Report on a Two-year College
Farm Management/Agricultural Mechanics Curriculum Review

Agriculture Program
North Dakota State College of Science
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Introduction

Agriculture is a dynamic industry. Because agriculture increasingly relies on technology to remain profitable, the NDSCS Agriculture program wanted it's curriculum to reflect the skills and competencies needed to successfully meet industry career expectations. In order to address this, the college chose the Farm Management/Ag Mechanics program to undergo the curriculum review process.

A trained facilitator guided industry experts through a process that would identify the skills, knowledge, and abilities (SKA) needed for successful employment. A faculty member of the North Dakota State University, School of Education, Occupational and Adult Education Program, was selected to facilitate the curriculum review. The department faculty used the results of the facilitator's summative reports to determine if changes were needed in the Farm Management/Agricultural Mechanics program. If any changes were to be made, they needed to be approved by the Fall Semester of 2006.

Background Information

In the early 1970's, North Dakota State College of Science (NDSCS) offered an Agricultural Mechanics Short Course. This course was offered during winter quarter and provided interested students and agricultural producers the opportunity to develop the skills and competencies needed to understand and perform farm mechanics tasks.

In 1976 the Agriculture Department was created. The Agricultural Mechanics Short Course was expended into a program that offered the Associate of Science degree. The areas of instruction centered on farm management/record keeping, agricultural production, and agricultural mechanics. A sales and service option was also offered for students who were interested in agriculture but were not planning on returning to the family farm. Adult Farm Management (Vet's Ag program) was also added as part of the college's agriculture department.

The NDSCS Agriculture department's faculty grew to four instructors by the early 1980's. The purpose of the programs offered remained centered on farm management, agricultural production, and agricultural mechanics. The faculty and advisory committee were responsible for curriculum oversight. In 1992, NDSCS converted from quarters to semesters. Curriculum and individual courses were repackaged by faculty to comply with this conversion.

During the 2000-2001 school year, the college reviewed all programs to determine if the classes required in programs were appropriate to the degree awarded. This review was conducted by college personnel and did not include industry experts.

Farm Management/Agricultural Mechanics Review

In December of 2006, the NDSCS Agriculture Department faculty initiated a curriculum review process to determine if the current course content continued to meet the needs of graduates. The faculty decided to seek the assistance of an outside facilitator to design and conduct the curriculum review. It was determined that an interactive group process using subject matter experts would provide the best means for collecting data in a timely manner. The faculty created a list of regional agricultural producers who own, operate, and manage cutting-edge operations. Seven of the farmers agreed to come to campus on December 20, 2005 to participate in the curriculum review process. They were paid a one hundred dollar stipend to help defray their expenses. A discussion of the results of their work follows.

Purpose Statement

The purpose of this project was to review the Farm Management curriculum at the North Dakota State College of Science (NDSCS) to determine if current curriculum content provides the knowledge and skills needed to be an entry-level farm manager in a contemporary farming operation. The study was guided by the following questions:

1. What would a graduate from a two-year college farm management program need to know and do to successfully begin a career as a farm manager?

2. What are farm managers doing more of today than they did ten years ago and what are they doing less of today than they did ten years ago?

3. What specific modifications to curriculum content need to be made to meet the knowledge and skill needs of a graduate entering a career as a farm manager?

Methods

The nominal group technique was selected for this curriculum review. Witkin & Altschuld (1995) stated that "(g)enerally, 6 to 10 people participate in a group whose main purpose is to produce a large number of ideas in a relatively short period of time" (p. 167). The faculty identified and invited individuals considered progressive in the use of contemporary, leading edge farming practices and considered by others to be expert managers. Seven area farm managers accepted the invitation and participated in the curriculum review conducted on December 20, 2005. All of the participants had more than 15 years of management experience. Three of the seven participants were graduates of the NDSCS farm management program. All of the participants were engaged in crop production and two of the participants were engaged in livestock production. Program faculty were not part of this curriculum review process. This was done intentionally to eliminate any possibility that faculty member presence might affect the willingness of participant to freely voice their perceptions of the curriculum. However, some faculty were present to welcome the participants prior to the review and visited with the participants over the lunch hour.

Participants were informed that individual answers would be recorded and reported in such a way that anonymity and confidentiality would be protected. The facilitator had an assistant who entered the proceedings into a word processing file and audio recorded the sessions.

The nominal group technique was selected to allow all participants to have equal opportunity to contribute ideas and to limit any possible dominance of discussion by one or more individuals (Witkins & Altschuld, 1995). The group process was completed in seven hours.

