completed, webinars will be used as periodic meetings to discuss questions and concerns. These webinars will be held on a monthly basis to complete the full training. In addition to the webinars, face-to-face sessions will be held each semester to train on various aspects of the curriculum and to incorporate new ideas.

Initially, the curriculum will be delivered over 24 months to 240 to 300 beginning farmers, and includes postsecondary agriculture program graduates and new beginning farmer students.

Timeline:

July 1 to September 30, 2016: FBM instructors identify participating beginning farmers

October 1 to October 15, 2016: Workshops for initial training

October 15, 2016 to September 30, 2017: Ongoing training: webinars and group meetings

Objective #2: Identify strengths and weaknesses to aid in curriculum modification.

Description of Activities:

The curriculum for this project will be monitored for strengths and weaknesses on a regular basis. Each semester the instructor will assess the curriculum using a form similar to the state FBM program assessment guide. Curriculum goals and objectives will be rated by the farmers/students based on their perceptions of the value of the objectives and understanding of the material presented. Strengths and weaknesses will be listed by both the farmers/students and the instructor.

This information will be shared during the scheduled webinars and group meetings. After the data is gathered, the CD Team will meet on a quarterly basis to assign responsibilities for curriculum revisions and modifications.

Revisions to the first year of the curriculum will be made during a six-month time period. The revised curriculum will be available to FBM instructors by October 1, 2017. This will allow the instructors to add a new group of beginning farmers to the first year of the curriculum, while the initial group is completing the second year of the curriculum.

Revisions to the second year of the curriculum will also be made during a six-month time period using the same process as the first year.

Timeline:

October 1, 2016 to September 30, 2018: Identify strengths and weaknesses

March 1, 2017 to September 30, 2018: Modify curriculum

Goal #4: Evaluate benefits to student participants.

Objective #1: Report on progress of students enrolled in the program

Course and program assessment is an integral part of identifying student learning. The materials developed will include both items. With the information collected from interviews and surveys prior to the start of the program, the CD Team and instructors can work together to gauge student learning as assessments are completed. The course and program assessment will be modeled after the state FBM curriculum forms.

Each student will be encouraged to prepare a farm technology plan and a full farm business plan. The actual completion of a plan will depend on the goals of the student as they relate to the education provided by the project. During the first year of deliver, these plans will be initiated by students and will not be completed until mid-year of the second year. An enhanced view of student understanding will result from this assignment.

By the conclusion of the second year, a 60% completion rate is expected for each plan. As the second year comes to an end, a group of the beginning farm students will have started implementing the plan. The goal for this project is to have 40% of the students take the first step in implementing both plans.

Profitability is difficult to quantify in ever changing economic times, but it will be critical to monitor financial performance and the financial challenges beginning farmers face compared to other farmers. Existing studies show that “beginning farmers have lower liquidity and solvency but about the same profitability, efficiency and repayment capacity compared to the rest of the farm population.” In addition, “beginning farmers have different likelihood of experiencing financial stress depending on operator characteristics, farm enterprise, size and organization (Katchova). Beginning farmers in this program will complete a detailed financial analysis for year of the project.

The U of MN Center for Farm Financial Management will create the tools needed to conduct longitudinal studies of the cohort of beginning farmers and compare those farms to established farms, as well as to other beginning farms not in the project. Longitudinal studies work with the same group (beginning farmers in this project) and variables (key financial factors) over a long period of time (i.e. five years). This study will demonstrate if the project’s beginning farmers have gained financially at a level greater than the average beginning farmer. This would suggest greater sustainability.

Timeline:

October 1, 2015 to September 30, 2018

Goal #5: Incorporate updated curriculum in delivery of MN FBM education.

Objective: Promote updated curriculum statewide

Description of Activities:

The Minnesota Association of Agricultural Educators (MAAE) hosts a statewide conference in January and July of each year. Workshops will be held at each conference targeting this beginning farmer curriculum for both promotion and training on delivery. The workshop sessions can vary in time from one hour to an all-day session.

