ND FFA Association

AGRONOMY

CDE Handbook

Purpose

To create interest and promote understanding in agronomy by providing opportunities for recognition through the demonstration of skills and proficiencies.

General Rules

1. The State Agronomy Career Development Event will be held as a part of the ND winter Career Development Events.
2. All participants must meet eligibility requirements for junior high or high school students as outlined in the General Guidelines section of the ND State FFA Career Development Events Guide.
3. Each chapter may enter up to five (5) active members. Team scoring shall be the total of the three highest scores from that chapter. The high team receives the State FFA Plaque and the traveling trophy. The four high team members will also receive travel stipends to attend the National FFA Convention to participate in the National FFA Agronomy CDE.
4. The high individual shall receive a state baby bison trophy and a $250.00 stipend and a travel stipend (if not a member of the high team) from ND FFA Foundation to attend the National FFA Convention.
5. Breaking team ties in the contest - Tie scores in the agronomy event shall be broken using the team score of the Team Event followed by the Plant Identification class followed by the Seed Identification class. If the tie remains unbroken the scores from the wheat seed class will be used, followed by the barley seed class and then the oat seed class. If the tie remains unbroken, the score of disorders, equipment/machinery, insect ID, and soils. High individual tie scores will not be broken.
6. Notes or other printed material may not be used in the event. Clipboards free of notes may be utilized in the Agronomy CDE.
7. Flashlights and magnification devices may be used.
8. The ND State FFA Career Development Events Guide (this publication) shall be the official rules for scoring. Extension bulletins are references that can be used in teaching agronomy.

Event Outline

A. Selection of Seed Grain (placing & reasons) A twelve (12) minute time period is allowed for each class (10 minutes with an additional two-minute warning).

	GRAIN	POINTS
1.	Wheat (hard red spring or durum)	100
2.	Barley	100
3.	Oats	100

B. Crops and Weeds - Seed and Plant Identification A twelve (12) minute time period is allowed for each class (10 minutes with an additional two-minute warning).

1.	15 seed identification	150
2.	15 plant identification	150

C. Grain Marketing

1. Market Grade Description and Evaluation 100
   Hard Red Spring Wheat and/or Durum (paper class)
   A twelve (12) minute time period is allowed for each class (10 minutes with an additional two-minute warning).

D. Pest Management

1. Disorders 100
   Ten samples will be identified according to category, causal agent, and damage location. Pictures must demonstrate how the agent has affected the plant. For example: pictures of nematodes are not acceptable. Rather, the pictures will be of plants affected by nematodes. A twelve (12) minute time period is allowed for each class (10 minutes with an additional two-minute warning).
2. Insect Identification 100
   Ten samples will be identified according to insect name, life cycle, economic impact, and mouth part. Pictures, live specimens, or mounts may be used to identify insects. A twelve (12) minute time period is allowed for each class (10 minutes with an additional two-minute warning).

E. Equipment Management 100
Participants will be required to identify 20 samples from the state equipment list. Samples may appear as actual equipment, scale models, toys, or pictures. Major components that are unique to a certain piece of equipment can also be used. A twelve (12) minute time period is allowed for each class (10 minutes with an additional two-minute warning).

F. Soils 100
The soils practicum will be 10 questions taken from County Soil Survey Reports. The soil survey maps/reports will be provided by contest coordinators at each event. A twelve (12) minute time period is allowed for each class (10 minutes with an additional two-minute warning).

Individual Total Points 1100

G. Team Calculation/Problem Solving 100
Teams will be required to answer a 10-20 multiple choice test dealing with pesticides, fertilizers, land descriptions, and seeding populations. Resources provided for the team activity may include North Dakota Weed Control Guide (www.ndsu.edu/weeds/), cost sheets, seed tag information, pesticide labels, extension bulletins, fertility reports, trail data and application information. Teams will have 30 minutes to complete and should be done before starting or after all other practicums are completed.

Contest Procedures

A. **Seed Grain Classes 300 points** – A crop can be no better than the quality of seed sown. In this section of crop selection, the individual evaluates four (4) samples of grain, identifies factors that affect seed quality and ranks these samples for seed purposes. To place one sample of seed

over another, you must know the seriousness of the various factors and their order of importance. To provide a basis for ranking classes, individual factors are grouped according to their importance, and these groups are ranked. Factors which are to be considered in order of importance with the least serious factors given first are:

Number	Factor	Characteristics
1	Inert Matter	Soil, chaff/straw, sticks, stones, insects/insect parts, rodent contamination, bird contamination.
2	Appearance & Texture	Low test weight, starchiness.
3	Diseases	WHEAT–smut, ergot, blackpoint, scab; BARLEY–smut, blight, ergot; OATS–ergot.
4	Damages	WHEAT – Weathered, heat, sprout, frost, broken, green. BARLEY – Skinned, broken, heat, sprout, weathered. OATS – Hulled, weathered, sprout. (Naked Oats will not be used as a base sample.)
5	Contrasting Classes	Mixtures of: HRSW & Durum;
6	Other Crop Seeds	Rye in wheat; oats in barley; barley in wheat, etc. or any other crop seed mixed in a sample. Note: some grains are not used in seed classes - see official list.
7	Other Weed Seeds	Amounts of seeds classed as "Other Weed Seeds" are present in the sample. Note: See the official list for those seeds that will not be used in seed classes.
8	Low Germination	If a germination percentage is given it will be given for all four samples in the class. If the percentage given is less than 85 percent germination LOW GERMINATION should be identified as a seed quality factor.
9	Restricted Noxious Weeds	See official list
10	Prohibited Noxious Weeds	See official list

Completing the Seed Grain Class Score Card

The participant must learn to identify and name the individual factors (such as starchy kernels or frost damaged seed) and then list such conditions under REASONS on their scorecard. Each factor found in a sample must be specifically identified. (Example – write chaff/straw not inert matter.) Samples of HRSW/Durum will be numbered 11-12-13-14, Barley 21-22-23-24, Oats 31-32-33-34.