Participants were asked, “What would a graduate from a two-year college farm management program need to know and do to successfully begin a career as a farm manager?” The participants were asked to work independently to record their responses to the question. After recording their responses, the individuals work divided into two discussion groups. In the discussion groups, the individuals presented their responses and collectively compiled a group list of responses to the question. The two discussion groups were then combined and their listed items were recorded on the white board to create a master list of responses. The master list was then analyzed to eliminate redundant items, combine similar ideas, and rephrase items to clarify meaning. After the master list was edited, the participants were asked to study the list and asked to identify ten items on the list that they considered to be “Extremely Important” knowledge or skills needed by a new farm management graduate. Participants then checked the items on the board to indicate their selections.

Findings

Study question 1: What would a graduate from a two-year college farm management program need to know and do to successfully begin a career as a farm manager?

The participants indicated that extremely important knowledge and skills needed by a recent graduate from the program include, risk management, agronomy, financial analysis, and commodity marketing. Other items selected by one or more participants included financing options, use of GPS/field mapping technology, and working with governmental entities. Table 1 lists the items that the participants considered to be “important” knowledge and skills needed by farm management

graduates. The right hand column indicates the number of participants who considered the item to be "extremely important".

Table 1

Important Knowledge and Skills Needed and Those Deemed Extremely Important

Important Knowledge and Skills	Extremely Important*
Risk management– marketing tools, diversification, FSA, insurance.	6
Agronomy	5
Financial analysis – being able to understand it.	5
Marketing– commodity marketing	5
Knowing finance & understanding different options available	4
Knowing how to use technology – GPS/field maps	4
Government – local & state operations	4
Labor management	3
FSA knowledge	3
Insurance – multi-liability, worker's comp, life	3
People contact – interpersonal skills, building relationships, communications	3
Basic mechanical – management skills	2
Weed ID & control	2
Cash flow	2
Ability to find information	2
Financial banking	2
Accounting/bookkeeping	2
Taxes management {re: income, inheritance}	2
Occupational Experience Program (On an operation other than the family business)	2
Think outside the box	1
Fertilizer recommendations	1
Common sense	1
Soil science	1
Diversification – enterprise mix, land use, other income source, maximize asset use, other complementary enterprises (diversification other than crop/livestock mix and rotation)	1
Computer skills	
Work ethics	
Independent thinking	

*not all participants checked ten items

Study questions 2: What are farm managers doing more of today than they did ten years ago and what are they doing less of today than they did ten years ago?

The next step in the review process was to answer the second study question; "What are farm managers doing more of today than they did ten years ago?" and the third study

question; “What are farm managers doing less of today than they did ten years ago?” Each of the participants was asked to divide a sheet of paper into two columns. The left hand column was titled “More of” and the right hand column was titled “Less of”. The participants were asked to work independently to list the things that they were doing *more of* or *less of* than they were ten years ago. The facilitator asked each participant to report items in a round-robin sequence and added the item to a master list on a flip chart that was also divided into two columns similar to the participants’ paper. After all items had been recorded on the flip chart, the participants were asked to pick three items in each column that they believed best related to their experience. Participants then approached the flip chart and checked three items on each side of the flip chart (“More of and Less of”) to indicate the items that they believed best represented their experience.

The farm managers indicated that the three top items they were spending more time dealing with include financing, marketing, and insurance. Other items identified by the participants included GPS/field monitors, Farm Service Administration, and labor management. The items on which they were spending less time included crop scouting, repairs and maintenance, hired help, and time on tractors. Table 2 contains the participants’ responses to study questions two and three and the number of check marks (votes) that each of the items received.

Study question 3: Curriculum content and recommendations for change

In the next step of the study, the participants were asked to consider the items in Table 1 and provide additional details on what topics of study would provide the needed knowledge and skills for beginning farm managers. The nominal group process was used to develop a list of topics that the participants considered to be important. During this process, participants were not asked to indicate (vote) for the listed items. The facilitator took care to include in the list only those items that received group consensus.

Table 2

What Farm Managers are Doing More or Less of Than Ten Years Ago. Listed by Number of Top Three Check Marks (Votes) of Participants

More of	**Top Picks***	**Less of**	**Top Picks***
Financial/banking	7	Crop scouting	5
Marketing	6	Mechanical skills (repairs and maintenance)	4
Insurance	4	Hired help	3
GPS field monitors	2	Time on tractors	2
Farm service admin	2	Weed control	
Labor management	1	Diversification (crops/livestock)	
Computer skills			
Custom hire			
Local government interaction			
Cash flow, Financial management and analysis			
Researching information			

*Note: not all participants picked three items

The recommended topics for each of the important knowledge and skill areas are listed in the Appendices Tables A1 through A6. Table A1 contains the recommended concepts and strategies for financial analysis. Table A2 contains the recommendations for commodity marketing. Table A3 shows recommended concepts and strategies for agronomy. A list of concepts and strategies for risk management/insurance is presented in Table A4. Table A5 provides a list of concepts and strategies for agricultural technologies. And finally, Table A6 presents a list of concepts and strategies for government interaction.

