



MURRAY STATE
UNIVERSITY

Hutson School of Agriculture

NACTA Judging
Conference 2019

Crops Contest Official Rules

Saturday, April 13th

Location and Time to Be Determined

Contest Director:

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Contest Rules

1. All official contestants and unofficial participants must be currently enrolled in a two-year or a four-year institution and pursuing an undergraduate degree with a major or minor in agriculture. Two-year and four-year teams will evaluate the same contest components. Separate awards will be made for both team and overall individuals in each division.
2. A school may enter one four-person competing team and its members must be designated prior to the start of the contest. Scores of all four team members will be totaled for the team score.
3. Schools may enter up to six additional official scored contestants to compete for individual awards, but their scores will not count toward the team score.
4. Unofficial unscored participants will also be allowed to experience the contest, however there is a maximum of 10 total persons combined from one school (official team and individual contestants). Unofficial unscored participants are not eligible for awards and their answer forms may not be graded. Unofficial unscored participants must register and pay the same entry fee as required for official contestants.
5. A competing individual may compete in this contest up to two times as an official contestant in a national NACTA Crops Contest. A contestant that placed in the top three in the contest in the previous year is still eligible to compete in the same contest for another year of competition.
6. No communication with contestants or anyone else except superintendents will be permitted once the contest has started. Coaches may not communicate with a team or individuals until the contest is finished. No cell phones, text messaging, or conferring during the contest will be allowed. Contestants observed in violation of this WILL be disqualified from the competition.
7. Contestants must bring a #2 lead pencil and should bring a hand held calculator and clipboard into the contest. If the calculator is programmable it must be cleared of all stored programs. No device capable of sending or receiving wireless messages may be used as a calculator. A hand held magnifying lens may be used in identification and on the lab practical. All other material necessary will be provided. Contestants may not bring notes or reference material of any kind. A list for plant and seed identification, machinery, insects, and diseases will be provided.
8. The superintendents will be responsible for preparation of all contest materials, setting up the contest, providing official keys for scoring, and overseeing the contest operation and scoring of papers. Room supervisors will be assigned to each section of the contest and will be responsible for the operation and conduct of each section. Coaches may be asked to help grade papers during and after the contest.
9. Tie Breakers. Ties for both teams and individual contestants will be broken using the following contest sections: a. lab practical b. plant and seed ID c. math practical d. agronomic quiz
10. Announcements made at the coaches meeting or on the contest day will take precedent over the previously published rules

2019 Crops Contest Description

The contest will be divided into four areas with 600 total points as follows:

- A. Agronomic Quiz (150 points)
- B. Math Practical (150 points)
- C. Lab Practical (150 points)
- D. Plant and Seed Identification (150 points)

One hour will be allowed for completion of each section. Additional descriptions and specific rules for each section of the contest follow and will be considered official for the contest.

A. AGRONOMIC QUIZ

This section will consist of 75 written multiple-choice exam questions worth 2 points each for a total of 150 points. Both general and specific questions will be asked on production of major US grain and forage crops. The International Certified Crop Adviser (ICCA) Performance Objectives will provide an excellent outline of potential topics. They are available from the American Society of Agronomy, 5585 Guilford Road, Madison, WI 53711-5801 (608-273-8080) or website at:

<https://www.certifiedcropadviser.org/exams/icca-performance-objectives>

Topics may include:

- Crop production statistics (major world and U.S. crops) and distribution of US crop production
- Crop classification terms (botanical, growth habit, crop utilization, etc.)
- Crop physiology, growth, and development
- Crop quality and quality evaluation, including typical levels for important quality factors in various grain and forage crops
- Seed and plant morphology and anatomy
- Plant breeding and genetics, including biotechnology and genetic engineering tools and applications
- Seed industry/technology (seed quality, seed certification, testing, processing, treatment, intellectual property rights, etc.)
- Planting (cultivar selection, seeding equipment, planting practices, seed treatment, seeding dates, replanting decisions, etc.)
- Pest problems and pest control (insects, diseases, and weeds, biology/life cycle of major crop pests)
- Herbicide management (classification of herbicides, crop injury symptoms, managing herbicide resistance, herbicide programs, application timing terminology and strategies)
- Pest management alternatives (cultural and biological control practices, IPM principles, pest scouting and monitoring, role of beneficials, etc.)
- Pesticide use and management (pesticide stewardship, safety, restrictions, formulations, adjuvants, trade/common names of major pesticides, etc.)
- Harvesting and storage of grain and forage crops and crop products
- Management of forage crops, including harvest factors and effects on forage quality, comparison of tame pasture systems (grasses, legumes, mixtures), native range management, evaluating forage quality (protein, NDF, ADF, TDN), grazing management, cutting systems.
- Cropping systems and crop rotations.
- Climate and crop environment (light, temperature, and moisture effects on plants, weather and weather patterns, earth's energy balance, climate change, global temperature and CO₂ levels)