An October workshop for FBM instructors has been held in recent years. In 2016, this project will be introduced and promoted. In 2017, training will be provided for all instructors. With the number of beginning farmers in the state database totaling over 400, and the opportunity to serve the other beginning farmers not currently in the program, this training will be welcomed.

This project will be promoted to stakeholders in the agricultural community throughout the term of the project. At the conclusion of the first year of delivery, a summary of the monitoring process and updated curriculum will be shared to promote the program. During the final year of the project, major promotion will occur in order to enhance the longevity of the curriculum developed under this project.

Timeline:

October 1, 2017 to September 30, 2018

Rationale for Approach to Target Audience:

To justify the investment of the technologies targeted in this project, a beginning farmer would need to generate an income level at, or above, the average stated previously. For beginning farmers who generate less than the average, the curriculum will present options for collaborating with other farmer(s) to share technology. Managing big data is critical to the future of beginning farmers either way.

Personal and family business data are difficult to share with an outside presence. Existing FBM farmer students have already adjusted to sharing this information and understand the value to their future sustainability. Targeting this beginning farmer group is the best opportunity to ensure success of the project

How will the project, partnerships and collaborations, be sustained?

After two years of delivery, credit-based instruction in Minnesota generates formula-driven state aid to support future delivery. This aid supplements the dollars generated from tuition and fees and support from industry partners. Outside revenue is critical to the first two years of development of new delivery options. This start-up revenue enables the program to build the student base to a level of sustainability. This project is designed to build that critical base for future funding.

AgCentric will play a key role in the ongoing partnership that is being enhanced with this project. These three colleges joined in a partnership to establish AgCentric and are committed to continuing the relationship demonstrated in this project.

The three colleges involved in this partnership have had a long history of collaborating with agricultural industries in northern Minnesota. AgCentric is initiating new partnerships by providing the colleges with new opportunities to collaborate with the agriculture community and related agencies.This project provides an opportunity to strengthen those relationships and adds value for both parties. Project collaborators will continue to be members of college advisory committees and college staff will continue to work with partners on various professional and community activities.

Specifically, Midwest Machinery will continue to support the CLC Ag and Energy Center efforts in precision agriculture. In addition, the company has teamed with the college to promote job opportunities in the agriculture technology fields.

The Minnesota Farmers Union has focused discussions with CLC on beginning farmer needs, especially the needs of veterans who are beginning farmers. This organization will continue to provide insight in future efforts to expand the program across Minnesota.

What novel ideas or contributions are planned for the project?

This partnership is unique on several levels. AgCentric is one of only two Centers of Excellence in Agriculture in Minnesota. Ridgewater College brings the largest two-year postsecondary Farm Operations and Management program in the state, expertise in precision agriculture, and an FBM program. Northland Community and Technical College (NCTC) brings expertise in Unmanned Aerial Systems (UAS) technology, a two-year postsecondary Farm Operations and Management program, and a FBM program. Central Lakes College (CLC) an FBM program and operates a 1,500 acre farm for practical demonstration of technology.

The 1,500 acre CLC Ag and Energy Center operates as a demonstration center and educational resource for greater Minnesota. The parcel adjacent to the college has been operated by the college for almost 50 years. This resource is the key to bringing in collaborators such as Midwest Machinery because they can provide reduced rates so that the Center can demonstrate the equipment, collect the data, and provide education in the region.

The primary novel idea is to bridge the knowledge gap between the technology producing the data and the analysis of the data (i.e. variable rate technology, soil mapping and yield data). Education on how to understand, interpret, and incorporate the data into a sustainable business is greatly needed. The development of technology moves faster than the beginning farmer can absorb and understand. Similarly, beginning farmers need assistance in learning how to analyze and utilize the data the technology is producing.

Identify pitfalls and limitations; challenges and a plan to address those challenges.

We are confident that there will be a critical mass of beginning farmer students to participate in the project. A concern is the potential for the level of interest from beginning farmers to exceed resource capacities. If interest exceeds the ability to provide the education, outside revenue will be needed to hire instructors in new locations. Currently Minnesota is in the process of developing new funding sources to address that very issue. This project would provide addition rationale for development of those funding sources.

