

Meeting Minnesota's Workforce Needs:

Agriculture Occupations in Minnesota

July, 2012



Minnesota
STATE COLLEGES
& UNIVERSITIES

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AGRICULTURE OCCUPATIONS IN MINNESOTA

INTRODUCTION

This report provides context for conversations about alignment of Minnesota State Colleges and Universities academic programs with workforce needs. The concept of workforce alignment includes four distinct dimensions:

- (1) **Understanding** of the workforce needs of business and industry.
- (2) **Supply and demand alignment:** Is there currently (or is there likely to be in the future) a substantial difference between the supply and demand for program graduates? Supply and demand also considers:
 - *Geography:* Are programs offered in the appropriate locations?
 - *Educational Level:* Are graduates prepared with the appropriate degree (certificate, associate, baccalaureate or graduate)?
- (3) **Skill and knowledge alignment:** Does curriculum (e.g., learning outcomes, soft skills, tools and technology) meet industry needs? Are program graduates adequately prepared for jobs related to their training?
- (4) **Market and occupational awareness:** Are current and prospective students aware of market demand and occupational requirements?

This report provides background on the supply and demand (dimension #2). Regional meetings will review supply and demand data, and collect information on industry needs, as well as skill and knowledge gaps (dimensions #1 and #3). The MnSCU system office has other initiatives aimed at increasing student awareness (dimension #4).

EXECUTIVE SUMMARY

GROUP #1: AGRICULTURAL MECHANICS AND EQUIPMENT

- There were 12 new graduates in Agriculture Mechanics and Equipment related programs in 2009-2010, representing only a small fraction of the projected 173 new workers needed each year from 2010-2020. Nationally, however, these occupations typically require a high school diploma or equivalent. It is likely that the number of postsecondary program completers do not represent the total supply of workers for this group, prohibiting definitive statements about supply/demand alignment.
- Graduates in these programs are being prepared with either a short-term certificate or an associate degree. People with postsecondary training may be more competitive for these jobs than those with just a high school diploma.
- Minnesota's capacity to produce agricultural mechanics appears to be low. Awards for 12 graduates from just one program were conferred in this group.

GROUP #2: ANIMAL SCIENCE

- There were 103 new graduates in Animal Science programs in Minnesota in 2009-2010—more than twice the number needed to fill the projected annual openings for workers in these occupations (37). However, since graduates from Animal Science programs may go on to work in a variety of settings, or may continue their education in veterinary medicine, this suggests that the oversupply may not be as significant as the numbers suggest.
- Nearly all postsecondary program completers in Animal Science earned a bachelor's degree. These graduates may be going on to work in a variety of settings that require a four-year degree, or some may go on to veterinary medicine programs.
- Minnesota's capacity to produce animal science-related professionals appears to be low. Just two programs educated 103 students in 2009-2010. On the other hand, it appears these programs are more than adequately supplying the market.

GROUP #3: FARM BUSINESS OPERATION AND MANAGEMENT

- There were 488 graduates of diverse programs related to Farm Business Operation and Management in 2009-2010. The projected annual demand for workers in this group is much higher—1,840. However, because about half of the occupations in this group require no

postsecondary training, postsecondary program completer data alone cannot support definitive statements about shortages in this group of occupations.

- About 85 percent of graduates from Farm Business Operation and Management programs earned short-term certificates and associate degrees. Just 12.3 percent of completers earned a bachelor's degree and 2.9 percent earned an advanced degree. Given the educational requirements of these occupations, students are being trained at the appropriate educational level.
- Minnesota's capacity to produce Farm Business Operation and Management professionals is adequate. Ten programs from across the state educated 488 graduates in this group.

GROUP #4: PLANT AND SOIL SCIENCE

- In all, there were 60 completers in the group of programs related to Plant and Soil Science occupations. This represents less than half of the projected annual demand (137), suggesting a slight undersupply of workers in this category.
- Graduates of Plant and Soil Science programs appear to be trained at the appropriate educational level. More than half of the completers in this group earned bachelor's degrees, 35 percent earned advanced degrees, and 10 percent earned associate degrees.
- Minnesota's capacity for producing Plant and Soil Science graduates appears low. Just four programs educated all 60 graduates, with two programs accounting for 80 percent of all graduates.

GROUP #5: FOOD SCIENCE AND TECHNOLOGY

- There were 34 graduates in Food Science related programs in 2009-2010. This represents just one-quarter of the supply needed to fill the projected 136 openings in this group each year, suggesting an undersupply of workers in this group.
- More than half of all completers in Food Science disciplines earned bachelor's degrees, while another 26.5 percent earned advanced degrees. Since the national educational requirement for Food Science occupations is a bachelor's degree, this level of training is appropriate. Advanced degree earners may be slightly more competitive for jobs than those with less education.
- Minnesota's capacity for producing Food Science graduates appears low. Just three programs educated all 34 graduates, with one program accounting for more than 80 percent of all graduates.

A DESCRIPTION OF SUPPLY AND DEMAND MEASURES

SUPPLY. Supply of workers for a particular occupation in a region is measured as the *number of recent program graduates from related training programs in the region*. This includes graduates from all private and public postsecondary institutions in the state. When applicable, graduates from neighboring states' border counties also are included. This measure includes only one source of supply: recent program graduates in the region.

Other sources of supply are not included here: (1) recent program graduates from other regions or states, (2) people employed in related occupations in the current region, other regions or other states, (3) part-time employees who switch to full-time employment, (4) returning veterans, (5) apprentices, (6) high school graduates, (7) customized training students and (8) self-employed. Using data about recent program graduates may underestimate the true supply of workers. In other words, if the number of recent program graduates is less than the estimated number of job openings for the same time period, it does not guarantee that there will be a job for every graduate. On the other hand, if the number of graduates exceeds the number of estimated openings, there is reasonably strong evidence that the market is being oversupplied.

DEMAND. Demand for workers in a particular occupation and region can be measured as both *current* and *future* demand. Current demand is measured with the Occupations In Demand (OID) indicator (See the Appendix for a detailed description). The OID score ranges from 1 to 5, with 1 indicating low current demand and 5 indicating high current demand. Job vacancy rates are another way to measure current demand. The job vacancy rate is the number of openings divided by the total employment in the occupation. Future demand is measured by the 2010-2020 occupational projections. Included are (1) growth rate for the occupation over 2010-2020, and (2) projected number of annual openings over the same time period.

