



Agricultural Technology and Mechanical Systems

Purpose

Technological advances in America continue to influence the way students must prepare for their futures.

Students entering the workforce need a strong knowledge base and the ability to comprehend the interaction of complex systems. Employers want productive workers and managers that can access and use a broad range of information. The most sought-after employees are those who communicate effectively, continue to stay current with modern technology, and work successfully and effectively as individuals and as team members. Students with these skills and abilities are more competitive in the job market, receive financial rewards and are selected for advancement.

Agricultural technology and mechanical systems is comprised of strong technical content and complemented by the development of practical, hands-on skills. The subject matter areas and skill development practices have been grouped into five “systems” areas, so named because of the complex interaction and synergistic processes common to agriculture. The term “system” is used to emphasize the interactive relationship between each area of agricultural technology and mechanical systems. These five systems areas are described with examples on the pages that follow.

Each agricultural technology and mechanical systems activity is in response to a problem or need encountered in the workplace. The solving of such problems is dependent upon how each decision or solution, imposed on one component, will influence the other system components. Solving one component of a problem without using a “systems approach” can, and often does, result in additional problems. An example of this is observed in the many obstacles that agricultural producers currently face regarding environmental pollution, ground water contamination and stricter governmental regulations. Decisions and solutions made in the past 100 years have impacted the environment negatively and resulted in a new set of problems.

The National FFA Agricultural Technology and Mechanical Systems Career Development Event recognizes students with agricultural technology and mechanical systems competencies important to the modern workplace. The technical content and required skills continue to include all traditional areas of agricultural technology and mechanical systems. Additionally, the operation of modern equipment, the application of new management strategies and the mastering of advanced technologies are increasingly emphasized.

This career development event selects and awards those students and teams that demonstrate

- Mastery of the subject matter and skills common to the systems areas.
- Effective communication skills.
- Superior problem-solving techniques.
- An understanding of modern technology.
- The ability to function as individuals and as team members working together.

Event Rules and Format

Team Make-Up

Teams will consist of four members. Team ranking is determined by combining the scores of all students from each team.

Equipment

Students Must Provide Safety Materials as well as noted materials as stated by the event superintendent. Each event participant must adhere to the safe practices and work habits appropriate when performing required activities. Participants are responsible for and must provide all personal safety equipment.

Eye Protection

Each team member must wear eye protection. Safety glasses must have the Z87+ rating. Individuals with prescription glasses will need either prescription safety glasses or safety glasses that can be worn over prescription glasses. Do not bring tinted safety glasses.

Individuals Must Wear Style B.

Industrial-quality eye protection should be used during the team activity and the skill/problem-solving activities. Safety glasses do not have to be worn while completing the written exam. Those with prescription eyewear that is not Style B must also wear safety glasses or goggles while participating in this event. Acceptable spectacles or goggles must adhere to the American National Standard Practice for Occupational and Education Eye and Face Protection, Z87.1 – 1979 (or Z87.1 – 1968) and revisions approved by ANSI.

Descriptions of style A, B and C Industrial Quality Eye Protection are as follows:

- **Style A:** Not acceptable for use in the event. These are safety spectacles without side shields. They are for limited-hazard use requiring only frontal protection. The addition of accessory side shields that are not firmly secured does not upgrade style A to a style B or C.
- **Style B:** Acceptable — These are safety spectacles with wire mesh, perforated plastic or non-perforated side shields. The side shields shall be tapered, with an anatomical periphery extending at least halfway around the circumference of the lens frame. Industrial-quality eye protection for those not wearing prescription glasses shall be style B.
- **Style C:** Not acceptable for use in the event. These are safety spectacles with a semi- or flat-fold shield that must be firmly secured to the frame. Style C glasses do not provide maximum protection from the top and bottom angles.

Clothing

Each individual shall furnish and wear appropriate clothing such as long pants and long-sleeved cotton shirt, coveralls, etc., for this event. Clothing must be in good repair and fit properly. Oversized or loose-fitting clothing is dangerous around agricultural equipment and is not allowed. Long-sleeves must be worn when welding or oxy-fuel cutting. No open-toed footwear shall be worn during the event.