**4) Personnel and Resources**

Project Director: Keith Olander, Dean of Agricultural Studies; Director of AgCentric, MnSCU Center of Excellence in Agriculture; Director of CLC Ag & Energy Center. Central Lakes College

Experience – Overall and related to the target group: Keith Olander has worked in agriculture education for over twenty years. This tenure has included work in the secondary and post-secondary setting. His experience in classroom teaching form 14 years of his experience and five years of one-on-one education with farmers of all ages. Aside from his teaching experience Keith is a farmer. He owns and operates 300 acres of crop production. This integration of experience coupled with his education and training experience makes him well qualified to lead a project such as this of designing curriculum, teaching and training beginning farmers, and developing financial benchmarks based on data collected through this project.

Current/Recent activities & impact related to proposed project: Keith has had several experiences in curriculum development and design with a notable experience of leading a state project to form a “frameworks” for all state agriculture education in Minnesota. Approximately half of the FBM students he has taught in the past five years have less than 10 years of farming experience and fit the USDA definition of “beginning farmer”.

Project Coordinator: The Project Coordinator will be hired once the project has been funded. The key role for this position is to coordinate the program under the direction of the project director and in support of key personnel.

College Faculty: During the term of the project it is anticipated that the instructors listed below will participate in interviewing students, developing, delivering, and/or modifying the curriculum. Below is a list of the instructors, programs they teach, and years of experience.

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| --- | --- |
| **Central Lakes College** | |
| Nate Converse, FBM, 7 years | Lee Todnem, FBM, 27 years |
| Kent Montgomery, Nat Res, | Ed Uhlenkamp, FBM, 1 year |
| Bob Rick, FBM, 15 years |  |
| **Northland Community and Technical College** | |
| Greg Dvergsten, FBM, 17 years | Paul Oelke, FBM, 7 years |
| Ron Dvergsten, FBM, 20 years | Ryan Sobolik, Farm Oper & Mgt, 5 years |
| Doug Fjerstad, FBM, 35 years | Josh Tjosaas, FBM, 3 years |
| Greg Kalinowski, FBM, 22 years | Randy Zimmerman, FBM, 8 years |
| Jade Klein, Farm Operations & Mgt, 5 years | Johnathan Beck, UAS program, 4 years |
| ADawn Melbye, FBM, 3 years |  |
| **Ridgewater College** | |
| Randy Barka, PS Ag, 1 year | Mike Mastey, FBM, 17 years |
| Deron Erickson, FBM, 14 years | Shawn Meyer, FBM, 8 years |
| Gregory Ervin, PS Ag, 1 year | Zack Rada, FBM, 8 years |
| Paul Filzen, FBM, 17 years | Kurt Schoephoerster, FBM, 32 years |
| Wade Gustafson, PS Ag, 1 year | Bob Stommes, FBM, 11 years |
| Thomas Lorang, PS Ag, 4 years | Steve Zenk, FBM, 29 years |

**5) Plan for Outcome Based Reporting**

We are confident that the outcomes identified for this project will provide beginning farmers and their families the knowledge, skills, and tools needed to make informed decisions regarding “big data” in technology information usage and farm planning. Education on those issues, supported by instruction in financial management and business analysis, will enhance their sustainability. The outcomes and output previously explained in this document provide the general overview of the project.

Changes in behavior and learning are best evaluated and assessed through direct meetings with adult learners. This project begins with interviews and surveys to identify a base assessment of knowledge of technology’s big data and status of the business. Beginning farmer needs will be identified based on initial findings which will establish core recommendations for the curriculum. Once the curriculum is being taught, input will be sought from students and instructors using assessment materials and complemented by survey evaluations. The curriculum will then be updated to address the recommended changes. Initially, and during the project, financial database information will be analyzed and reports prepared to illustrate comparative data for demonstrating progress. Action steps directing change, in the form of farm planning, are critical to business sustainability. Therefore, the percentages of completion and implementation of farm technology and business plans will be recorded.