For more information on these data sources, please refer to the Appendix of this report.

A NOTE ON AGRICULTURE DEMAND DATA

All demand data come from the Department of Employment and Economic Development (DEED). DEED employment surveys count only those Minnesotans working in incorporated firms (establishments covered by Unemployment Insurance law). Many agricultural businesses are small unincorporated farms. Therefore, these agricultural establishments are not reflected in some occupational demand data. In this report, the occupation most likely to be affected is Farmers, Ranchers, and Other Agricultural Managers, as most of these workers are self-employed.

In what follows, we have mitigated this problem by relying on DEED's projections data for employment estimates. The projections program corrects for employment undercounts by supplementing with other sources of data that include unincorporated establishments. The estimates of 2010 employment and 2010-2020 percent growth, and 2010-2020 average annual openings are all adjusted to include self-employed, unincorporated workers. The Occupations In Demand (OID) measure is similarly corrected. Therefore, the only two data elements which are potentially affected by this problem are wages and job vacancy rates, as noted in the tables below. Supply data are not affected by these undercounts.

DESCRIPTION OF OCCUPATION AND PROGRAM GROUPS

Labor market experts have selected and grouped critical occupations on the demand side with related training programs on the supply side to represent supply and demand for targeted sets of labor market activity. It is important to note that not all agriculture-related occupations have been included in this report. Rather, industry experts selected specific occupations to study for the purposes of the summer 2012 meetings.

Future work will add new occupation-training groups and build upon processes developed through these meetings. Eventually, all occupation-training groups will be analyzed to inform program planning by the Minnesota State Colleges and Universities system. Tables below summarize the occupations and programs included in each group for the agriculture sector.

GROUP #1: AGRICULTURAL MECHANICS AND EQUIPMENT

Occupation Code	Occupation Title
49-3041	Farm Equipment Mechanics and Service Technicians
49-3042	Mobile Heavy Equipment Mechanics, Except Engines

Program Code	Program Title
01.0201	Agricultural Mechanization, General
01.0204	Agricultural Power Machinery Operation
01.0205	Agricultural Mechanics and Equipment/Machine Technology
01.0299	Agricultural Mechanization, Other

GROUP #2: ANIMAL SCIENCE

Occupation Code	Occupation Title
19-1011	Animal Scientists
25-9021	Farm and Home Management Advisors
45-1011	First-Line Supervisors of Farming, Fishing, and Forestry Workers

Program Code	Program Title
01.0901	Animal Sciences, General
01.0902	Agricultural Animal Breeding
01.0903	Animal Health
01.0904	Animal Nutrition
01.0905	Dairy Science
01.0906	Livestock Management
01.0907	Poultry Science
01.0999	Animal Sciences, Other

GROUP #3: FARM BUSINESS OPERATION AND MANAGEMENT

Occupation	
Code	Occupation Title
45-2093	Farmworkers, Farm, Ranch, and Aquacultural Animals
45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse
11-9013	Farmers, Ranchers, and Other Agricultural Managers
19-1013	Soil and Plant Scientists
45-1011	First-Line Supervisors of Farming, Fishing, and Forestry Workers
19-4099	Life, Physical, and Social Science Technicians, All Other
45-2091	Agricultural Equipment Operators
19-4011	Agricultural and Food Science Technicians
45-2021	Animal Breeders

Program Code	Program Title
01.0000	Agriculture, General
01.0101	Agricultural Business and Management, General
01.0102	Agribusiness/Agricultural Business Operations
01.0104	Farm/Farm and Ranch Management
01.0105	Agricultural/Farm Supplies Retailing and Wholesaling
01.0106	Agricultural Business Technology
01.0199	Agricultural Business and Management, Other
01.0301	Agricultural Production Operations, General
01.0302	Animal/Livestock Husbandry and Production
01.0303	Aquaculture
01.0304	Crop Production
01.0306	Dairy Husbandry and Production
01.0307	Horse Husbandry/Equine Science and Management
01.0308	Agroecology and Sustainable Agriculture
01.0309	Viticulture and Enology
01.0399	Agricultural Production Operations, Other
01.9999	Agriculture, Agriculture Operations, and Related Sciences, Other

GROUP #4: PLANT AND SOIL SCIENCE

Occupation	
Code	Occupation Title
19-1013	Soil and Plant Scientists
19-1022	Microbiologists
19-1031	Conservation Scientists
45-1011	First-Line Supervisors of Farming, Fishing, and Forestry Workers
19-4099	Life, Physical, and Social Science Technicians, All Other

Program Code	Program Title
01.1101	Plant Sciences, General
01.1102	Agronomy and Crop Science
01.1103	Horticultural Science
01.1104	Agricultural and Horticultural Plant Breeding
01.1105	Plant Protection and Integrated Pest Management
01.1106	Range Science and Management
01.1199	Plant Sciences, Other
01.1201	Soil Science and Agronomy, General
01.1202	Soil Chemistry and Physics
01.1203	Soil Microbiology
01.1299	Soil Sciences, Other

GROUP #5: FOOD SCIENCE AND TECHNOLOGY

Occupation Code	Occupation Title
19-1012	Food Scientists and Technologists
19-4011	Agricultural and Food Science Technicians
45-1011	First-Line Supervisors of Farming, Fishing, and Forestry Workers
45-2011	Agricultural Inspectors
51-8099	Plant and Systems Operators, All Other

Program Code	Program Title
01.0401	Agricultural and Food Products Processing
01.1001	Food Science
01.1002	Food Technology and Processing
01.1099	Food Science and Technology, Other

SUPPLY AND DEMAND FINDINGS

GROUP #1: AGRICULTURAL MECHANICS AND EQUIPMENT

TABLE 1A. EDUCATION AND WAGES FOR
AGRICULTURAL MECHANICS AND EQUIPMENT

Occupation Title	National Education Level	Median Wage*
Farm Equipment Mechanics and Service Technicians	High school diploma or equivalent	\$17.80
Mobile Heavy Equipment Mechanics, Except Engines	High school diploma or equivalent	\$24.93
Statewide Average, All Occupations		\$17.77

* Wages do not represent data from unincorporated companies (those not covered by Unemployment Insurance law). This may disproportionately affect wage estimates in agriculture occupations because small agricultural establishments are frequently not included in counts.