The final step in the curriculum review process was to provide general recommendations for curriculum changes. Participants were given the program of study for the farm management program and each of the courses in the program were discussed. Course syllabi were reviewed to understand course objectives and outcomes. The Agriculture Department Chair was consulted for specific questions that could not be answered by reviewing the program of study or course syllabi. The participants were asked to discuss and formulate general curriculum recommendations based on the concepts and strategies

identified in the previous activities and the program of study. The facilitator took care to record only those items that had group consensus. A summary of general curriculum recommendations is listed in Table 3 in an unranked sequence.

Table 3

List of Unranked General Curriculum Recommendations

Curriculum Recommendations
Keep the Agricultural Economics 2 cr. class
Teach accounting in Farm Accounting I and Farm Accounting II courses (it will free-up credits and time) (have students work in class on practice sets - not home farm records) (it was considered important to experience alternative record data sets than those in the home operation)
Move to a computerized farm accounting system
Stress the importance of financial analysis (important, must be stressed)
Reduce amount of time on Farm Mechanics (only minor mechanical work and troubleshooting is performed on farms, the rest is taken to dealers)
Teach only the basics of engine theory, not in-depth mechanics.
Keep the AC electricity course
Incorporate DC into another basic mechanics course. (don't need a whole course in it)
Welding is okay the way it is for now (do not increase the time spent on it)
Require a course in Insurance
Move world food crops to an elective
Develop a course on Governmental Impact on Farming (Local and State Gov't.)
Agricultural Marketing must be Required
Keep the livestock elective courses and note earlier livestock technology comments.

Department Response to Curriculum Review

The facilitator provided the Agriculture Department with a summative curriculum review report two days after completion of the review. This short turn around time allowed members of the agriculture department to process the data before the beginning of spring semester.

Before any new courses can be added in a program at NDSCS, the North Dakota University System Articulation and Transfer Coordinator must verify that no duplication in course numbers exists. This means that all of the colleges and universities that offer agriculture must review new course syllabi and communicate their approval to the coordinator, who must in turn notify our campus with his endorsements. This was done by email on January 31, 2006.After the NDSCS Agriculture Department reviewed the recommendations and suggestions found in the curriculum review summative report, it chose to propose changes to the Farm Management/Agricultural Mechanics program. These changes were submitted to the NDSCS Curriculum Committee members on January 31, 2005. The full committee met on February 14, 2006 and approved the changes as submitted. Details of the submitted changes are discussed below. A summary of all approved changes in required and elective courses is shown in Table 4.

Drop Course from Program and Catalog: (Effective Fall 2006)

AGEC 142 *Agricultural Accounting* – 3 credits

Reason: The agriculture department recently conducted a curriculum review of the Farm Management/Ag Mechanics program. A stratified group of seven agricultural producers from a variety of different types of farms reviewed and made suggestions to an unbiased facilitator regarding program curriculum. One of the significant changes they suggested was to drop AGEC 142 and in its place offer AGEC 145. This allows that to happen.

AGEC 242 *Intro to Ag Management* – 3 credits

Reason: The agriculture department recently conducted a curriculum review of the Farm Management/Ag Mechanics program. A stratified group of seven agricultural producers from a variety of different types of farms reviewed and made suggestions to an unbiased facilitator regarding program curriculum. One of the significant changes they suggested was the dropping of AGEC 242 and in its place offer AGEC 243. This allows that to happen.

AGEC 249 *Computerized Farm Recordkeeping* – 2 credits

Reason: As the result of the Curriculum Review, area farm managers indicated a significant need to improve and change overall content of the Farm Management/Ag Mechanics program. The elective course, Computerized Farm Recordkeeping, was not taught for several academic years due to low enrollment. In order for students to obtain the necessary background in this area, computerized farm recordkeeping will be included in AGEC 145.

ASM 278 *Machinery Principles & Management* – 3 credits

Reason: The agriculture department recently conducted a curriculum review of the Farm Management/Ag Mechanics program. A stratified group of seven agricultural producers from a variety of different types of farms reviewed and made suggestions to an unbiased facilitator regarding program curriculum. One of the recommendations of this group was to drop this class and expand the content of DTEC 122. The group felt that there was too much redundancy in having both offered and required.