At the close of the project, the following items will be measured using a detailed listing of project outcome information, which align with the Outcomes Based Reporting Guide:

Activity Measures:

1. Report amount of materials formally published…
   1. There will be no formally published materials. Printed curriculum materials will be shared within the three colleges and FBM colleges in the MnSCU system.
2. Report amount of materials produced for beginning farmer and rancher training…

Curricula – A 64 hour curriculum, consisting of eight courses, will be developed and modified

Data/Databases – Reports and summaries will be prepared for seven project sections:

Evaluation Instruments – Student Learning Assessment documents will be developed for each course and the program as a whole. These documents will be a rubric documenting learning based on relative ability to master a key outcome. (i.e. Identify the advantages of UAS in your business)

Fact sheets – Fact sheets will be prepared, based on developer insights. Student and instructor evaluations will measure the value and recommend modifications.

Networks and/or other collaborations – Networks will be organized with representatives of the technology industry in the three primary areas. Success will be measured by the number of representatives and the time provided.

Physical collections or resources – The curriculum will include a resource library, a listing of educational tools, and a listing of electronic resources. This will be measured based on whether or not they were produced.

Surveys – Two surveys will occur at the beginning of the project. Surveys to evaluate the education provided will be administered 4-6 times during the project. Data will be gathered and shared with all project participants.

Train-the-trainer materials – An instructional guide will be developed to provide guidance in delivering the curriculum. Instructor feedback after the first and second year of delivery will guide modifications as needed.

Worksheets – Worksheets will be prepared based on developer insights. Student and instructor evaluation will measure the value and suggest modifications.

1. Report amount of materials to promote the program…

Brochures/pamphlets – Pamphlets will be developed for distribution to agricultural community stakeholders and FBM instructors in southern MN.

Event flyers – Event flyers may be developed in support of conferences attended.

1. Report number of training programs/sessions/contacts offered/facilitated and the number of participants…

College credit classes – Eight community and technical college courses will be developed for individualized delivery at the business and for online delivery.

Conferences/symposiums – Training sessions will be held at three state conferences. This will be measured by the number of participants.

Curriculum development – Four individuals and outside consultants will write the curriculum. Twenty FBM instructors, approximately 100 students, and a Minnesota Farmers Union representative will identify areas needed for curriculum modifications, based on surveys, evaluations, and interviews.

Program evaluation – A program assessment document will be developed with the curriculum. This document will assess key curriculum outcomes based on the student’s ability, rated by factors such as: with assistance, with minor guidance, or independently. Additionally, all students will be surveyed periodically to evaluate the strengths and weaknesses of the courses.

Train-the-trainers – Four individuals, with support from representatives of the three targeted industries, will provide training to 20 FBM instructors in the first and second year of the project. Assessment will be based on relative understanding of curriculum outcomes.

1. Report number of participants facilitated and the number of participants involved…

Participants facilitated – The goal is 240-300 beginning farmers. This will measured for success based on whether the 240 participants is attained.

Organizational goal – CLC will have a minimum of 8 active participants for meetings and curriculum efforts. This will measured based on the number and time spent.

Participants across partner organizations – 27-32 members will participate. Success will be measured based on the base number of 17 and the total amount of time spent.

Number of Collaborator organizations – There will be 6-10 partner organizations participating. This will be measured based on actual participants and time spent.

Target Audience Measures:

Beginning farmers are the target audience. Through collaborations with the Minnesota Farmers Union and U of MN CFFM, we anticipate the inclusion of veterans who are beginning farmers. This would be deemed successful with 10 veterans participating.

Outcome Measures:

1. Of those who complete any part of the training program, immediately record the number and percent of participants

Who are farming – 100% will currently be farming

Plan to continue farming – A target of 95% will continue at program end

Change in knowledge, attitudes, & skills – 100% is the program goal

Plan a change to behavior/approach - 75% is the program goal

Plan to continue in training – 95% is the program goal

1. Each year, record the number or percent/total of participants…

Continue farming – 95% is the program goal

Change practices – 75% is the program goal

Develop a farm plan – 60% is the goal for a technology and business plan

Increase productivity and profitability – 75% is the program goal

Continue to participate – 100% is the goal through the first year

1. Conduct interviews of participants to capture stories, highlighting:

Changes in knowledge, abilities, skills, intensions, and practices – Interviews will occur at the beginning, on four occasions during the program, and at the conclusion of the program.