- **Education and Wages.** The data in Table 1A indicate that both occupations in the Agricultural Mechanics and Equipment group require relatively low levels of formal education. Based on a national measure of educational requirements, both occupations require a high school diploma or equivalent. In Minnesota, both pay at or slightly above the statewide median wage across all occupations (\$17.77).

TABLE 1B. CURRENT AND FUTURE LABOR DEMAND FOR AGRICULTURAL MECHANICS AND EQUIPMENT

Occupation Title	Current Demand			Future Demand	
	2010 Estimated Employment	Current Occupations in Demand Indicator (5=high)*	Job Vacancy Rate**	2010-2020 Percent Growth	2010-2020 Average Annual Openings
Farm Equipment Mechanics and Service Technicians	1,472	3	1.3%	13.6%	58
Mobile Heavy Equipment Mechanics, Except Engines	2,843	2	0.6%	14.6%	115
Statewide Total - Agricultural Mechanics and Equipment	4,315			14.2%	173
Statewide Total - All Occupations	2,830,000		2.0%	13.0%	104,150

* See the Appendix for more information about Occupations in Demand and all other data cited in this report.

** Job vacancy rates do not include vacancies in unincorporated companies (those not covered by Unemployment Insurance law). This may disproportionately affect vacancy estimates in agriculture occupations because small agricultural establishments are frequently not incorporated.

- **Overall**, the data in Table 1B show a low-to-moderate demand for workers in these occupations.
- **Current demand** is indicated by the first three columns in Table 1B. Current demand is slightly higher for Farm Equipment Mechanics and Service Technicians than it is for Mobile Heavy Equipment Mechanics, Except Engines. With OID rates of 3 and 2, respectively, and vacancy rates lower than the statewide average of 2.0 percent, current hiring demand for workers in these occupations is modest.
- **Future demand** for workers in these occupations is moderate, with growth rates close to the overall statewide average growth rate of 13.0 percent. Combined, these two occupations are projected to need 173 new workers each year between 2010 and 2020. This includes openings due to both new growth and replacement of workers leaving the field.

TABLE 1C. RELATED EMPLOYMENT RATE, BY PROGRAM, 2010
FOR AGRICULTURAL MECHANICS AND EQUIPMENT*

Program	Number of Awards Conferred	Share of Available Graduates Who Found Employment Related to Major
Agricultural Mechanics and Equipment/Machine Technology	1	100.0%
Agricultural Power Machinery Operation	*	**
Statewide Total - Agricultural Mechanics and Equipment	1	100.0%
Statewide Total – Agriculture	431	99.2%

* Includes only graduates of Minnesota State Colleges and Universities system.

** Too few awards to report.

- Related Employment Rates.** The related employment rate shows the share of available MnSCU program graduates who found employment in a job related to their field of study. A high related employment rate would indicate a high demand for these graduates. The data in Table 1C show that only one MnSCU award was conferred in the Agricultural Mechanics and Equipment group in 2010. That graduate found employment related to his or her major.

WORKFORCE SUPPLY

TABLE 1D. NUMBER OF PROGRAM COMPLETERS BY AWARD LEVEL, 2009-2010,
FOR AGRICULTURAL MECHANICS AND EQUIPMENT

Program Title	Certificate (< 2 Years)	Associate	Bachelor's	Advanced Degree	Total
Agricultural Mechanics and Equipment/Machine Technology		9			9
Agricultural Power Machinery Operation	3				3
Statewide Total - Agricultural Mechanics and Equipment	3	9			12

- Number of Completers.** There were 12 completers in 2009-2010 in the Agriculture Mechanics and Equipment group. This represents a small fraction (seven percent) of the 173 new workers needed each year (see Table 1B). However, considering that the national measure of education indicates that workers in this group require a high school diploma or equivalent, it is likely that the total supply is understated in Table 1D. Postsecondary program completer data alone cannot support definitive conclusions about alignment of supply and demand.

TABLE 1E. PERCENTAGE OF PROGRAM COMPLETERS BY AWARD LEVEL, 2009-2010,
FOR **AGRICULTURAL MECHANICS AND EQUIPMENT**

Program Title	Certificate (< 2 Years)	Associate	Bachelor's	Advanced Degree	Total
Agricultural Mechanics and Equipment/Machine Technology		100.0%			100.0%
Agricultural Power Machinery Operation	100.0%				100.0%
Statewide Total - Agricultural Mechanics and Equipment	25.0%	75.0%			100.0%

- Percentage of Completers.** Completers of Agricultural and Mechanics Equipment programs earned either an associate degree (75 percent) or a postsecondary certificate (25 percent). Since these occupations generally require a high school diploma or equivalent, graduates from postsecondary programs may be more competitive for job openings in this field than those without postsecondary training.

TABLE 1F. NUMBER OF AWARDS CONFERRED BY INSTITUTION, 2009-2010
FOR **AGRICULTURAL MECHANICS AND EQUIPMENT**

Institution	Number of Awards Conferred	Percentage of Awards Conferred
South Central College	12	100.0%
Statewide Total - Agricultural Mechanics and Equipment	12	100.0%

- Awards by Institution.** South Central College conferred all 12 postsecondary awards in the Agricultural Mechanics and Equipment group.

GROUP #2: ANIMAL SCIENCE

TABLE 2A. EDUCATION AND WAGES FOR ANIMAL SCIENCE

Occupation Title	National Education Level	Median Wage*
Animal Scientists	Doctoral or professional degree	\$22.78
Farm and Home Management Advisors	Master's degree	\$22.89
First-Line Supervisors of Farming, Fishing, and Forestry Workers	High school diploma or equivalent	\$21.63
Statewide Average, All Occupations		\$17.77

* Wages do not represent data from unincorporated companies (those not covered by Unemployment Insurance law). This may disproportionately affect wage estimates in agriculture occupations because small agricultural establishments are frequently not included in counts.

- Education and Wages.** The Animal Science group includes a diverse set of occupations, with education levels ranging from a high school diploma to a doctoral or professional degree. Wages in this group of occupations exceed the statewide median wage across all occupations.