There may be from zero (pure) to three (3) factors per pan. All samples will be readily placeable. Samples are to be evaluated by each contestant. Samples must then be placed in accordance with the order of importance by the most serious factor found in each sample. If a sample has no defects, the word pure must be written on the "reasons" line on the scorecard.

No two samples will end with the same worst factor. For example: there may be only one sample of the four that contains any of the seeds designated as prohibited noxious weeds (although that seed sample may have up to three kinds of prohibited noxious weed seeds present). Pure base samples

are a must in preparing judging classes. Any treated seeds should be disregarded as the sample is being judged for seed purposes.

Correct weed and crop names shall be used and shall be those listed in this publication. Correct spelling of weed and seed names according to the official list is recommended. However, points will not be deducted if the word is recognizable. A minimum of six (6) seeds or other identifiable items per factor will be present in each sample. Do not count seeds - the factors will be obvious however they may be difficult to see (example: barley in oats)

Use the minus system for scoring - 15 points per sample. *See attached score card*. Forty (40) points will be allowed for the correct placing using the cut card (attached) as the basis for grading (even cuts). Sixty (60) points (15 per line) will be allowed for reasons. Failure to indicate the correct sample number in each row or to place a sample will result in a zero-placing score. Failure to identify the class will result in a deduction of ten (10) points. The accepted class names are: HRSW or Hard Red Spring Wheat; Barley; Durum; or Oats. If a contestant duplicates two numbers in making his/her placing, the lowest possible score will be used.

Always use the stirring sticks present in each sample, do not use fingers, pencils, or other items. Remove coats and caps so sleeves do not tip pans. Use extra care not to mix the samples or spill the entire sample. A twelve (12) minute time period is allowed for each class (10 minutes with an additional two-minute warning). Placing and reasons scores are added together to give the total score for each class (100 pts).

Specific Seed Class Rules

1. **Inert Matter** – These factors are least serious and detract from the appearance of crop seed but do not affect its quality or germination. Inert material includes soil, chaff/straw, sticks, stones, insects/insect parts, and rodent or bird contamination.
2. **Appearance and Texture** – Starchiness and lack of plumpness contribute to poor appearance and texture of the seed sample. Starchiness is found in wheat samples only and an obvious content of starchy kernels will be present in the sample of HRSW or Durum. If Test Weight is provided, it will be given on all four samples. Any weight given below the minimum test weight for U.S. #1 grade is to be identified as "**low test weight**". Minimum test weights = HRSW - 58, Durum - 60, Barley - 47, and Oats – 36.

3. & 4. **Diseases and Damages**

HRSW & Durum:

- Accepted diseases – blackpoint, scab, smut, and ergot.
- Accepted damages – broken, heat, green, sprout, frost and weathered.

Barley:

- Accepted diseases – blight, ergot, and smut.
- Accepted damages – skinned, broken, heat, sprout, and weathered.

Oats:

- Accepted diseases – ergot.
- Accepted damages – weathered, hulled, and sprouted.

5. **Contrasting Classes** – Contrasting classes of wheat are obvious mixtures of HRSW and Durum.
6. **Other Crop Seeds** – This factor indicates that other crop seeds are mixed in a seed sample. (Such as rye in wheat or oats in barley.) Other crop seeds that could be found in a seed sample include:

Alfalfa	Millet – Proso	Sudangrass
Barley	Wheat – Durum	Sweetclover
Black Turtle Bean	Navy Bean	Triticale
Buckwheat	Oats	Wheat - HRSW
Canola	Pinto Bean	Sugarbeet
Corn	Reed Canarygrass	Sunflower(oil)
Crambe	Rye	Sunflower(non-oil)
Field Pea	Safflower	Yellow Mustard
Flax	Smooth Brome	
Lentils	Sorghum ~~(grain)~~	
Millet – Foxtail	Soybean	

7. **Other Weed Seeds** – This factor includes all other weed seeds not included as Prohibited or Restricted Noxious. (See Official Weed List)
8. **Low Germination** – If germination percentage is provided it will be given on all four samples in the class. Any percent given below the minimum standard germination is to be called **"Low Germination"**. Minimum acceptable percentage for all grains = 85 % germination
9. **Restricted Noxious Weeds** – These include seeds of weeds that are very objectionable in fields or weed seeds that are hard to clean out of crop seed. Under North Dakota State Seed Law, crop seed containing more than specified amounts of these seeds must be labeled accordingly.

Dodder	Quackgrass
Hedge Bindweed	Wild Oats

10. **Prohibited Noxious Weeds** – These are persistent and difficult to control weeds that reproduce by seed or spread by roots or underground stems. Under North Dakota Seed Law, crop seed containing these seeds cannot be sold.

**Absinth Wormwood	Musk Thistle	**Dalmation Toadflax	*Houndstongue (No ID)*
Canada Thistle	Perennial Sowthistle	**Saltcedar	*Palmer Amaranth (No ID)*
Field Bindweed	Russian Knapweed	**Diffuse Knapweed	
Hoary Cress	Spotted Knapweed	**Yellow Starthistle	
Leafy Spurge	**Purple Loosetrife	**Yellow Toadflax	

**only used in Plant ID

B. **Plant and Seed Identification 300 points**

1. Official Weed List (56). Pictures or mounts can be used for plant identification.

Prohibited Noxious Weeds	**Other Weeds (Continued)**
*^Absinth Wormwood	Curly Dock
^Canada Thistle	*Dandelion
*^Dalmatian Toadflax	*Downy Brome
*^Diffuse Knapweed	Eastern Black Nightshade
Field Bindweed	*Erect Knotweed
Hoary Cress	Field Pennycress
^*Houndstongue (No ID)*	Field Sandbur
^Leafy Spurge	*Flixweed
^Musk Thistle	*Foxtail Barley
^*Palmer Amaranth (No ID)*	Giant Ragweed
Perennial Sowthistle	Green Foxtail
*^Purple Loosestrife	Kochia
^Russian Knapweed	Lanceleaf Sage
*^Saltcedar	*Marestail
^Spotted Knapweed	Marshelder
*Yellow Starthistle	Nightflowering Catchfly
*^Yellow Toadflax	Prickly Lettuce
Restricted Noxious Weeds	*Prostrate Knotweed
Dodder	*Prostrate Pigweed
Hedge Bindweed	Redroot Pigweed
Quackgrass	Russian Thistle
Wild Oats	Smartweed (Pennsylvania dropped)
Other Weeds	*Waterhemp
Barnyardgrass	Wild Buckwheat
*Biennial Wormwood	Wild Mustard
Common Cocklebur	Wild Proso Millet
Common Lambsquarters	Wild Sunflower
Common Mallow	Yellow Foxtail
Common Milkweed	
Common Ragweed	