**6) Management and Collaboration Plan**

Central Lakes College (CLC) is the lead on this project, working closely with Ridgewater College, Northland Community and Technical College (NCTC), and the Minnesota State Colleges and Universities (MnSCU) Northern Center of Excellence for Agriculture (AgCentric). Collaborators and organizations will work with all three colleges. Communications between partners will be a combination of regularly scheduled meetings/webinars, Advisory Committee Meetings, and regular messaging from the Project Director and the Project Coordinator.

The Project Director, with dual employment at CLC and AgCentric, will oversee all activities of the project and delegate specific sections of the project to appropriate staff. Five percent of his workload will be assigned to this project. He will specifically lead efforts for:

- Goal #1, the development of the initial data study

- Goal #2, guiding the curriculum development plan and the Advisory Committee

- Goal #5, providing leadership in moving the curriculum towards a statewide presence

He will direct the role of the Project Coordinator, lead meetings with partners, build relationships with collaborators, and direct the process for collecting and analyzing data related to the project.

The Project Coordinator, employed by CLC, will serve under the Project Director. This position will be employed on a 50% time basis. This person will specifically lead efforts for:

* Goal #3, for the delivery, review, and monitoring of the curriculum
* Goal #4, guiding the process for assessment and farm plan development

This position will also support the Project Director in the other three goal areas, communicate regularly with the CD Team and FBM instructors; and gather the findings from the initial data review, data collected during the project, and the final results of the project.

The CD Team will consist of four instructors from each of the three community college partners. Their efforts will be under the direction of the Project Director and their local college administration, with additional support from the Project Coordinator. The CD Team is responsible for: evaluating base interview and survey findings; preparing the initial curriculum outline; developing the 64 hour curriculum; developing evaluation and assessment materials; preparing a guide to aid students in developing a technology plan; and updating these materials based on feedback from FBM instructors and students. Postsecondary instructors on the team will also conduct student interviews and surveys at the beginning of the project.

There will be 20 FBM instructors from the three community colleges delivering the curriculum for this project with five percent of their time assigned to this project. Specifically, these instructors will: conduct interviews and surveys of students for base data; record student achievement/assessment information during delivery; guide the development of the technology and business plans; conduct interviews and surveys for curriculum revisions; and survey students at the conclusion of the project.

AgCentric will make time available to support the Project Director and will provide secretarial support to the Project Director and Coordinator. AgCentric will also provide matching funds to support data collection and data evaluation.

Central Lakes College will house the Project Director, serve as the fiscal agent, support four FBM instructors for delivery of curriculum, and two instructors to serve on the CD Team. The college will also provide instructor and administrative representation for the Advisory Committee, encourage local curriculum approval, and print final materials for the project.

Northland Community and Technical College will support eight FBM instructors for delivery of the curriculum, two postsecondary instructors to gather initial student data, and 1-2 instructors serving on the CD Team. The college will also provide instructor and administrative representatives for the Advisory Committee and encourage local curriculum approval.

Ridgewater College will support eight FBM instructors for delivery of the curriculum, two postsecondary instructors to gather initial student data, and 1-2 instructors for serving on the CD Team. In addition, the college will provide instructor and administrative representatives for the Advisory Committee and encourage local curriculum approval.

The University of Minnesota Center for Farm Financial Management (CFFM) is a key collaborator, serving as the source of comparative, longitudinal data to track beginning farmer progress from the base data to the final results. A sub-award is provided to CFFM to support staff in the development of queries and basic software to target the demographics of beginning farmers. One representative of the CFFM will work with the Project Director and Coordinator to establish specific beginning farmer progress identification factors.

Midwest Machinery is a key collaborator, providing a representative to work with curriculum development and modifications. In addition, a representative will partner in workshops to educate beginning farmers on precision agriculture’s big data and its interpretation.

The Minnesota Department of Agriculture is a key collaborator, providing financial support for students enrolled in the FBM program. Matching funds will be available to provide scholarship funds to beginning farmers enrolled in this curriculum.

The Minnesota Farmers Union is a key collaborator, providing curriculum review and evaluation.