WORKFORCE DEMAND

TABLE 2B. CURRENT AND FUTURE LABOR DEMAND FOR ANIMAL SCIENCE

	Current Demand			Future Demand	
	2010 Estimated Employment	Current Occupations in Demand Indicator (5=high)*	Job Vacancy Rate**	2010-2020 Percent Growth	2010-2020 Average Annual Openings
Animal Scientists	191			12.6%	10
Farm and Home Management Advisors	75			10.7%	3
First-Line Supervisors of Farming, Fishing, and Forestry Workers	718	3	1.0%	4.5%	24
Statewide Total - Animal Science	984				37
Statewide Total - All Occupations	2,830,000		2.0%	13.0%	104,150

* See the Appendix for more information about Occupations in Demand and all other data cited in this report.

** Job vacancy rates do not include vacancies in unincorporated companies (those not covered by Unemployment Insurance law). This may disproportionately affect vacancy estimates in agriculture occupations because small agricultural establishments are frequently not included in counts.

- **Overall**, there is not enough available data for the Animal Scientist group to make general statements about current demand. Future demand for workers in these occupations is low.
- **Current demand** is indicated by the first three columns in Table 2B. The only occupation for which current demand data are available is First-Line Supervisors of Farming, Fishing, and Forestry Workers. The Occupations in Demand score is 3, indicating a moderate level of current demand. The job vacancy rate of 1.0 percent is below the statewide average of 2.0 percent across all occupations in Minnesota.
- **Future demand** for these workers is very low. All growth rates are slower than the overall statewide rate of 13.0 percent. Across all occupations in this group, there is a projected need for 37 workers annually to fill growth and replacement openings from 2010-2020.

TABLE 2C. RELATED EMPLOYMENT RATE, BY PROGRAM, 2010
FOR ANIMAL SCIENCE*

****Not available—no completers from MnSCU institutions.****

WORKFORCE SUPPLY

TABLE 2D. NUMBER OF PROGRAM COMPLETERS BY AWARD LEVEL, 2009-2010,
FOR ANIMAL SCIENCE

Program Title	Certificate (< 2 Years)	Associate	Bachelor's	Advanced Degree	Total
Animal Sciences, General			99	4	103
Statewide Total - Animal Science			99	4	103

- **Number of Completers.** There were 103 completers in Animal Science, General programs. There were no completers from other related programs that are part of this group (see page 9 for a full list of included programs). This number of completers is nearly three times the number needed to fill the projected annual openings for workers in these occupations (37), as shown in Table 2B. This suggests that the market is somewhat oversupplied. However, as some or many of these graduates may go on to study veterinary medicine—and others may work in settings outside of the Animal Science occupations included above—this could indicate that there may be less of an oversupply than the numbers would suggest.

TABLE 2E. PERCENTAGE OF PROGRAM COMPLETERS BY AWARD LEVEL, 2009-2010,
FOR ANIMAL SCIENCE

Program Title	Certificate (< 2 Years)	Associate	Bachelor's	Advanced Degree	Total
Animal Sciences, General			96.1%	3.9%	100.0%
Statewide Total - Animal Science			96.1%	3.9%	100.0%

- Percentage of Completers.** Nearly all program completers in Animal Science earned a bachelor's degree. Nationally, Animal Scientists require a doctoral or professional degree, indicating that graduates of the Animal Sciences program may need further education to qualify for employment in this occupation. However, as noted above, graduates of this program may work in a variety of settings and/or may go on to study veterinary medicine.

TABLE 2F. NUMBER OF AWARDS CONFERRED BY INSTITUTION, 2009-2010
FOR ANIMAL SCIENCE

Institution	Number of Awards Conferred	Percentage of Awards Conferred
University of Minnesota-Twin Cities	94	91.3%
University of Minnesota-Crookston	9	8.7%
Statewide Total - Animal Science	103	100.0%

- Awards by Institution.** The University of Minnesota-Twin Cities and the University of Minnesota-Crookston trained all 103 completers in the Animal Sciences category in 2009-2010.

GROUP #3: FARM BUSINESS OPERATION AND MANAGEMENT

TABLE 3A. EDUCATION AND WAGES FOR
FARM BUSINESS OPERATION AND MANAGEMENT

Occupation Title	National Education Level	Median Wage*
Agricultural and Food Science Technicians	Associate degree	\$17.62
Agricultural Equipment Operators	High school diploma or equivalent	\$13.79
Animal Breeders	High school diploma or equivalent	
Farmers, Ranchers, and Other Agricultural Managers	High school diploma or equivalent	\$36.85
Farmworkers and Laborers, Crop, Nursery, and Greenhouse		\$11.00
Farmworkers, Farm, Ranch, and Aquacultural Animals		\$10.39
First-Line Supervisors of Farming, Fishing, and Forestry Workers	High school diploma or equivalent	\$21.63
Life, Physical, and Social Science Technicians, All	Associate degree	\$23.64
Sales Representative, Wholesale and Manufacturing, Technical Products	Bachelor's degree	\$38.41
Soil and Plant Scientists	Bachelor's degree	\$29.88
Statewide Average, All Occupations		\$17.77

* Wages do not represent data from unincorporated companies (those not covered by Unemployment Insurance law). This may disproportionately affect wage estimates in agriculture occupations because small agricultural establishments are frequently not included in counts.

- Education and Wages.** The Farm Business Operation and Management group is a diverse set of occupations, including specialties such as farmers and farmworkers, animal breeders, scientists, and sales representatives. Educational requirements (as measured by the national education indicator) range from a high school diploma or equivalent to a bachelor's degree. Wages in this group range from well below to well above the statewide average across all occupations.

TABLE 3B. CURRENT AND FUTURE LABOR DEMAND
FARM BUSINESS OPERATION AND MANAGEMENT

Occupation Title	Current Demand			Future Demand	
	2010 Estimated Employment	Current Occupations in Demand Indicator (5=high)*	Job Vacancy Rate**	2010- 2020 Percent Growth	2010- 2020 Average Annual Openings
Agricultural and Food Science Technicians	687	3		2.3%	25
Agricultural Equipment Operators	1,582	4	0.4%	6.7%	59
Animal Breeders	72			4.2%	2
Farmers, Ranchers, and Other Agricultural Managers	47,719	5		-2.8%	931
Farmworkers and Laborers, Crop, Nursery, and Greenhouse	11,080	5		5.0%	394
Farmworkers, Farm, Ranch, and Aquacultural Animals	1,754	2	8.9%	5.9%	63
First-Line Supervisors of Farming, Fishing, and Forestry Workers	718	3	1.0%	4.5%	24
Life, Physical, and Social Science Technicians, All Others	1,076	2	3.3%	6.0%	51
Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products	7,613	5	4.0%	10.1%	256
Soil and Plant Scientists	694	3	1.5%	10.1%	35
Statewide Total - Farm Business Operation and Management	72,995			0.5%	1,840
Statewide Total - All Occupations	2,830,000		2.0%	13.0%	104,150

* See the Appendix for more information about Occupations in Demand and all other data cited in this report.