*Plant Identification Only

^ND Noxious Weeds

2. Official Grain and Forage Crops List (35 seeds, 23 plants)

Alfalfa	Reed Canarygrass
Barley - six row	*Russian Wild Rye
*Barley - two row	Rye
**Black Turtle Bean	Safflower
**Buckwheat	Smooth Brome
**Canola	Sorghum
**Corn	Soybean
**Crambe	Sudangrass
***Field Bean	**Sugarbeet
Field Pea	**Sunflower - Non-oil
Flax	**Sunflower - Oil
*Kentucky Bluegrass	Sweetclover
**Lentils	**Triticale
Millet - Foxtail	Wheat - Durum
Millet – Proso	Wheat - HRSW
**Navy Bean	*Wheatgrass, Crested
Oats	*Wheatgrass Slender
**Pinto Bean	**Yellow Mustard

*Plant and seed identification only (not included in seed grain pan classes)

**Seed identification and pan classes only

***In Plant Identification – black turtle bean, navy bean & pinto bean are "field beans". The term "field beans" is not used in seed ID or pan classes

Scoring – 15 plants and 15 seeds will be identified at a value of 10 points per correct answer for a total of 300 points. Any variation from the official list of names will be wrong. Correct spelling is recommended; however, points will not be deducted if the name is recognizable.

Plants and seeds are available to be purchased from Dale Hruby, "Dakota Mounts" dhruby@bis.midco.net or call (701) 222-4683.

C. **Market Grade Description and Evaluation of Spring Wheat and Durum (GRAIN GRADING) 100 points**

- From information provided on a market class Grain Inspection Report contestants will determine grade, subclass, special grade (including dockage and protein %) and the grade determining factor, of five (5) lots of hard red spring wheat and/or durum
- Contestants will compare information given in the Grain Inspection Report to an Official Wheat Grading Chart that will be provided to determine the grade, subclass, and special grade of each lot. They will also express the correct figures (rounded to the nearest tenth of a percent) for dockage in HRSW and durum and protein in HRSW and durum, and then identify the Grade Determining Factor for each lot.

Special Instructions - Grain Grading

- **Grade** - Determined by comparing given percentages from the grain inspection report to the grading chart. If any factor does not meet the minimum test weight or maximum allowed percentage in any grade and does for a lower grade, the grade given to the lot will remain at the lower grade. Grades used are: U.S. No. 1, U.S. No. 2, U.S. No. 3, U.S. No. 4, U.S. No. 5, and U.S. Sample.
- **Subclass** - determined by the charts expressing subclasses based on the percentage of Hard Vitreous Kernels in the lot. Be sure to use the hard-red spring wheat or durum chart that pertains to the lot. Abbreviations as shown in the chart may be used.
- **Special Grade** - give these special grades to the lot if applicable. Write the special grade in the box provided or write None and/or a diagonal slash, in the box provided.
  - Ergoty – contains more than 0.05% of ergot
  - Garlicky – contains more than 2 green garlic bulblets (or an equivalent quantity of dry bulblets) per 1000-gram sample.
  - Infested – infested with live weevils injurious to stored grain.
  - Treated – has been scoured, limed, washed, sulfured, or commercially treated in such a manner that the true quality is not reflected by either the numerical grade or the U.S. sample grade alone.
  - Light Smutty – Wheat that has an unmistakable odor of smut, or which contains 6 to 30 smut balls, portions of smut balls or spores of smut per 250-gram sample.
  - Smutty – contains more than 30 smut balls, portions of smut balls, or spores of smut per 250-gram sample.
- **% Protein** – (HRSW and Durum) Round the amount given in the grain inspection report to the nearest tenth of a percent. (Example: 14.24 = 14.2; 14.25 = 14.3; 14.26 = 14.3; etc.) Protein percentage will be given for hard red spring wheat and durum. If protein is not given for HRSW or durum, write None, a diagonal slash or 0 in the box provided.
- **% Dockage** – Round the amount given in the grain inspection report to the nearest tenth of a percent. (Example: 1.44 = 1.4; 1.45 = 1.5; 1.46 = 1.5; etc.) if percentage of dockage is not given or is zero write No Dock in the box provided or None, a diagonal slash or 0.
- **Grade Determining Factor** – The factor (or factors) that takes the lot to its lowest grade must be identified in the boxes provided. The factor or factors that takes a lot to a lower grade is called the Grade Determining Factor. The Grade Determining Factor maybe written out for clarity or abbreviated according to the following: T.W.= test weight; H.D.= heat damaged; T.K.D.= total kernel damage; F.M.=foreign material; S.B.= shrunken & broken; T.D.= total defects; C.C.= contrasting class; or T.W.O.C= total wheat of other classes, AF = Animal filth, CB = Castor Beans, CS = Crotalaria Seeds, GL = Glass, ST = Stones, UFS = Unknown Foreign Substance, ID =Insect Damage, and TC = Other Materials Total Count

- Also note that in a grain inspection report, the total of T.K.D. + F.M. + S.B. = T.D. Total defects may not be given in the contest but can be found (calculated) by the contestant by adding these three factors.
- If there is more than one factor, determining the grade, all of these factors must be listed.
- If the grade is U.S. No. 1, write None and/or a diagonal slash in the box provided for the grade determining factor.