- Weather and climate effects on crop production and management decisions
- Basic soil properties (physical, chemical, and biological)
- Soil fertility (nutrient availability, nutrient movement, factors affecting nutrient loss, plant needs for nutrients, soil pH, organic matter, etc.)
- Nutrient management (soil testing, soil test reports/recommendations, fertilizers and fertilization, fertilizer application and nutrient stewardship, four R's - source, rate, timing, placement)
- Managing soil pH, lime and liming, description and management of saline and sodic soils
- Soil water management (irrigation, drainage, erosion, leaching, evapotranspiration, conservation, etc.)
- Tillage and residue management (tillage systems, seedbed preparation, tillage tool selection, etc.)
- Site specific management concepts (GPS, GIS, variable rate technology, guidance, row and boom control, grid sampling, field mapping, sensing technology, UAS technology, NDVI mapping, etc.)
- Managing temperature (effects of cover and tillage on soil temperature, frost prevention, snow and ice)
- Biofuels and biomass production for bioenergy
- Carbon management in agriculture (greenhouse gases, carbon sequestration, carbon credits)

B. MATH PRACTICAL

This section will include mathematical problems related to agronomy. It will be scored on the basis of 150 total points. Answers must be rounded and given in correct units as specified in the problem. Critical information will be given except for commonly known conversion factors. Possible types of problems are listed below:

- Area conversion calculations (Estimate per acre yield from harvest strips or small plots; Calculate areas and yields from irregularly shaped fields; Area covered and time required for given capacity and delivery rate of fertilizer/chemical applicator; Time to complete tillage/harvest operation given area of field, width of equipment, and speed of travel; Obtaining material and cost estimates for fencing materials for given field size; Converting units involving area to corresponding metric units, etc.)
- Pesticide application (Calibrate broadcast or band application given number of nozzles, nozzle spacing, output from one or more nozzles, and distance traveled or intended speed of travel; Find amount of chemical formulation to add to a spray tank to meet product or active ingredient label recommendations given tank size and delivery rate; Calculate costs of pesticide application, etc.)
- Fertilizer/lime application (Spreader calibration given amount delivered in a distance traveled or by turning the drive wheel; Fertilizer application rates given carrier analysis and recommended rates in elemental or oxide form or replacement of nutrients removed by the crop; Prepare bulk blends from given rates and available carriers; Calculate costs of fertilizer/lime application; Compare costs of different fertilizers/lime sources)
- Seeding/Planting (Calibration of row planter or grain drill given amount of seed delivered in a set distance traveled or by turning the drive wheel a certain number of revolutions; Seeding rates, plant population, and percent seed emergence calculations; Calculating PLS and adjusting seeding rates and comparing costs based on PLS)
- Volume calculations (tank capacity, storage volume for hay, grain bin, or silo)
- Unit conversions (English to metric units and vice versa)
- Concentration (ppm, %)
- Harvest (estimating harvest losses, harvest speed, area covered, harvest efficiency)

- Irrigation (application rate for given GPM and area covered, convert gallons to acre-inches)
- Tillage and field operations (time required, field efficiency, cost per acre, labor and fuel costs)
- Pasture carrying capacity (stocking rates based on animal units)
- Soil erosion loss equation
- Soil physical properties (bulk density, % soil moisture, water retention in profile):
- Plant breeding (heritability, % homozygosity, expected genotypic and phenotypic ratios from a cross)
- Water usage (day, season, species)
- Weed competition (seeds/acre, yield loss, spread of resistant weed seed)
- Yield determination and adjustment for % moisture
- Forage quality (protein content, NDF, ADF, TDN, relative feed value)
- Livestock rations (combining forages, grains, and supplements to target protein levels - Pearson square)
- Heat units/growing degree days

C. LAB PRACTICAL

This section will consist of 75 stations worth 2 points each for a total of 150 points. Each station will have photographs or actual samples of various plant materials, fertilizers, pesticides, seed samples, data tables, equipment, insects, diseases, etc. along with specific questions which will require identification, interpretation, calculation, or evaluation of the display material to answer correctly. These stations will represent activities commonly completed in laboratories or field trips in crop production and soil management courses. For example, contestants may have to:

- Identify common crop diseases and disease symptoms (see attached list*)
- Identify common crop insects and insect damage (see attached list*)
- Identify common field machinery and other agronomic equipment (see attached list*)
- * A copy of the lists for the above three sections will be provided during the contest. The final five items on each list are added by the host school each year.
- Recognize classes of pedigreed seed from standard seed tags and interpret information from a seed bag (germination, purity, seed size, noxious weeds, variety or hybrid identification, genetically modified traits, refuge requirements, treatments applied, recommended seeding rates, planter adjustments, etc.)
- Write the commercial grade and grade determining factors for market grain samples given various quality factors and official FGIS grain standards tables
- Identify specific plant and seed structures, crop growth stages, or developmental characteristics on fresh or pressed plant samples
- Recognize common nutrient deficiency symptoms (N, P, K, S, Fe) on both dicot and grass crops
- Recognize common herbicide injury symptoms on weeds and crops and classify based on group number
- Use a soil textural triangle to name soil textural class
- Determine soil texture by feel, distinguish different types of soil structure, determine soil color and relate soil color to soil properties
- Interpret information found in a soil survey or on a soil test report

- Recognize common fertilizer carriers (major nutrient supplied, typical analysis, common name)
- Interpret information on a fertilizer bag or pesticide label
- Recognize common pesticide formulations and their standard abbreviations
- Determine proper sprayer nozzle tip size and type, screens, pressure, etc. for pesticide applications
- Identify and explain the purpose of items such as ag lime, inoculum, talc, seed treatments, soil amendments, etc.
- Identify stored or processed crop products and common livestock feed ingredients made from crops (silage as to type, hay as to type, alfalfa pellets and cubes, soybean meal, cottonseed meal and hulls, wheat bran, corn meal, beet pulp, dried distillers grains, flaked or ground grains, etc.)
- Match various food or industrial products with the crops (or classes of a crop) from which they are made
- Evaluate crop quality by ranking two or more samples of hay, silage, seed, or cotton
- Interpret data from tables or graphs (analyze a variety trial based on the LSD mean comparison statistic, select the proper spray nozzle tip for given conditions from a manufacturer's spraying equipment manual, read a calibration nomograph for a sprayer or planter, interpret crop yield response to different input levels, determine economic threshold from pest counts vs. yield response given control costs, etc.)
- Evaluate various crop production problems from photos, illustrations, or displays.
- Identify or describe common crop production and soil management practices from photos or slides.
- Apply precision ag and site specific management concepts – identify precision ag tools (GPS unit, variable rate control, autosteer, boom and row control, UAS, etc.) assessing variability, analysis and interpretation of maps and data (grid samples, yield maps, aerial imagery, remotely sensed data, NDVI)

D. CROP AND WEED PLANT AND SEED IDENTIFICATION

1. A total of 75 specimens will be identified in a one hour time limit. Each sample will be worth 2 points for a total of 150 points.
2. Contestants must move among stations as directed by the room monitor. Contestants must stand directly in front of the specimen being viewed and only one contestant may examine a specimen at a time.
3. Crop and weed plants will be shown either as fresh or dried and pressed samples. All seed samples will be mature. Seed may be shown either hulled, or where typical, within surrounding hulls, burs or pods (e.g. wild buckwheat, peanut, Korean lespedeza, rice, etc.).
4. Crop and weed identification materials will be selected from the attached identification list. Items are marked with a (p) for plants that may be shown in the flowering to mature plant stage, (v) for plants that may be shown in the vegetative stage, and (s) if seed identification is required. (The final ten plants and/or seeds on the list are added by the host school each year.)
5. Plants and seeds will be identified by common name as given on the official identification list provided each contestant. Contestants must fill in bubbles corresponding to the identification code for the specimen as given on the list provided.
6. Hand magnifying lenses will be allowed.
7. Sample specimens may not be moved from their stations. Live plant specimens may be touched carefully to aid in identification, but must not be broken or damaged by the contestant or disqualification may result. Dried, pressed plant specimens cannot be touched. Seeds may be rearranged in their place but may not be removed from their containers.