** Job vacancy rates do not include vacancies in unincorporated companies (those not covered by Unemployment Insurance law). This may disproportionately affect vacancy estimates in agriculture occupations because small agricultural establishments are frequently not included in counts.

- **Overall**, the data in Table 3B indicate that current and future hiring demand for workers in this group is moderate to high. Demand varies by occupational specialty.
- **Current demand** is indicated by the first three columns in Table 3B. In this group, three occupations have a high current demand (OID is 5): Farmers, Ranchers, and Other Agricultural Managers; Farmworkers and Laborers, Crop, Nursery, and Greenhouse; and Sales Representatives, Wholesale and Manufacturing, Technical and Scientific Products. Sales Representatives have a job vacancy rate of 4.0 percent and Farmworkers and Laborers, Crop,

Nursery, and Greenhouse have a job vacancy rate of 8.9 percent—both of which are well above the statewide average job vacancy rate of 2.0 percent.

- **Future demand** is indicated by projected growth rates and average annual openings shown in the last two columns of Table 3B. Future demand for these occupations varies, but in every occupation, the growth rate is below the statewide average rate of 13 percent. Taken as a group, the growth rate for these occupations is just 0.5 percent, primarily due to one large occupation, Farmers, Ranchers, and Other Agricultural Managers, which is projected to shrink over the next 10 years. On the other hand, this one occupation has a projected need for 931 new workers each year from 2010 through 2020. These openings will be due to the need to replace workers leaving the field. They account for half of all the projected openings in this group over the next 10 years.

TABLE 3C. RELATED EMPLOYMENT RATE, BY PROGRAM, 2010
FOR FARM BUSINESS OPERATION AND MANAGEMENT*

Program	Number of Awards Conferred	Share of Available Graduates Who Found Employment Related to Major
Agribusiness/Agricultural Business Operations	46	97.2%
Agricultural Production Operations, General	75	98.3%
Agriculture, General	**	**
Animal/Livestock Husbandry and Production	22	100.0%
Crop Production	**	**
Farm/Farm and Ranch Management***	257	100.0%
Horse Husbandry/Equine Science and Management	**	**
Statewide Total - Farm Business Operation and Management	412	99.2%
Statewide Total – Agriculture	431	99.2%

* Includes only graduates of Minnesota State Colleges and Universities system.

** Too few awards to report.

*** The vast majority of these graduates were already working as farmers at the time they completed their training.

- **Related Employment Rates.** Table 3C shows the related employment rates of graduates of Farm Business Operation and Management programs. This provides an indication of demand for these graduates. Related employment rates are quite high, suggesting that the vast majority of available graduates are finding work in a field related to their major.

TABLE 3D. NUMBER OF PROGRAM COMPLETERS BY AWARD LEVEL, 2009-2010,
FOR **FARM BUSINESS OPERATION AND MANAGEMENT**

Program Title	Certificate (< 2 Years)	Associate	Bachelor's	Advanced Degree	Total
Agribusiness/Agricultural Business Operations		40	15		55
Agricultural Business and Management, General			8		8
Agricultural Business and Management, Other	1		28		29
Agricultural Business Technology		6			6
Agricultural Production Operations, General	19	54			73
Agriculture, General		6		1	20
Animal/Livestock Husbandry and Production		22			22
Farm/Farm and Ranch Management***	196	65			261
Horse Husbandry/Equine Science and Management	2	3	9		14
Statewide Total - Farm Business Operation and Management	218	196	60	14	488

*** The vast majority of these completers were already working as farmers at the time they completed their training. Therefore, the supply of “new workers” coming specifically from Farm/Farm and Ranch Management programs may be overstated.

- Number of Completers.** There were 488 completers of programs related to Farm Business Operation and Management in 2009-2010. This represents an undersupply—only about one-quarter of the workers needed annually to fill the 1,840 annual growth and replacement openings in this field. Moreover, graduates of Farm/Farm and Ranch Management programs are often farmers who are already employed, suggesting that the true supply of new graduates to fill open positions is even lower. On the other hand, because four of the largest occupations in this group require no postsecondary training (see Table 3A), the completer data in Table 3B may understate the total supply of workers in these fields. Therefore, the graduate completer data alone cannot support definitive statements about shortages in these occupations.

TABLE 3E. PERCENTAGE OF PROGRAM COMPLETERS BY AWARD LEVEL, 2009-2010,
FOR **FARM BUSINESS OPERATION AND MANAGEMENT**

Program Title	Certificate (< 2 Years)	Associate	Bachelor's	Advanced Degree	Total
Agribusiness/Agricultural Business Operations		72.7%	27.3%		100.0%
Agricultural Business and Management, General			100.0%		100.0%
Agricultural Business and Management, Other	3.4%		96.6%		100.0%
Agricultural Business Technology		100.0%			100.0%
Agricultural Production Operations, General	26.0%	74.0%			100.0%
Agriculture, General		30.0%		70.0%	100.0%
Animal/Livestock Husbandry and Production		100.0%			100.0%
Farm/Farm and Ranch Management	75.1%	24.9%			100.0%
Horse Husbandry/Equine Science and Management	14.3%	21.4%	64.3%		100.0%
Statewide Total - Farm Business Operation and Management	44.7%	40.2%	12.3%	2.9%	100.0%

- Percentage of Completers.** The postsecondary program completers in this category are fairly evenly split between short-term certificates and associate degrees. Just 12.3 percent of completers earned a bachelor's degree and 2.9 percent earned an advanced degree. Given the educational requirements shown in Table 3A, the data suggests that students are being trained at the appropriate levels to qualify for these occupations.