Other Materials

Each participant must have a clipboard, two sharpened No. 2 pencils and an electronic calculator. Calculators used in this event should be battery operated and silent.

Computers

Each state team is required to provide a computer. You must be able to download activity instructions and turn in your document to the officials in a form readable by a Windows-based system to be judged.

Specialized safety equipment provided

- Necessary equipment such as basic welding helmets or goggles as required for welding, shields, gloves, welding leathers, hearing protection devices, etc., will be provided by the Tennessee FFA Agricultural Technology and Mechanical Systems Career Development Event committee.
- All required tools and equipment will be furnished for the event. Teams/individuals may choose to use their own equipment subject to approval by the event superintendent.
- If a team member needs modified equipment due to physical size and stature, the student must supply this equipment. The team member or coach must present the student-supplied equipment to the event superintendent prior to the start of the event for approval. Team members who need specialized or modified equipment due to disability as defined by the American Disabilities Act must submit the appropriate special needs request form and documentation at the time of the team's certification.

Event Areas

The Tennessee FFA Agricultural Technology and Mechanical Systems Career Development Event is divided into the following areas. Each area includes competencies common to agriculture. Students will be assessed on their proficiency as individuals and as a team. Specific competencies will be identified annually from the following areas:

- **Machinery and Equipment:** Repair and maintenance, materials handling, processing, adjustments, metal fabrication.
- **Electricity:** AC/DC power, electrical safety, electrical standards, sensing devices, electrical wiring, controls, electronics, motors and other electrical loads, operating instructions, and manufacturer's recommendations.
- **Compact Equipment:** Mechanical power, electrical power, hydraulic power, engine operation, maintenance, troubleshooting, repair.
- **Structures:** Structures, storage, concrete, masonry, plumbing, electrical, fabrication, construction, building materials, ventilation, heating, air conditioning.
- **Environment and Natural Resources:** Water quality, sustainable agricultural practices, soil and water conservation, surveying, biological waste handling.

Team Activities

The individuals on each state team will work together and be evaluated as a team while solving multi-system agricultural problem(s) selected from the skills and problem-solving components of the five system competency areas.

The specific problem scenario is presented to the team on the day of the event. Team

members will utilize the materials and equipment provided to solve the problem(s) and prepare a computer-generated report. Teams will organize themselves, assign duties and complete tasks together or separately depending on individual skills and abilities. Each team will receive a score, and each team member will receive one-quarter of the total team activity score. The team activity score will be based on the finished product, the process including teamwork and the written report.

The team activity will be evaluated as follows:

- **Teamwork process:** 100 points.
- **Team report:** 50 points.
- **Finished product:** 250 points.
- **Total for team activity:** 400 points.

Individual Activities

Five practicum areas (5 at 30 points each)

Each student is individually evaluated in each of the five areas. The specific activities occurring in each event are not publicized prior to the event. Each student is allowed 25 minutes to complete each of the five activities.

Written examination (50 points)

Each student completes an examination that consists of 25 problem-solving/multiple-choice questions. A test bank of 300 questions will be developed by the event superintendent and posted on tnffa.org under the downloads tab. The test bank will be updated annually by Tennessee FFA State staff via the CDE superintendent. The event superintendent will write the exam. There are five questions from each of the five agricultural technology and mechanical systems areas. Students will have 60 minutes to complete this portion of the career development event.

Annual Event Announcements

Agricultural Technology and Mechanical Systems (ATMS) CDE focus is published and distributed by the National FFA Organization and posted at the following web site: <https://schumacherl.mufaculty.umsystem.edu/home/national-ffa-webpage>

Specific information and event updates generally occur following each year's event during November, June and August. The schedule for announcing event information and details on equipment selection is governed by equipment availability and changes by equipment manufacturers, dealers and contributors.