- **Scoring** – Two (2) points per box are allotted for protein percentage and dockage percentage. All other boxes are worth four (4) points each for a total of 100 points.
  - Failure to write the class name on the score card results in a deduction of ten (10) points. Contests are to write "HRSW" or "Durum" or "HRSW and Durum" on the class name line.
  - If the lot is a sample grade as determined by the grading chart (be sure to read qualifications for this grade) write U.S. Sample or Sample in the grade box provided on the scorecard. *Treated* has no bearing on the U.S. grade number, it is a special grade only. Do not leave any box empty on the scorecard. Use a diagonal slash, the word None, 0, or use No Dock in % dockage. Samples with greater than 10% contrasting classes and wheat of other classes would be considered Mixed Wheat and will not be used in the grain grading class.

Maximum Count Limits of Other Materials

The count of other materials found in a sample will be given on the Market Class Grain Inspection Report card. Counts of materials such as Animal filth, Castor Beans, Crotalaria Seeds, Glass, Stones, Unknown Foreign Substances, and Insect Damage per 100 grams will be given. The chart easily shows that counts that exceed these limits take the sample to "U.S. Sample" grade. If any one factor exceeds the count limit, it must be listed as a "Grade determining factor".

If the total count of any combination of animal filth, castor beans, crotalaria seeds, glass, stones or unknown foreign substances exceeds 4, the sample must be given the U.S. Sample grade and the grade-determining factor would be "Total Count" (or T.C.). The contestant may need to add these counts to determine this factor.

D. **Pest Management**

a. **Disorders- 100 points**

Ten samples will be identified according to category and causal agent. Pictures must demonstrate how the agent has affected the plant or seed.

Causal Category

- Students will evaluate samples and place them in one of three possible causal categories (cultural, biological, environment).
- Cultural – these are production practices taken by the producer. Examples include nutrient deficiencies, tillage practices, herbicide/pesticide application, heat damage, etc.
- Biological – disorders affecting plants will be from living organisms such as fungi, viruses, bacteria, and insects

- Environmental – disorders caused by Mother Nature that could include frost, wind, drought, hail, and flood.

Agents (Potential samples could include)

- Fungus – tan spot, smut, fusarium head blight (scab), fusarium root rot, downy mildew, ergot, leaf rust, and white mold.
- Chemical – damage from herbicide application
- Mechanical – cracked/broken kernels, plant damage from equipment
- Nematodes – soybean cyst nematode
- Viruses – wheat streak mosaic, Barley yellow dwarf
- Insect – soybean aphids, grasshoppers, cutworms, corn rootworm, European corn borer, sunflower weevils, wheat stem saw fly, flea beetle
- Nutritional – nitrogen, potassium, and phosphorus deficiencies
- Frost Damage – damaged plant or seed
- Wind Damage – lodging of field crops
- Drought – limited moisture
- Hail – damaged plants
- Flooding – excessive moisture
- Heat – kernels that are damaged through excessive drying practices
- Bacteria – Goss's Wilt

b. **Insect Identification- 100 points**

Ten samples will be identified according to insect name, life cycle, economic impact, and mouth part.

Pictures, live specimens, or mounts will be used to identify insects. Below is the insect list and characteristics.

This will be the official list used for the ND FFA State Agronomy CDE.

Insect Name	**Economic Impact**	**Life Cycle**	**Mouth Parts**
10. Alfalfa Weevil	V - vegetative Part Destruction	C- complete	C- chewing
11. Aphids	R - removal of plant fluids	I - incomplete	PS-piercing -sucking
12. Armyworm Larva	V - vegetative Part Destruction	C- complete	C- chewing
13. Bean Leaf Beetle	V - vegetative Part Destruction	C- complete	C- chewing
14. Blister Beetle	V - vegetative Part Destruction	C- complete	C- chewing
15. Colorado Potato Beetle	V - vegetative Part Destruction	C- complete	C- chewing
16. Corn Earworm Larva	F - Fruit/Flower Destruction	C- complete	C- chewing

Insect Name	Economic Impact	Life Cycle	Mouth Parts
17. Corn Rootworm larva	V - vegetative Part Destruction	C- complete	C- chewing
18. Cricket	F - Fruit/Flower Destruction	I - incomplete	C- chewing
19. Cutworm larva	V - vegetative Part Destruction	C- complete	C- chewing
20. European Corn Borer Larva	V - vegetative Part Destruction	C- complete	C- chewing
21. Flea Beetle	V - vegetative Part Destruction	C- complete	C- chewing
22. Grain Weevil	F - Fruit/Flower Destruction	C- complete	C- chewing
23. Grasshopper	V - vegetative Part Destruction	I - incomplete	C- chewing
24. Green Lacewing	N - None or Predatory	C- complete	C- chewing
25. Honeybee	N - None or Predatory	C- complete	CL-chewing-lapping
26. Japanese beetle	V - vegetative Part Destruction	C- complete	C - chewing
27. Lady Beetle Larva	N - None or Predatory	C- complete	C- chewing
28. Leafhopper	R - removal of plant fluids	I - incomplete	PS-piercing -sucking
29. Lygus	R - removal of plant fluids	I - incomplete	PS-piercing -sucking
30. Salt Marsh Caterpillar (wooly worm)	V - vegetative Part Destruction	C- complete	C- chewing
31. Scale	R - removal of plant fluids	I - incomplete	PS-piercing -sucking
32. Spider mite	R - removal of plant fluids	I - incomplete	PS-piercing -sucking
33. Stinkbug	R - removal of plant fluids	I - incomplete	PS-piercing -sucking
34. Tobacco/Tomato Hornworm Larva	V - vegetative Part Destruction	C- complete	C- chewing
35. Western Corn Rootworm Beetle	V - vegetative Part Destruction	C- complete	C- chewing
36. Western Flower Thrip	R - removal of plant fluids	C- complete	PS-piercing -sucking
37. Wheat Stem Sawfly	V - vegetative Part Destruction	C- complete	C- chewing
38. White Grub	V - vegetative Part Destruction	C- complete	C- chewing

Insect Name	Economic Impact	Life Cycle	Mouth Parts
39. Whitefly	V - vegetative Part Destruction	I - incomplete	RS-rasping-sucking
40. Wireworm	V - vegetative Part Destruction	C- complete	C- chewing

E. **Equipment Management- 100 points**

Participants will be required to identify 20 samples from the state equipment list. Samples may appear as actual equipment, scale models, toys, or pictures. Major components that are unique to a certain piece of equipment can also be used.