TABLE 3F. NUMBER OF AWARDS CONFERRED BY INSTITUTION, 2009-2010
FOR **FARM BUSINESS OPERATION AND MANAGEMENT**

Institution	Number of Awards Conferred	Percentage of Awards Conferred
Northland Community and Technical College	169	34.6%
Ridgewater College	104	21.3%
Minnesota West Community and Technical College	57	11.7%
University of Minnesota-Twin Cities	42	8.6%
Central Lakes College	40	8.2%
South Central College	30	6.1%
University of Minnesota-Crookston	28	5.7%
Rochester Community and Technical College	11	2.3%
Southwest Minnesota State University	6	1.2%
Riverland Community College	1	0.2%
Statewide Total - Farm Business Operation and Management	488	100.0%

- Awards by Institution.** Two institutions produced more than half of the program completers in the Farm Business Operation and Management group: Northland Community and Technical College and Ridgewater College. The state has 10 geographically dispersed institutions that offer programs in this group.

GROUP #4: PLANT AND SOIL SCIENCE

TABLE 4A. EDUCATION AND WAGES FOR
PLANT AND SOIL SCIENCE

Occupation Title	National Education Level	Median Wage*
Conservation Scientists	Bachelor's degree	\$28.71
First-Line Supervisors of Farming, Fishing, and Forestry Workers	High school diploma or equivalent	\$21.63
Life, Physical, and Social Science Technicians, All Other	Associate degree	\$23.64
Microbiologists	Bachelor's degree	\$31.03
Soil and Plant Scientists	Bachelor's degree	\$29.88
Statewide Average, All Occupations		\$17.77

* Wages do not represent data from unincorporated companies (those not covered by Unemployment Insurance law). This may disproportionately affect wage estimates in Agriculture occupations because small agricultural establishments are frequently not included in counts.

- Education and Wages.** Plant and Soil Science occupations require varying levels of educational preparation, from a high school diploma to a bachelor's degree. Median wages for all these occupations are above the statewide median rate (\$17.77), ranging from \$21.63 (for First-Line Supervisors of Farming, Fishing, and Forestry Workers) to \$31.03 (for Microbiologists).

TABLE 4B. CURRENT AND FUTURE LABOR DEMAND FOR PLANT AND SOIL SCIENCE

Occupation Title	Current Demand			Future Demand	
	2010 Estimated Employment	Current Occupations in Demand Indicator (5=high)*	Job Vacancy Rate**	2010-2020 Percent Growth	2010-2020 Average Annual Openings
Conservation Scientists	871	2	0.1%	5.2%	14
First-Line Supervisors of Farming, Fishing, and Forestry Workers	718	3	1.0%	4.5%	24
Life, Physical, and Social Science Technicians, All Other	1,076	2	3.3%	6.0%	51
Microbiologists	314	4	2.4%	17.8%	13
Soil and Plant Scientists	694	3	1.5%	10.1%	35
Regional Total - Plant and Soil Science	3,673				137
Statewide Total - All Occupations	2,830,000		2.0%	13.0%	104,150

* See the Appendix for more information about Occupations in Demand and all other data cited in this report.

** Job vacancy rates do not include vacancies in unincorporated companies (those not covered by Unemployment Insurance law). This may disproportionately affect vacancy estimates in Agriculture occupations because small agricultural establishments are frequently not included in counts.

- **Overall**, the data in Table 4B indicate a low to moderate demand for workers in the plant and soil science group.
- **Current demand**, indicated by the first three columns in Table 4B, is low to moderate for all occupations in this group. Microbiologists have the highest Occupations In Demand score (OID = 4), suggesting relatively high current hiring demand. Life, Physical, and Social Science Technicians, All Other, have the highest vacancy rate in this group (3.3 percent) which is slightly higher than the statewide average of 2.0 percent.
- **Future demand** for these workers is expected to be low (see the two right columns of Table 4B). While the ten-year projected growth rate for Microbiologists is much higher than the overall average of 13.0 percent, this represents an annual need for only 13 new workers in this occupation to fill growth and replacement openings. In total, there is a projected annual need for 137 new workers in the Plant and Soil Science group.

TABLE 4C. RELATED EMPLOYMENT RATE, BY PROGRAM, 2010
FOR PLANT AND SOIL SCIENCE

****Not enough data to report Related Employment Rates.****

WORKFORCE SUPPLY

TABLE 4D. NUMBER OF PROGRAM COMPLETERS BY AWARD LEVEL, 2009-2010,
FOR PLANT AND SOIL SCIENCE

Program Title	Certificate (< 2 Years)	Associate	Bachelor's	Advanced Degree	Total
Agronomy and Crop Science		4	2		6
Horticultural Science		2	26		28
Plant Sciences, General			5	18	23
Soil Science and Agronomy, General				3	3
Statewide Total - Plant and Soil Science		6	33	21	60

- **Number of Completers.** There were 60 completers in the group of programs related to Plant and Soil Science occupations. This represents less than half of the projected annual demand shown in Table 4B, suggesting that in spite of the relatively low demand, this group of occupations may be slightly undersupplied in the coming years.

TABLE 4E. PERCENTAGE OF PROGRAM COMPLETERS BY AWARD LEVEL, 2009-2010,
FOR PLANT AND SOIL SCIENCE

Program Title	Certificate (< 2 Years)	Associate	Bachelor's	Advanced Degree	Total
Agronomy and Crop Science		66.7%	33.3%		100.0%
Horticultural Science		7.1%	92.9%		100.0%
Plant Sciences, General			21.7%	78.3%	100.0%
Soil Science and Agronomy, General				100.0%	100.0%
Statewide Total - Plant and Soil Science		10.0%	55.0%	35.0%	100.0%

- Percentage of Completers.** Just over half of the completers in this group earned Bachelor's degrees, consistent with educational requirements shown in Table 4A. Another 35 percent earned advanced degrees and 10 percent earned Associate degrees.

TABLE 4F. NUMBER OF AWARDS CONFERRED BY INSTITUTION, 2009-2010
FOR PLANT AND SOIL SCIENCE

Institution	Number of Awards Conferred	Percentage of Awards Conferred
University of Minnesota-Twin Cities	48	80.0%
University of Minnesota-Crookston	6	10.0%
Ridgewater College	4	6.7%
Century College	2	3.3%
Statewide Total - Plant and Soil Science	60	100.0%

- Awards by Institution.** The University of Minnesota-Twin Cities educated 80 percent of Plant and Soil Science students in 2009-2010. Another 10 percent were educated at the University of Minnesota-Crookston and the remaining 10 percent at Ridgewater and Century Colleges. These four institutions are likely to have an adequate capacity to meet state workforce needs for this occupational group.