Scoring

Event participants are evaluated as follows:

Activity	Individual Points	Team Points
Written examination	50	200
Individual activities :(5 @ 30 points each) <ul style="list-style-type: none"> • Machinery and Equipment • Electricity • Compact Equipment • Structures • Environment & Natural Resources 	150	600
Team activity (1/4 of total team activity score) <ul style="list-style-type: none"> • Teamwork process: 100 points. • Team report: 50 points. • Finished product: 250 points. 	100	400
TOTAL POSSIBLE SCORE	300	1200

Tiebreakers

Team

The team activity scores will be used to break a tie associated with the team rankings. If a tie still exists, the combined written exam scores will be used to break the tie.

Individual

If a tie exists between individuals, the combined highest individual/activities scores will break the tie(s). If still tied, the highest written examination score will be used to break the tie.

References and Resources

This list of references is not intended to be all-inclusive. Other sources may be utilized, and teachers are encouraged to make use of the very best instructional materials available. The following list contains references that may prove helpful during event preparation.

The goal of the National FFA Agricultural Technology and Mechanical Systems Career Development Event is to guide and promote quality instructional programs in agricultural technology and mechanical systems. The multiple-choice test questions are written to be generic in nature and are selected from a variety of sources. It is the intent of the national event committee to reflect current technological practices common to the agricultural production industry. Refer to the CDE website for additional references and resources.

- National FFA Past Exams and Practicums—*Past exams & practicums*

Information specific to each annual event is available on the National FFA Agricultural Technology and Mechanical Systems Career Development Event webpage at <https://schumacherl.mufaculty.umsystem.edu/home/national-ffa-webpage>

Specific information and event updates generally occur following each year's event during November, June and August.

- FOS. John Deere.
- FMO. John Deere.
- Agricultural Power and Machinery. (CD format) CEV Multimedia. LTD.
- Agricultural Engineering Technology. (ASABE) Springer Science + Business Media, LLC.
- Mechanics in Agriculture. Prentice Hall.
- Agricultural Mechanics Fundamentals and Applications. Delmar and Thompson.
- Modern Agricultural Mechanics, V3. Prentice Hall.
- Developing Shop Safety Skills. American Association for Vocational Instructional Materials.
- Power Tool Safety and Operation. Hobar Publications.
- Practical Farm Buildings. Prentice Hall.
- National Electrical Code (latest edition). NFPA.
- Ag Wiring Handbook. Rural Electricity Resource Council.
- Mechanical Technology in Agriculture. Prentice Hall.
- Agricultural Technical Systems and Mechanics by Koel, Maur, Moniz & Radcliff, American Technical Publishers (ATP).
- Industry websites
 - [Briggs and Stratton](#)
 - [John Deere](#)
 - [New Holland](#)
 - [Lincoln Electric](#)

Safety Rubric

25 POINTS

	Very strong evidence of skill 5-4 points	Moderate evidence of skill 3-2 points	Weak evidence of skill 1-0 points	Points Earned	Weight	Total Points
Safety glasses	Safety glasses are worn by all team members at all times with one or no reminders.	Safety glasses are worn by team members most of the time with two to three reminders.	Safety glasses are worn rarely by team members with four or more reminders.		X2	
Safety practices	Safety practices used at all times.	Safety practices used most of the time with minor violations.	Moderate to major violations of safety practices observed.		X1	
Injuries	No injuries occurred during the activity.	Minor injuries occurred during the activity requiring no medical attention.	Moderate to severe injuries occurred during the activity.		X2	
TOTAL POINTS EARNED OUT OF 25 POSSIBLE						

Team Activity Process Rubric

100 POINTS

	Very strong evidence of skill 5-4 points	Moderate evidence of skill 3-2 points	Weak evidence of skill 1-0 points	Points Earned	Weight	Total Points
Communication	All team members effectively communicate with each other throughout the entire activity.	Most team members communicate fairly effectively with each other during most of the activity.	Communication between team members is ineffective and sporadic during the activity.		X4	
Work distribution	Work was evenly distributed between all team members and all team members were employed at all times.	Work was distributed between two to three team members, and these members were employed most of the time.	Work was completed by only one team member with little employment of the other members.		X8	
Time management	All team members managed their time efficiently.	Most team members managed their time fairly efficiently.	One (or no) team member managed their time efficiently.		X4	
Team organization	Team started right away, had no down time and was not rushed at the end of the task.	Team was delayed in starting, had down time and was somewhat rushed at the end of the task.	Team delayed starting, had long down times and did not complete all tasks during the time allotted.		X4	
TOTAL POINTS EARNED OUT OF 100 POSSIBLE						