01	Air Compressor/hose	31	Hearing protection
02	Air Seeder (tool and air cart together)	32	Hitch pin
03	Anemometer	33	Hydraulic cylinder/hose
04	Anhydrous tank (with/without applicator)	34	In-line ripper
05	Back pack sprayer	35	Irrigation pivot
06	Bale Wagon	36	Liquid manure tank/applicator (includes draglines)
07	Baler (square or round)	37	
08	Fertilizer broadcast spreader (spinner or air)	38	Dry Manure spreader
09	Chemigation unit for irrigation	39	Moldboard plow
10	Combine (maybe displayed with harvesting head attached)	40	PPE (all equipment)
11	Combine – auger platform with reel	41	Press wheel
12	Combine – belt pickup head	42	Pressure gauge
13	Combine – corn head	43	Pressure regulator
14	Combine – draper head	44	PTO shaft
15	Conveyor/elevator/auger	45	Rotary hoe
16	Disk - Tandem	46	Row crop cultivator
17	Disk chisel	47	Row crop planter (air or gravity)
18	Fertilizer density scale (dry fertilizer)	48	Shovel - field
19	Field cultivator/chisel plow	49	Skid steer
20	Gauge wheel	50	Soil probe
21	GPS receiver	51	Soil sample bag
22	Grain bin/leg	52	Soil thermometer
23	Grain drill (press)	53	Sprayer
24	Grain dryer (not bin)	54	Sprayer nozzle/nozzle body
25	Harvester – forage (maybe displayed with harvesting head attached)	55	Swather
26	Harvester - potato	56	Sweep net

27	Harvester – sugar beets	57	Tensiometer
28	Hand hoe	58	
29	Hay mower/conditioner	59	Tractor – wheeled
30	Hay rake	60	Tractor – tracked type

F. **Soils Practicum- 100 points**
The soils practicum will be 10 questions taken from County Soil Survey Reports. The soil survey maps/reports will be provided by contest coordinators at each event.

G. **Team Calculation/Problem Solving – 100 points**
Teams will be required to answer a 10-20 multiple choice test dealing with pesticides, fertilizers, land descriptions, and seeding populations. Resources provided for the team activity may include North Dakota Weed Control Guide (www.ndsu.edu/weeds/), cost sheets, seed tag information, pesticide labels, extension bulletins, fertility reports, trail data and application information. Teams will have 30 minutes to complete and should be done before starting or after all other practicums are completed.

All agronomy contest cards can be found on the ND FFA website at https://www.ndffa.org/agronomy

Agriculture, Food and Natural Resources Content Standards

Measurements Assessed	Event Activities Addressing Measurements	Related Academic Standards
ABS.01.01. Performance Indicator: Apply micro- and macroeconomic principles to plan and manage inputs and outputs in an AFNR business.		
ABS.01.01.01.c. Create strategies to maximize the efficiency of AFNR business inputs and outputs using microeconomic principles.	Team activity	CCSS.ELA-Literacy.L.9-10.6 CCSS.ELA-LITERACY.L.11-12.6 CCSS.ELA-LITERACY.RST.9-10.4 CCSS.ELA-LITERACY.RST.11-12.4 CCSS.MATH.CONTENT.HSS.ID.C.7 CCSS.MATH.CONTENT.HSS.IC.B.6 Financial Investing: Benchmarks: Grade 12, Statement 9
ABS.01.01.02.c. Analyze the impact of the current macroeconomic environment on decisions related to AFNR businesses.	Team activity	
ABS.01.03. Performance Indicator: Devise and apply management skills to organize and run an AFNR business in an efficient, legal and ethical manner.		
ABS.01.03.01.c. Devise strategies to improve the operation of AFNR businesses using management skills.	Team activity	CCSS.ELA-LITERACY.SL.9-10.6 CCSS.ELA-LITERACY.SL.11-12.6 CCSS.ELA-LITERACY.L.9-10.6 CCSS.ELA-LITERACY.L.11-12.6 CCSS.ELA-LITERACY.RST.9-10.4 CCSS.ELA-LITERACY.RST.11-12.4
ABS.01.03.02.c. Devise management or operational strategies to address and adhere to local, state, federal, international and industry regulations.	Team activity	
ABS.03. Performance Element: Manage cash budgets, credit budgets and credit for an AFNR business using generally accepted accounting principles.		
ABS.03.01.01.c. Develop cash budgets for AFNR businesses.	Team activity	CCSS.ELA-LITERACY.RH.9-10.7 CCSS.ELA-LITERACY.RH.11-12.7 CCSS.ELA- LITERACY.L.9-10.6 CCSS.ELA-LITERACY. L.11-12.6 CCSS.ELA-LITERACY.RST.9-10.4 CCSS.ELA-LITERACY.RST.11-12.4 CCSS.MATH.CONTENT.HSS.IC.B.6
ABS.04.01. Performance Indicator: Analyze characteristics and planning requirements associated with developing business plans for different types of AFNR businesses.		
ABS.04.01.01.c. Demonstrate the application of entrepreneurial skills to conceptualize an AFNR business (e.g., idea generation, opportunity analysis, risk assessment, etc.).	Team activity	CCSS.ELA-LITERACY.L.9-10.6 CCSS.ELA-LITERACY.L.11-12.6 CCSS.ELA-LITERACY.RST.9-10.4 CCSS.ELA-LITERACY.RST.11-12.4 CCSS.ELA-LITERACY.W.9-10.2 CCSS.ELA-LITERACY.W.11-12.2 CCSS.ELA-LITERACY.W.9-10.9