GROUP #5: FOOD SCIENCE AND TECHNOLOGY

TABLE 5A. EDUCATION AND WAGES FOR
FOOD SCIENCE AND TECHNOLOGY

Occupation Title	National Education Level	Median Wage*
Agricultural and Food Science Technicians	Associate degree	\$17.62
Agricultural Inspectors	Bachelor's degree	\$23.16
First-Line Supervisors of Farming, Fishing, and Forestry Workers	High school diploma or equivalent	\$21.63
Food Scientists and Technologists	Bachelor's degree	\$34.41
Plant and Systems Operators, All Other	High school diploma or equivalent	\$26.40
Statewide Average, All Occupations		\$17.77

* Wages do not represent data from unincorporated companies (those not covered by Unemployment Insurance law). This may disproportionately affect wage estimates in Agriculture occupations because small agricultural establishments are frequently not included in counts.

- Education and Wages.** The Food Science group includes five occupations that require varying levels of education, from a high school diploma or equivalent to a bachelor's degree. Wages range from \$17.62 (for Agriculture and Food Technicians) to \$34.41 (for Food Scientists and Technologists).

WORKFORCE DEMAND

TABLE 5B. CURRENT AND FUTURE LABOR DEMAND FOR FOOD SCIENCE

Occupation Title	Current			Future	
	2010 Estimated Employment	Current Occupations in Demand Indicator (5=high)*	Job Vacancy Rate**	2010-2020 Percent Growth	2010-2020 Average Annual Openings
Agricultural and Food Science Technicians	687	2		2.3%	25
Agricultural Inspectors	357	4		1.4%	10
First-Line Supervisors of Farming, Fishing, and Forestry Workers	718	3	1.0%	4.5%	24
Food Scientists and Technologists	1,288	5	1.7%	14.4%	71
Plant and Systems Operators, All Other	194			-3.6%	6
Statewide Total - Food Science	3,244			7.1%	136
Statewide Total - All Occupations	2,595,450		2.0%	13.0%	104,150

* See the Appendix for more information about Occupations in Demand and all other data cited in this report.

** Job vacancy rates do not include vacancies in unincorporated companies (those not covered by Unemployment Insurance law). This may disproportionately affect vacancy estimates in agriculture occupations because small agricultural establishments are frequently not included in counts.

- **Overall**, demand in the Food Science group of occupations ranges from low (for example, for Agricultural and Food Science Technicians) to relatively high (for Food Scientists and Technologists).
- **Current Demand.** Current demand is indicated by the data in the first three columns in Table 5B. For these occupations, the Occupations In Demand (OID) score ranges from a low of 2 to a high of 5, suggesting that demand conditions differ across these occupations. Job vacancy rates are only available for two of the five occupations, and are lower than the statewide average of 2.0 percent, indicating low current hiring demand for these two occupations.
- **Future Demand.** Future demand is indicated by the 2010-2020 growth rate and average annual demand, shown in the two right-hand columns in Table 5B. With one exception, future hiring demand will be low. However, projected growth for Food Scientists and Technologists will be more than twice the statewide average, at 14.4 percent. This occupation is expected to generate 71 annual openings over the next ten years, and these openings will comprise more than half of all the openings in this group. Taking all occupations together, there is an annual demand for 136 new workers to fill growth and replacement openings in the Food Science group.

TABLE 5C. RELATED EMPLOYMENT RATE, BY PROGRAM, 2010
FOR **FOOD SCIENCE**

****Not enough data to report Related Employment Rates.****

WORKFORCE SUPPLY

TABLE 5D. NUMBER OF PROGRAM COMPLETERS BY AWARD LEVEL, 2009-2010,
FOR **FOOD SCIENCE**

Program Title	Certificate (< 2 Years)	Associate	Bachelor's	Advanced Degree	Total
Agricultural and Food Products Processing	3	2			5
Food Science			19	9	28
Food Technology and Processing			1		1
Statewide Total - Food Science and Technology	3	2	20	9	34

- **Number of Completers.** There were 34 graduates in Food Science related programs in 2009-2010. This represents a substantial undersupply relative to the projected need for 136 new workers each year (see Table 5B).

TABLE 5E. PERCENTAGE OF PROGRAM COMPLETERS BY AWARD LEVEL, 2009-2010,
FOR **FOOD SCIENCE**

Program Title	Certificate (< 2 Years)	Associate	Bachelor's	Advanced Degree	Total
Agricultural and Food Products Processing	60.0%	40.0%			100.0%
Food Science			67.9%	32.1%	100.0%
Food Technology and Processing			100.0%		100.0%
Statewide Total - Food Science and Technology	8.8%	5.9%	58.8%	26.5%	100.0%

- Percentage of Completers.** More than half of all completers in Food Science disciplines earned bachelor's degrees, while another 26.5 percent earned advanced degrees. According to the national measure of education for Food Scientists, workers in this occupation require a minimum of a bachelor's degree, so students are being prepared at the appropriate educational level. Students with an advanced degree may be more competitive for these jobs.

TABLE 5F. NUMBER OF AWARDS CONFERRED BY INSTITUTION, 2009-2010
FOR **FOOD SCIENCE**

Institution	Number of Awards Conferred	Percentage of Awards Conferred
University of Minnesota-Twin Cities	28	82.4%
Minnesota West Community and Technical College	5	14.7%
Minnesota State University, Mankato	1	2.9%
Statewide Total - Food Science and Technology	34	100.0%

- Awards by Institution.** The vast majority—82.4 percent—of awards in Food Sciences disciplines were awarded by the University of Minnesota-Twin Cities. Just three schools across the state of Minnesota conferred all 34 awards.

APPENDIX: DATA SOURCES

Data Sources

This report quantifies current and projected worker supply and demand. Demand data come from the Labor Market Information Office at the Minnesota Department of Employment and Economic Development (DEED). Supply data come from the Integrated Postsecondary Educational Data System (IPEDS). The Graduate Follow-Up Survey conducted by the Research and Planning unit of the Minnesota State College and Universities system (MnSCU) provides an indicator of both supply and demand. The survey's Related Employment Rate reflects employer demand for completers of a particular program who are available for employment (supply) during the year after their graduation.