2019 PLANT AND SEED IDENTIFICATION LIST

CODE: (p) flowering to mature stage plant (live or dry mount) (v) vegetative plant (live) (s) seed

	Cultivated Crops	
001	wheat	p v
002	hard red winter wheat	s
003	hard red spring wheat	s
004	soft red winter wheat	s
005	soft white wheat	s
006	hard white wheat	s
007	durum wheat	s
008	barley	p v
009	six-rowed barley	s
010	two-rowed barley	s
011	rye	p v s
012	oat	p v s
013	triticale	p s
014	rice	p v s
015	corn	p v
016	dent corn	s
017	flint corn	s
018	sweet corn	s
019	pop corn	s
020	grain sorghum	p v s
021	sudangrass	s
022	foxtail millet	p s
023	proso millet	p s
024	pearl millet	p s
025	soybean	p v s
026	fieldbean	p v
027	great northern fieldbean	s
028	red kidney fieldbean	s
029	pinto fieldbean	s
030	navy fieldbean	s
031	black turtle fieldbean	s
032	cowpea	p v
033	blackeye cowpea	s
034	purplehull cowpea	s
035	fieldpea	p v s
036	Austrian winter fieldpea	s
037	peanut	p v s
038	green mungbean	p v s
039	guar	p v s
040	canola	p v s
041	cotton	p v s

042	castor	p v s
043	flax	p v s
044	safflower	p v s
045	sesame	p v s
046	potato	p v
047	common buckwheat	p v s
048	crambe	p v s
049	lentil	p v s
050	sugarbeet	p v s
051	tobacco	p v s
052	sunflower	p v
053	confectionary sunflower	s
054	oilseed sunflower	s
	Forage Grasses	
055	big bluestem	p s
056	little bluestem	p s
057	blue grama	p
058	sideoats grama	p
059	buffalograss	p s
060	Indiangrass	p s
061	switchgrass	p s
062	Kentucky bluegrass	p v s
063	orchardgrass	p v s
064	tall fescue	p v s
065	smooth bromegrass	p v s
066	bermudagrass	p v s
067	perennial ryegrass	p v s
068	reed canarygrass	p v s
069	timothy	p v s
070	crested wheatgrass	p v s
	Forage Legumes	
071	alfalfa	p v s
072	sweetclover	p v s
073	red clover	p v s
074	white clover	p v s
075	crimson clover	p v s
076	arrowleaf clover	p v s
077	alsike clover	p v s
078	Korean lespedeza	p v s
079	birdsfoot trefoil	p v s
080	crownvetch	p v s
081	hairy vetch	p v s

	Weeds	
082	barnyardgrass	p v s
083	blackseed plantain	p s
084	buckhorn plantain	p s
085	buffalobur	p v s
086	Canada thistle	p v s
087	cheat	p s
088	chickweed	p v s
089	cocklebur	p v s
090	common lambsquarters	p v s
091	common ragweed	p v s
092	curly dock	p v s
093	dandelion	p v s
094	dodder	p v s
095	downy brome	p v s
096	eastern black nightshade	p s
097	field bindweed	p v s
098	field pennycress	p s
099	field sandbur	p s
100	giant foxtail	p v
101	giant ragweed	p v s
102	goosegrass	p s
103	greenflower pepperweed	p s
104	green foxtail	p s
105	hedge bindweed	p
106	henbit	p v s
107	hoary cress	p s
108	horsenettle	p s
109	horseweed	p v
110	jimsonweed	p v s
111	johnsongrass	p s
112	jointed goatgrass	p s
113	kochia	p v s
114	leafy spurge	p s
115	large crabgrass	p v s
116	musk thistle	p v s
117	Palmer amaranth	p v

	Weeds (cont.)	
118	Pennsylvania smartweed	p s
119	perennial sowthistle	p v s
120	prickly sida	p v s
121	puncturevine	p v s
122	quackgrass	p v s
123	redroot pigweed	p v s
124	rescuegrass	p s
125	Russian thistle	p v s
126	shepherdspurse	p s
127	sicklepod	p v s
128	silverleaf nightshade	p
129	spotted knapweed	p s
130	tall morningglory	p v s
131	tall waterhemp	p v
132	velvetleaf	p v s
133	Venice mallow	p v s
134	wild carrot	p v s
135	wild buckwheat	p v s
136	wild mustard	s
137	wild oat	p s
138	wild sunflower	p s
139	yellow foxtail	p v s
140	yellow nutsedge	p v
2019	Additional Plants	
141	common burdock	p v s
142	eastern gammagrass	p v s
143	hemp	v s
144	broadleaf signalgrass	p v
145	honeysuckle milkweed	p v
146	little barley	p v s
147	redtop	p v s
148	yellow sorrel	p v
149	pitted morningglory	p
150	teff	p s