Measurements Assessed	Event Activities Addressing Measurements	Related Academic Standards
		CCSS.ELA-LITERACY.W.11-12.9
ABS.04.01.03.c. Prepare business plans for an AFNR business.	Team activity	
ABS.04.02. Performance Indicator: Develop production and operational plans for an AFNR business.		
ABS.04.02.01.b. Compare and contrast the strengths and weaknesses of operational plans from different AFNR businesses to determine best practices.	Team activity	AFNR Career Cluster – Agribusiness Systems Pathway, Statement 3 CCSS.ELA-LITERACY.ELA-W.9-10.2 CCSS.ELA-LITERACY.W.11-12.2 CCSS.ELA-LITERACY.L.9-10.6 CCSS.ELA-LITERACY.L.11-12.6 CCSS.ELA-LITERACY.RST.9-10.4 CCSS.ELA-LITERACY.RST.11-12.4
ABS.05.02. Performance Indicator: Assess and apply sales principles and skills to accomplish AFNR business objectives.		
ABS.05.02.01.c. Analyze the sales process of AFNR businesses and create methods to suggest improvements.	Team activity	CCSS.ELA-LITERACY.SL.9-10.6 CCSS.ELA-LITERACY.SL.11-12.6 CCSS.ELA-LITERACY.RH.9-10.7 CCSS.ELA-LITERACY.RH.11-12.7 Buying Goods & Services: Benchmarks: Grade 12, Statements 1 Buying Goods & Services: Benchmarks: Grade 12, Statements 3 Buying Goods & Services: Benchmarks: Grade 12, Statements 4 Buying Goods & Services: Benchmarks: Grade 12, Statements 5
ABS.05.03. Performance Indicator: Assess marketing principles and develop marketing plans to accomplish AFNR business objectives.		
ABS.05.03.01.c. Deconstruct and analyze current AFNR marketing plans to determine the effectiveness of implementation of marketing principles and alternative marketing strategies.	Team activity	AFNR Career Cluster – Agribusiness Systems Pathway, Statement 4 CCSS.ELA-LITERACY.L.9-10.6 CCSS.ELA-LITERACY.L.11-12.6 CCSS.ELA-LITERACY.RST.9-10.4 CCSS.ELA-LITERACY.RST.11-12.4 CCSS.ELA-LITERACY.W.9-10.2 CCSS.ELA-LITERACY.W.11-12.2 CCSS.ELA-LITERACY.RH.9-10.7 CCSS.ELA-LITERACY.RH.11-12.7 CCSS.ELA-LITERACY.SL.9-10.6 CCSS.ELA-LITERACY.SL.11-12.6 Buying Goods & Services: Benchmarks: Grade 12, Statements 1

Measurements Assessed	Event Activities Addressing Measurements	Related Academic Standards
		Buying Goods & Services: Benchmarks: Grade 12, Statements 3 Buying Goods & Services: Benchmarks: Grade 12, Statements 4 Buying Goods & Services: Benchmarks: Grade 12, Statements 7
CS.02.01. Performance Indicator: Research geographic and economic data related to AFNR systems.		
CS.02.01.01.c. Evaluate geographic data and select necessary data sets to solve problems within AFNR systems.	Soils	
CS.03.01. Performance Indicator: Identify required regulations to maintain and improve safety, health and environmental management systems.		
CS.03.01.01.c. Evaluate how AFNR organizations/businesses promote improved health, safety and environmental management.	Exam	
CS.03.01.02.c. Construct and implement methods to evaluate compliance with required safety, health and environmental management regulations.	Exam	
CS.03.04. Performance Indicator: Use appropriate protective equipment and demonstrate safe and proper use of AFNR tools and equipment.		
C3.06.04.01.c. Design plans to ensure the use of appropriate protective equipment when using various AFNR tools and equipment.	Exam	
C3.06.04.02.c. Evaluate and select appropriate tools and equipment to complete AFNR tasks.	Exam Machinery identification	
CRP.01.01.02.c. Model personal responsibility in workplace and community situations.	Team activity	
CRP.01.02 Performance Indicator: Evaluate and consider the near-term and long-term impacts of personal and professional decisions on employers and community before taking action.		
CRP.01.02.01.c. Make and defend personal decisions after analyzing their near- and long-term impacts on self and others.	Team activity	
CRP.01.02.02.c. Make and defend professional decisions after evaluating their near- and long-term impacts on employers and community.	Team activity	
CRP.01.02.02.c. Make and defend professional decisions after evaluating their	Team activity	

Measurements Assessed	Event Activities Addressing Measurements	Related Academic Standards
near- and long-term impacts on employers and community.		
CRP.02.02. Performance Indicator: Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.		
CRP.02.02.01.c. Apply technical concepts to solve problems in the workplace and reflect upon the results achieved.	Pest management Team activity	
CRP.04.01. Performance Indicator: Speak using strategies that ensure clarity, logic, purpose and professionalism in formal and informal settings.		
CRP.04.01.02.b. Apply strategies for speaking with clarity, logic, purpose and professionalism in a variety of situations in formal and informal settings.	Team activity	
CRP.04.02. Performance Indicator: Produce clear, reasoned and coherent written communication in formal and informal settings.		
CRP.04.02.02.c. Compose clear and coherent written documents (e.g., agendas, audio-visuals, drafts, forms, etc.) for formal and informal settings.	Team activity	
CRP.04.03. Performance Indicator: Model active listening strategies when interacting with others in formal and informal settings.		
CRP.04.03.01.b. Apply active listening strategies (e.g., be attentive, observe non-verbal cues, ask clarifying questions, etc.).	Team activity	
CRP.07.01. Performance Indicator: Select and implement reliable research processes and methods to generate data for decision-making in the workplace and community.		
CRP.07.01.01.b. Analyze how different research methods are used to generate data in a variety of situations.	Soils Team activity	
CRP.08.01. Performance Indicator: Apply reason and logic to evaluate workplace and community situations from multiple perspectives.		
CRP.08.01.01.b. Apply steps for critical thinking to a variety of workplace and community situations.	Team activity	
CRP.08.01.02.b. Assess solutions to workplace and community problems for evidence of reason, logic and consideration of multiple perspectives.	Team activity	
CRP.08.02. Performance Indicator: Investigate, prioritize and select solutions to solve problems in the workplace and community.		