Occupation-Program Groups

Occupation-program groups reflect the connections between occupations and instructional programs. Each group is a combination of occupations (Standard Occupational Classification codes and titles) and programs (Current Instructional Program codes and titles). Industry experts created these groups to facilitate data analysis and presentation. Each grouping is designed to reflect real-world movement of people in a defined set of occupations and instructional programs.

Demand Data

Demand data in this report are from the Labor Market Information Office at the Minnesota Department of Employment and Economic Development (DEED).

1. **Education Level** – The level of education information presented in this report is a national indicator of the education that is typically needed in each occupation. This indicator is developed by the U.S. Bureau of Labor Statistics Employment Projections program.
2. **Wages** – Occupational Employment Statistics is a federal-state program between the Bureau of Labor Statistics and state agencies. Wages are updated quarterly. Data included in this report include first quarter 2012 wages.
3. **Employment and Employment Projections** – For the purposes of this report, analysts used estimated 2010 employment and employment projections from DEED's Employment Projections program. Employment projections are developed based on a national trend analysis model. Minnesota's industry and occupational mix are accounted for in the development of projections using Minnesota's Current Employment Statistics data and Occupational Employment Statistics staffing pattern data. Projections compiled by both occupation and industry for the state and for six regional planning areas. These 10-year forecasts are updated every other year: state projections in even number years, and regional projections in odd number years. Data included in this report cover 2010-2020.

It is important to note that the Employment Projections program at DEED corrects for the under sampling of agricultural establishments in other data collection efforts.

4. **Occupations in Demand** – Occupations in Demand lists current career opportunities in a region as determined by regularly updated local labor market demand. The Occupations in Demand list for a region is the group of occupations that ranks highest on a Current Demand Indicator, which measures short-term demand for jobs locally and is calculated on the basis of the Job Vacancy Survey, Occupational Employment Statistics and unemployment data. Occupations in Demand lists are updated semi-annually. Data included in this report were released in June 2012.

Demand Data Limitations

While demand data in this report represent the best and most current information available, they have limitations:

1. Demand data are presented at the occupational level, not the job level. Occupational data rely on the Standard Occupational Classification coding structure, which may miss more detailed nuances, trends and skill needs at the level of the job. They may also omit newly emerging fields that are not yet captured in the classification coding structure.
2. Occupational Employment Statistics data reflect wage and salary workers on payrolls of Minnesota establishments. They do not capture self-employment or micro-businesses, which may not be subject to Minnesota's unemployment insurance system. This may disproportionately affect estimates in agricultural establishments since many of these businesses are small, self-employed or unincorporated organizations.
3. The reliability of projections for individual occupations is subject to error due to the assumptions of the trend analysis method. While the growth and replacement openings in this report are presented as annual averages, in reality, there may be fluctuations in demand from year to year.
4. The reliability of projections also can vary depending on the employment size of the occupation and the geographic area. Projections for large occupations and geographic areas are generally more accurate than for small occupations and small geographic areas.
5. Projected job openings are limited to new jobs created and the replacement openings created when workers die, retire or otherwise permanently leave the occupation. They do not include openings created by employee turnover – when a worker leaves a job at Company A to take a similar job at Company B.

Supply Data

1. Program completers data are from the annual completions component of the Integrated Postsecondary Education Data System, conducted by the National Center for Education Statistics. All postsecondary institutions that have a Program Participation Agreement with the Office of Postsecondary Education in the U.S. Department of Education are required to report data using a web-based data collection system. Unique identification numbers are assigned to postsecondary institutions surveyed. The annual completions component of IPEDS collects number of degrees and other formal awards (certificates) conferred. These data are reported by level (associate, bachelor's, master's, doctorate and first professional), as well as by length of program for some, using the 2010 Classification of Instructional Programs code. Institutions report all degrees and other awards conferred during an entire academic year from July 1 of one calendar year through June 30 of the following year. In this report, data are for completers from July 1, 2009 through June 30, 2010.

Supply Data Limitations

The supply of labor available for job openings is rather difficult to measure because of mobility and skill transferability. The potential supply of labor includes new graduates from related training programs in the labor market or those who could relocate; experienced unemployed workers in the occupation who live in the labor market or who could relocate; employed workers in the occupation who might switch employers; and those who are qualified but currently out of the labor force who could re-enter. Some specific limitations to keep in mind include:

1. This report uses just recent completers of related academic programs in the state of Minnesota. Minnesota may not contain a college or university with the specific related programs within its boundaries, but completers may relocate from a nearby region or a bordering state. While there may appear to be a surplus of supply, only some of the completers will stay in the region while others will move to other states to seek employment.
2. The supply of workers for some occupations may be trained by apprenticeships or alternative training programs, rather than academic programs.
3. In some cases, individuals may begin working with an associate degree but then earn a bachelor's degree. The IPEDS data do not identify the supply of new entrants to the occupation. Other data, such as that compiled by the Board of Nursing, are helpful in counting the number of individuals preparing for first-time licensure.
4. An associate degree can include both those who have completed the first two years of coursework and will transfer to a university to complete a bachelor's degree, as well as those who have completed a program with technical and general education that prepares them to enter the workforce for some occupations.
5. Completer data only measure part of the quantity of the labor supply for an occupation or group of occupations. It does not measure the quality of those applying for the openings.

Employers may be looking for experience or additional skills that the new entrants do not have. So what might appear to be a plentiful supply of labor is actually reduced.

6. Completions data for multi-campus institutions are reported for a single institution address.
7. The IPEDS completions data include second majors. A person who graduates with a double-major will be counted as a completer in both programs.

Related Employment Rate

The related employment rate is based on data collected through the Minnesota State Colleges and Universities (MnSCU) Graduate Follow-Up Survey, conducted annually.

The related employment rate is calculated as the number of survey respondents (MnSCU graduates) who reported working either full-time or part-time in job that was related to their major, divided by the total number of program graduates who were available for employment. "Available graduates" includes those who were employed in a related job, available for work but unemployed, and those who were working in a field unrelated to their major and seeking a related job. It does not include those who were out of the labor force, continuing their education, or whose status was unknown.

The related employment rate gives an indication of the alignment of supply and demand. A low related employment rate could indicate that the market is oversupplied with graduates in a particular major. A high related employment rate could indicate that the demand for these majors is high and the market is under-supplied or balanced.