2019 CROP DISEASE IDENTIFICATION LIST (on lab practical)

Samples followed by (s) will be shown on seed only

Small Grains

1. powdery mildew (any small grain)
2. stem rust (wheat or oat)
3. leaf rust (wheat or oat)
4. loose smut (wheat, barley, or oat)
5. barley yellow dwarf mosaic (wheat or barley)
6. ergot (any small grain head or seed)
7. black point of wheat (s)
8. common bunt (s)
9. wheat scab (s)

Corn

10. common corn smut
11. ear rot
12. gray leaf spot
13. northern corn leaf blight
14. southern corn leaf blight
15. Gibberella stalk rot
16. Fusarium stalk rot

Soybean

17. bacterial blight
18. brown stem rot
19. Phytophthora root rot
20. pod and stem rot
21. bean pod mottle (s)
22. purple stain (s)
23. Asian rust

Cotton

24. bacterial blight
25. Verticillium wilt

Peanut

26. Cercospora leaf spot
27. Sclerotinia blight

Sorghum

28. charcoal rot
29. gray leaf spot
30. maize dwarf mosaic

Alfalfa

31. bacterial wilt
32. leaf spot
33. Phytophthora root rot

Additional Selections for 2019

34. frog-eye leaf spot (soybean)
35. glume blotch (wheat)
36. angular leaf spot (tobacco)
37. stripe rust (wheat)
38. frog-eye leaf spot (tobacco)

2019 INSECT IDENTIFICATION LIST (on lab practical)

CODE: (a) adult stage (l) larval stage

Alfalfa

1. alfalfa weevil (a l)
2. blue alfalfa aphid (a)
3. pea aphid (a)
4. spotted alfalfa aphid (a)
5. potato leaf hopper (a)

Cotton

6. boll weevil (a)
7. cotton bollworm (l)
8. lygus bug (a)

Corn

9. European corn borer (a l)
10. Southwestern corn borer (l)
11. corn earworm (l)
12. corn rootworm (l)
13. northern corn rootworm (a)
14. southern corn rootworm (a)
15. western corn rootworm (a)

Soybean

16. green stinkbug (a)
17. soybean cyst nematode (a)
18. green cloverworm (l)
19. bean leaf beetle (a)

Sorghum

20. chinch bug (a)
21. corn leaf aphid (a)

Small grains

22. greenbug (a)
23. Russian wheat aphid (a)
24. Hessian fly (l)

Stored grain

25. granary weevil (a)
26. sawtoothed grain beetle (a)
27. lesser grain borer (a)
28. red flour beetle (a)
29. Indian meal moth (a l)

Miscellaneous

30. black cutworm (l)
31. blister beetle (a)
32. Colorado potato beetle (a l)
33. fall armyworm (l)
34. grasshopper (a)
35. spider mite (a)
36. thrips (a)
37. white grub (a l)
38. wireworm (l)

Beneficials

39. lady beetle (a l)
40. lacewing (a)
41. parasitic wasp (a)

Additional Selections for 2019

42. bird cherry oat aphid (small grains) (a)
43. Dectes stem borer (sunflower, soybean) (a)
44. Japanese beetle (soybean) (a)
45. tobacco hornworm (a l)
46. syrphid fly (a l)

2019 EQUIPMENT IDENTIFICATION LIST (on lab practical)

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|--|--|
| 001. anhydrous ammonia applicator | 026. moldboard plow |
| 002. bale wrapper | 027. offset disk |
| 003. bermudagrass sprigger | 028. peanut digger/shaker |
| 004. Boerner divider | 029. rod weeder |
| 005. broadcast fertilizer spreader | 030. rotary hoe |
| 006. broadcast seeder | 031. rotary mower |
| 007. Carter dockage tester | 032. rotary tiller |
| 008. chisel plow | 033. row crop cultivator |
| 009. combine yield monitor system | 034. row crop planter |
| 010. cotton picker | 035. self unloading forage wagon |
| 011. cultipacker seeder | 036. soil probe |
| 012. drainage tile installation system | 037. spiketooth harrow |
| 013. field cultivator | 038. subsoiler |
| 014. field sprayer | 039. swather/windrower |
| 015. forage chopper | 040. tandem disk |
| 016. forage probe | 041. variable rate control system |
| 017. global positioning system | 042. Winchester bushel weight apparatus |
| 018. grain combine | |
| 019. grain drill | |
| 020. grain moisture tester | <u>Additional Selections for 2019</u> |
| 021. grain trier | 043. tobacco setter |
| 022. hay baler | 044. tobacco float tray |
| 023. hay moisture tester | 045. sweep plow |
| 024. hay rake | 046. vertical tillage implement |
| 025. laser land plane | 047. soil compaction meter |