Measurements Assessed	Event Activities Addressing Measurements	Related Academic Standards
CRP.08.02.02.c. Evaluate and select solutions with greatest potential for success to solve workplace and community problems.	Pest management Team activity	
CRP.11.01. Performance Indicator: Research, select and use new technologies, tools and applications to maximize productivity in the workplace and community.		
CRP.11.01.01.b. Analyze advantages and disadvantages of new technologies, tools and applications to maximize productivity in the workplace and community.	Team activity	
CRP.11.01.02.b. Select, apply and use new technologies, tools and applications in workplace and community situations to maximize productivity.	Exam Pest management Team activity	
FPP.01.02. Performance Indicator: Apply food safety and sanitation procedures in the handling and processing of food products to ensure food quality.		
FPP.01.02.01.c. Identify sources of contamination in food products and/or processing facilities and develop ways to eliminate contamination.	Exam	
NRS.01.01. Performance Indicator: Apply methods of classification to examine natural resource availability and ecosystem function in a particular region.		
NRS.01.01.01.c. Devise strategies for the preservation of natural resources based on their classification.	Soils Team activity	AFNR Career Cluster, Statement 1 AFNR Career Cluster, Statement 2 AFNR Career Cluster - Natural Resources Systems Pathway, Statement 3 STEM Career Cluster, Statement 1 CCSS.ELA-LITERACY.RST.11-12.1 CCSS.ELA-LITERACY.RST.11-12.8 CCSS.ELA-LITERACY.WHST.9-10.2 CCSS.ELA-LITERACY.WHST.11-12.2 CCSS.ELA-LITERACY.WHST.9-10.9 CCSS.ELA-LITERACY.WHST.11-12.9
NRS.01.01.02.c. Conduct analyses of ecosystems and document the interactions of living species and non-living resources.	Exam	AFNR Career Cluster, Statement 1 AFNR Career Cluster, Statement 2 AFNR Career Cluster - Natural Resources Systems Pathway, Statement 3 STEM Career Cluster, Statement 1 CCSS.ELA-LITERACY.RST.11-12.1 CCSS.ELA-LITERACY.RST.11-12.8 CCSS.ELA-LITERACY.WHST.9-10.2 CCSS.ELA-LITERACY.WHST.11-12.2

Measurements Assessed	Event Activities Addressing Measurements	Related Academic Standards
		CCSS.ELA-LITERACY.WHST.9-10.9 CCSS.ELA-LITERACY.WHST.11-12.9
NRS.01.02. Performance Indicator: Classify different types of natural resources in order to enable protection, conservation, enhancement and management in a particular geographical region.		
NRS.01.02.05.c. Evaluate the non-living resources present in an area to determine the best practices for improving, enhancing and protecting an ecosystem.	Soils	AFNR Career Cluster - Natural Resources Systems Pathway, Statement 3 CCSS.ELA-LITERACY.RST.11-12.1 CCSS.ELA-LITERACY.RST.11-12.7 CCSS.ELA-LITERACY.RST.11-12.8 CCSS.ELA-LITERACY.WHST.9-10.2 CCSS.ELA-LITERACY.WHST.11-12.2 CCSS.ELA-LITERACY.WHST.9-10.7 CCSS.ELA-LITERACY.WHST.11-12.7 CCSS.ELA-LITERACY.WHST.9-10.9 CCSS.ELA-LITERACY.WHST.11-12.9 CCSS.MATH.CONTENT.HSN-Q.A.1 CCSS.MATH.CONTENT.HSN-Q.A.2 HS-ESS3-2
NRS.01.05. Performance Indicator: Apply ecological concepts and principles to terrestrial natural resource systems.		
NRS.01.05.04.c. Devise a soil management plan to minimize erosion and maximize biodiversity, plant productivity, and the formation of topsoil.	Soils	AFNR Career Cluster, Statement 1 AFNR Career Cluster – Animal Systems Pathway, Statement 3 AFNR Career Cluster – Natural Resources Systems Pathway, Statement 3 CCSS.ELA-LITERACY.RST.11-12.1 CCSS.ELA-LITERACY.RST.11-12.7 CCSS.ELA-LITERACY.RST.11-12.8 CCSS.MATH.CONTENT.HSS-ID.A.1 CCSS.MATH.CONTENT.HSS-IC.A.1 CCSS.MATH.CONTENT.HSS-IC.B.6 HS-ESS3-4 HS-ESS3-2
PS.01.01. Performance Indicator: Determine the influence of environmental factors on plant growth.		
PS.01.01.01.c. Analyze plant responses to varied light color, intensity and duration and recommend modifications to light for desired plant growth.	Exam	
PS.01.02. Performance Indicator: Prepare and manage growing media for use in plant systems.		