Team Activity Writing Summary Rubric

50 POINTS

	Very strong evidence of skill 5-4 points	Moderate evidence of skill 3-2 points	Weak evidence of skill 1-0 points	Points Earned	Weight	Total Points
Introduction <i>Written in narrative form</i>	Concise and brief overview of the team activity is provided and written in narrative form that accurately describes the activity.	Somewhat elaborate and lengthy overview of the team activity is provided and partially written in narrative form that somewhat describes the activity.	Introduction rambles without describing the activity or was too brief to adequately describe the activity. Narrative form was not used.		X1	
Delegation of tasks <i>Begins with an introductory sentence. The remainder can be written with bullet points.</i>	Fully explains how the labor and responsibilities were divided and how the group worked as a team. Identifies the division of labor and management.	Partially explains how the labor and responsibilities were divided and how the group worked as a team. Partially Identifies the division of labor and management.	Vaguely explains how the labor and responsibilities were divided and how the group worked as a team. Vaguely identifies the division of labor and management.		X2	
Discussion and success or challenges <i>Begin with an introductory sentence. The remainder can be written with bullet points.</i>	Fully identifies portions of the activity where the team succeeded and portions of the activity where the team struggled.	Partially identifies successes and challenges by only including successes or only including challenges. Partially describes successes and challenges.	Omits success and challenges or rambles without clearly identifying what portions of the activity were successful for the team or what portions were struggles.		X1	
Steps to designing the product <i>Use this section to briefly describe the process you went through to design the product</i>	All needed steps are included for designing the product constructed. All steps are clearly described.	Most steps are included for designing the product constructed. Some steps included are not clearly described.	A few or none of the steps are included for designing the product constructed. Steps included do not describe the steps to designing the product.		X1	
SUBTOTAL POINTS EARNED						

<p>Steps to construction</p> <p><i>Explain to another group the process of constructing the product built in this activity.</i></p> <p><i>Begin with an introductory sentence. The remainder can be presented in numbered statements.</i></p> <p><i>This part of the report can be an opportunity to make suggestions that would improve the process where you experienced specific challenges.</i></p>	<p>Complete and thorough steps are listed including suggestions to improve the process. Steps provide clarity so another team could follow the steps and construct the same product.</p>	<p>A partial list of steps are listed including suggestions to improve the process. Steps provide moderate clarity for another team to construct the same product.</p>	<p>Few, if any, steps are listed with minimum suggestions to improve the process. Steps are vague, and another team would struggle to construct the same product using these steps.</p>		<p>X2</p>	
<p>Annual team activity details</p> <p><i>Each year this will vary depending on activity details.</i></p>	<p>A complete description related to the annual team activity is provided.</p>	<p>A partial description related to the annual team activity is provided.</p>	<p>Few, if any, details are related to the team activity.</p>		<p>X1</p>	
<p>Safety</p>	<p>A complete list of safety practices is included in the report</p>	<p>A partial list of safety practices is included in the report.</p>	<p>Few, if any, safety practices are included in the report.</p>		<p>X1</p>	
<p>Conclusion</p>	<p>A concise, complete description of what the team learned and the benefits of completing the activity are included.</p>	<p>A somewhat elaborate, and lengthy, incomplete description of what the team learned and the benefits of completing the activity are included.</p> <p>Or a very brief conclusion that only partially describes what the team learned is included.</p>	<p>An elaborate and lengthy conclusion, with little or no description of what the team learned or the benefits of completing the activity is included.</p> <p>Or a missing or extremely brief conclusion does not describe what the team learned.</p>		<p>X1</p>	
<p>TOTAL POINTS EARNED OUT OF 50 POSSIBLE</p>						