Drop Course from Program: (Effective Fall 2006)

MATH 135 *Applied Mathematics* – 2 credits

Reason: The Ag Department wishes to provide students with the opportunity to take as many meaningful agricultural management and production courses as possible during their college stay. To facilitate this and still comply with the A.A.S. degree graduation requirements, MATH 135 will be dropped.

Change Course Status from required to elective classes: (Effective Fall 2006)

PLSC 110 *World Food Crops* – 3 credits

PLSC 223 *Introduction to Weed Science* – 3 credits

Reason: The agriculture department recently conducted a curriculum review of the Farm Management/Ag Mechanics program. A stratified group of seven agricultural producers from a variety of different types of farms reviewed and made suggestions to an unbiased facilitator regarding program curriculum. One of

the recommendations of this group was to consider PLSC 110 and PLSC 223 as elective courses, not required ones.

DTEC 115 *Introduction to Medium & Light Duty Engines* – 4 credits

DTEC 112 *Introduction to Diesel Engines* – 3 credits

DTEC 101 *Electrical Systems* – 2 credits

Reason: The agriculture department recently conducted a curriculum review of the Farm Management/Ag Mechanics program. A stratified group of seven agricultural producers from a variety of different types of farms reviewed and made suggestions to an unbiased facilitator regarding program curriculum. One of the suggestions was to not require the current amount of mechanics classes that are being required. At this time the department must continue to offer these courses to current and future students enrolled in Ag Mechanics Sales and Service program and NDSU's Agricultural Systems Management program. We also recognize that some students may wish to take these classes and electives as they feel they are relevant to their career goal. Giving students more elective choices also will eliminate the crowding in the Diesel Technology courses that have caused the agriculture program to have an enrollment cap placed on it.

New Courses Added: (Effective Fall 2006)

AGRI 123 *Rural Government* – 3 credits

Reason: The agriculture department recently conducted a curriculum review of the Farm Management/Ag Mechanics program. A group of seven agricultural producers from a variety of different types of farms reviewed and made suggestions to an unbiased facilitator regarding program curriculum. Creating and adding AGRI 123 was one of the recommendations our panel of content experts felt was needed when they validated our curriculum.

AGEC 145 *Farm Records* – 3 credits

Reason: The agriculture department recently conducted a curriculum review of the Farm Management/Ag Mechanics program. A stratified group of seven agricultural producers from a variety of different types of farms reviewed and made suggestions to an unbiased facilitator regarding curriculum curriculum. One

of the significant changes they suggested was the dropping of AGEC 142 and in its place offer AGEC 145. This change was needed to improve the understanding, application, and creation of records in production agriculture and involve students in computerized recordkeeping using a common software program such as Quicken.

AGEC 243 *Agricultural Financial Analysis* – 3 credits

Reason: The agriculture department recently conducted a curriculum review of the Farm Management/Ag Mechanics program. A group of seven agricultural producers from a variety of different types of farms reviewed and made suggestions to an unbiased facilitator regarding program curriculum. One of the significant changes they suggested was the dropping of AGEC 142 and in its place offer AGEC 243. This change was needed to improve student understanding of balance sheets, income statements, and cash flows. This is needed to better their understanding in management, marketing, and investment decisions in today's farm operations.

AGEC 248 *Introduction to Risk Management and Insurance* – 3 credits

Reason: As the result of the Curriculum Review, area farm managers indicated a significant need to improve and change overall content of the Farm Management/Ag Mechanics program. These experts in Farm Management stated a higher emphasis is needed in understanding principles of loss control, insurance, and financial risk management, as they apply to current farm operations. This proposed course, AGEC 248, meets these needs.

Listed below are the descriptions of the four new courses that were developed by the department as a result of the curriculum review:

1. AGEC 145 *Farm Records*. This is a basic course in farm balance sheets, accounts, inventories, enterprise and production records, and various other financial records. The course also includes but is not limited to crop and feed check, monthly inventory, and

family living expenses. The course will cover paper based as well as computerized farm recordkeeping systems.

2. AGRI 123 *Rural Government*. This class will expose agricultural students to rural governmental agencies which impact farm management decision making. Areas covered include taxation and mill levies, assessment, township government, county government, schools, bonds and referendums, zoning and permits, watershed cost allocation, fuel taxes, and general parliamentary procedure.
3. AGEC 243 *Agricultural Financial Analysis*. This is a basic course in creating and analyzing balance sheets, income statements, cash flows, partial budgets. Students will complete, analyze and interpret various financial ratios using financial information created during the course. The course will also cover investment analysis including but not limited to present values, return on investment, return on assets, return on equity, amortization, debt service, etc.
4. AGEC 248 *Introduction to Risk Management and Insurance*. This course presents principles of loss control, insurance, and financial risk management, as they apply to current farm operations. Basic concepts of financial risk management, crop insurance, property, liability, and disability insurance, life and health insurance, and functional and financial operations of insurers will be examined. Primary emphasis is placed on applying risk management principles to farm operations in order to manage risk exposure and improve financial security and profitability.