Measurements Assessed	Event Activities Addressing Measurements	Related Academic Standards
PS.01.02.01.c. Formulate and prepare growing media for specific plants or crops.	Exam	
PS.01.02.02.c. Determine the hydraulic conductivity for soil and how the results influence irrigation practices.	Exam Pest management Soils Team activity	
PS.01.03. Performance Indicator: Develop and implement a fertilization plan for specific plants or crops.		
PS.01.03.01.a. Identify the essential nutrients for plant growth and development and their major functions (e.g., nitrogen, phosphorous, potassium, etc.).	Exam Pest management Team activity	CCSS.MATH.CONTENT.HSN.Q.A.2 CCSS.MATH.CONTENT.HSN.Q.A.3
PS.01.03.01.c. Monitor plants for signs of nutrient deficiencies and prepare a scouting report to correct elements negatively affecting plant growth in a field or greenhouse.	Pest management	CCSS.MATH.CONTENT.HSN.Q.A.2 CCSS.MATH.CONTENT.HSN.Q.A.3
PS.01.03.02.c. Adjust the pH of growing media for specific plants or crops.	Exam Team activity	CCSS.MATH.CONTENT.HSN.Q.A.2 CCSS.MATH.CONTENT.HSN.Q.A.3
PS.01.03.03.c. Prescribe fertilizer applications based on the results of a laboratory analysis of soil and plant tissue samples.	Exam Team activity	CCSS.MATH.CONTENT.HSN.Q.A.2 CCSS.MATH.CONTENT.HSN.Q.A.3
PS.01.03.05.c. Devise a plan for soil management for a selected production method.	Exam Soils Team activity	CCSS.MATH.CONTENT.HSN.Q.A.2 CCSS.MATH.CONTENT.HSN.Q.A.3
PS.01.03.06.c. Devise a plan to meet plant nutrient needs based on environmental factors present.	Team activity	CCSS.MATH.CONTENT.HSN.Q.A.2 CCSS.MATH.CONTENT.HSN.Q.A.3
PS.02.02. Performance Indicator: Apply knowledge of plant anatomy and the functions of plant structures to activities associated with plant systems.		
PS.02.02.01.c. Apply the knowledge of cell differentiation and the functions of the major types of cells to plant systems.	Exam	HS-LS1-4
PS.02.02.02.c. Correlate the active and passive transport of minerals into and through the root system to plant nutrition.	Exam	HS-LS1-5

Measurements Assessed	Event Activities Addressing Measurements	Related Academic Standards
PS.02.02.03.c. Evaluate the function of the xylem, phloem and cambium tissues and the impact on plant systems.	Exam	HS-LS1-5
PS.02.02.04.c. Devise a plan for plant management practices that takes into account leaf structure and functions.	Team activity	HS-LS1-5
PS.02.02.05.c. Evaluate flower structures and analyze the impact of plant structure on plant breeding, production and use.	Exam	HS-LS1-4 HS-LS1-5
PS.02.02.06.c. Evaluate the impact of different seed and fruit structures to plant culture and use.	Exam	HS-LS1-4 HS-LS1-5
PS.01.03. Performance Indicator: Apply knowledge of plant physiology and energy conversion to plant systems.		
PS.02.03.01.c. Evaluate the impact of photosynthesis and the factors that affect it on plant management, culture and production problems.	Exam	HS-LS1-5
PS.02.03.02.c. Evaluate the impact of plant respiration on plant growth, crop management and post-harvest handling decisions.	Exam	HS-LS1-5
PS.02.03.05.c. Devise plans for plant management that applies knowledge of transpiration, translocation and assimilation on plant growth.	Exam	HS-LS1-4 HS-LS1-5
PS.03. Performance Element: Propagate, culture and harvest plants and plant products based on current industry standards.		
PS.03.01.01.c. Select and defend the use of pollination methods and practices used to maximize crop pollination.	Exam	
PS.03.01.03.a. Summarize optimal conditions for asexual propagation and demonstrate techniques used to propagate plants by cuttings, division, separation, layering, budding and grafting.	Exam	
PS.03.01.04.a. Define micropropagation, discuss advantages associated with the practice and summarize the main stages of the process.	Exam	

Measurements Assessed	Event Activities Addressing Measurements	Related Academic Standards
PS.03.02. Performance Indicator: Develop and implement a management plan for plant production.		
PS.03.02.01.b. Inspect propagation material for evidence of pests or disease.	Pest management	CCSS.ELA-Literacy.RI.9-10.1 CCSS.ELA-Literacy.RI.9-10.8 CCSS.ELA-Literacy.RST.9-10.3 CCSS.ELA-Literacy.WHST.9-10.2 CCSS.ELA-Literacy.WHST.9-10.4 CCSS.ELA-Literacy.WHST.9-10.9
PS.03.02.02.b. Prepare soil and growing media for planting with the addition of amendments.	Soils	
PS.03.02.03.a. Determine seeding rate need for specified plant population or desired quantity of finished plants.	Team activity	
PS.03.02.04.a. Observe and record environmental conditions during the germination, growth and development of a crop.	Exam	
PS.03.02.04.c. Prepare and implement a plant production schedule based on predicted environmental conditions and desired market target (e.g., having plants ready to market on a specific day such as Mother's Day, organic production, low maintenance landscape plants, etc.).	Team activity	
PS.03.02.05.b. Demonstrate proper techniques to control and manage plant growth through mechanical, cultural or chemical means.	Exam	
PS.03.03. Performance Indicator: Develop and implement a plan for integrated pest management for plant production.		
PS.03.03.01.a. Identify and categorize plant pests, diseases and disorders.	Pest management Identification	
PS.03.03.01.b. Identify and analyze major local weeds, insect pests and infectious and noninfectious plant diseases.	Pest management identification	
PS.03.03.01.c. Devise solutions for plant pests, diseases and disorders.	Team activity Pest management	
PS.03.03.02.b. Predict pest and disease problems based on environmental conditions and life cycles.	Exam Pest management Team activity	

Measurements Assessed	Event Activities Addressing Measurements	Related Academic Standards
PS.03.03.03.c. Employ pest management strategies to manage pest populations, assess the effectiveness of the plan and adjust the plan as needed.	Exam Pest management Team activity	
PS.03.03.04.b. Examine and apply procedures for the safe handling, use and storage of pesticides including personal protective equipment and re-entry interval.	Exam	
PS.03.05. Performance Indicator: Harvest, handle and store crops according to current industry standards.		
PS.03.05.02.b. Evaluate crop yield and loss data and make recommendations to reduce crop loss.	Team activity	CCSS.ELA-Literacy.RST.9-10.3 CCSS.ELA-Literacy.RST.9-10.4 CCSS.ELA-Literacy.WHST.9-10.2a
PS.03.05.03.c. Research laws and apply regulations to ensure the production of plants and plant products that are safe for distribution and use.	Exam Pest management	CCSS.ELA-Literacy.RST.9-10.3 CCSS.ELA-Literacy.RST.9-10.4 CCSS.ELA-Literacy.WHST.9-10.2a