Comments and recommendations from the curriculum review will be used when faculty develop the course objectives for each of the new classes that resulted from the review. Members of the Agriculture Department Advisory Committee will be notified as these documents are developed.

Table 4. Program Plan Revisions for the Farm Management Program

Conclusion

The facilitated curriculum review process provided data that led to significant program changes to the Farm Management/Agricultural Mechanics program. These changes also had an impact on other programs offered by the department. Several of the courses that were dropped from the Farm Management/Agricultural Mechanics program were required by other programs. Curricula changes are being developed for the Agricultural Mechanics Sales and Service and Agricultural Transfer programs.

Whenever change occurs, there is always risk and uncertainty. The changes that have been adopted as a result of the curriculum review in Farm Management/Agricultural Mechanics are intended to better prepare graduates to meet the challenges of production agriculture.

Does this mean that all the work is done? What it seems to indicate is that there is more work to do based on what was learned during this process. The question of animal science coursework came up during this process. NDSCS Enrollment Services recruiters indicate that the most requested coursework centers around animal science – both large and small animals. A request to expand our department by an additional full-time instructor to develop and deliver animal science courses is underway.

Table A1

List of important Concepts and Strategies for Financial Analysis.

Concepts and Strategies	Concepts and Strategies
Computerized bookkeeping/accounting	Analyze trends
Income statement account & cash	Lease vs. buy
Profit loss percentages	Amortization tables
Net worth statement	Net present values
Debt to equity	Payment structure
Working capital	Calculate break-even
Interest to sales	Debt structure
Asset turnover index	Short and long term
Enterprise analysis	Re-payment capacity
Balance sheet	Adding a new enterprise
Cash flow/budgeting	What if planning
Financial accountability	Accounting software
Credit card debt	Depreciation

Table A2

List of Concepts and Strategies for Commodity Marketing

Concepts and Strategies	Concepts and Strategies
Basic understanding of how the market works	Options
Hedging vs. speculating	Spreads – carrying charge vs. inverted market
Basis	Rolling of contracts
Forward contracting	Calculating break-even
Non-agr. influences on the markets	Writing marketing plan
Charting	Case problem for sample farm
Technical trend vs. fundamental trend	Risk management – CRC APH LRP
Calculating commodity handling costs	Calculating storage & interest costs

Table A3

List of Concepts and Strategies for Agronomy

Concepts and Strategies	Concepts and Strategies
Fertilizer recommendations	Application rates
Calculation of cost/unit	Calibration of equipment
Weed ID	Soil chemistry
General understanding of crop chemicals	PH
Types of chemical interactions	Salinity
Application types of chemicals	Organic matter
Calculating active chemicals in ingredients dry & wet	Affects of compaction
Chemical labels	Reading a soil test
Matching variety characteristics to soil types etc.	Influence of tillage on soils
Applicators license test	Use green house for
Crop diseases & pests	seed depth
	common deficiencies identification
	plant stages of growth
Rectangular survey system	Crop rotation

Table A4

List of Concepts and Strategies for Risk Management/Insurance

Concepts and Strategies
Insurance should be taught in the context of production agriculture
crop
life
health
health savings accounts
disability
workman's comp
farm liability
auto

Table A5

List of Concepts and Strategies for Agricultural Technologies.

Concepts and Strategies	**Concepts and Strategies**
Variable rate technology	Exposure to current systems
-seeding	Case IH
-fertility	JD
Yield monitors	Beeline
	Trimble
GPS	Surveying
yield mapping	topography mapping
varieties, fertility, and drainage analysis	Livestock
Economics of using technology	ultrasound
Auto steer	radio frequency
	backfat
	marbling
	carcass yield

Table A6

List of Concepts and Strategies for Government.

Concepts and Strategies	**Concepts and Strategies**
Roberts Rules of Order	Real Estate Taxes and mill levy
Principles of Taxation	Watershed
Assessment	Local and county taxation: How are these taxes determined and how are the revenues used?
Basic understanding of township, county, and schools	Reading Plat books
Bond vs. referendum	Zoning & permits
Use permits	Fuel tax – how the fuel tax revenue is used.