The Second Annual

Competition for Pennsylvania K-12 Students

Funded by

pennsylvania
DEPARTMENT OF AGRICULTURE

Hosted by

Millersville University

Elementary Division and Other Support by

INTAG
AQUAPONICS

Volunteer Support from

Innovate. Teach. Inspire.
TEECA
At Millersville University

INITIAL SUBMISSION DEADLINE: November 21, 2025

Calling all Pennsylvania K-12 teachers and students! This competition invites you to learn about sustainable agriculture in active, hands-on ways. Middle school and high school students will prepare a proposal to design, build, and test a hydroponic or aquaponic system. Elementary students will propose how they will use a provided aquaponics system to learn about sustainable agriculture. Hydroponics is the practice of using nutrient-rich water to grow plants without soil. Aquaponics is an extension of hydroponics that utilizes the ammonia waste that fish produce and converts it to something that plants can use as nutrients to grow.

The Challenge

High school and middle school teams are tasked to prepare a **design plan for a NEW hydroponics or aquaponics system** that can be constructed within the budget of $1200 (Middle school Division), $1500 (High school Division), or $2000 (Aquaponics Division). The proposal should also describe how the system would be integrated with classroom learning about science, technology, engineering, math, and sustainable agriculture. After submission, design plans and proposals will be reviewed by our judges. One winning team from each division will receive the funds needed to build their systems (based on your approved budget).

Elementary school teams are tasked with creating a unique proposal that explains how a provided aquaponics system could be integrated into classroom learning about science, technology, engineering, math, and sustainable agriculture. The winner of the elementary division will receive a STACK system from INTAG Aquaponics (Valued at $3000). For details about this system, see the section labeled “Stack System Information.”

All division winners will receive a trip to Millersville University on Friday **February 27, 2026**. During this visit, students will meet with a keynote speaker in the field of aquaponics, tour the hydroponics/aquaponics facilities at Millersville University, visit other related educational facilities, and participate in a question/answer session. Winners should plan to be at Millersville University from approximately 10:00 am - 3:00 pm on that day. There will be a mileage reimbursement allowed per winning team (1 vehicle @ a maximum of 150 mi., roundtrip @ $0.655/mi or the current approved rate). Lunch will be provided free of charge to the winning teams at the Millersville dining hall for up to 10 individuals per winning team. The team will be responsible for covering the lunch cost of any individuals in excess of 10.

As the winners create/implement their systems, they will receive one or more site visits from Tommy Kuhns. Tommy Kuhns is an undergraduate student at Millersville University who is studying to be a teacher. He has done extensive research and development on these systems. He created the primary hydroponics and aquaponics system at Millersville University. For winners

of divisions A, B, and D, he will provide design consultation and verify construction. For winners of division C, he will visit to provide consultation for operating and integrating the system.

Division Rules

Division A: High School Aquaponics or Hydroponics

- Open to student groups in grades 9-12 or ages 14-18
- This system may be hydroponic or aquaponic.
- Budget for the system: Maximum of $1,500

Division B: Middle School Aquaponics or Hydroponics

- Open to student groups in grades 6-9 or ages 11-15
- This system may be hydroponic or aquaponic.
- Budget for the system: Maximum of $1,200

Division C: INTAG Elementary Aquaponics

- Open to student groups in grades K-5 or ages 5-11
- This will be an aquaponic system.
- INTAG Aquaponics will be donating a "STACK" system to the winning school (valued at $3,000). (See the end of document for specifications.)

Division D: Middle and High School Aquaponics

- Open to student groups in grades 6-12 or ages 11-18
- This system **MUST** be an aquaponic system.
- Budget for the system: Maximum of $2,000

The Communication Platform (Slack)

We will be utilizing an online communication platform (Slack) to allow for streamlined communication between organizers and contestants. Slack is a platform that will allow mentors to directly contact organizers, ask questions publicly, and collaborate with mentors of other teams if they so choose. This platform will also be used to submit each team's final submission (sent confidentially to Tommy Kuhns). Slack is free to join and can be utilized in a browser window or a mobile/desktop app. We ask that this platform only be utilized by mentors and **NOT** students. To join our Slack, please scan the QR code at the end of this document and follow the instructions given. If there are any questions or issues with Slack, please contact Tommy Kuhns directly via email.

What to Submit for Divisions A, B, and D

Every team must submit a design plan for a hydroponic or aquaponic system **IN A SINGLE PDF FILE** (except for #6 – Letter of Support) that they will build and test at their site if their design is chosen as the winner. This document must include the following sections. **The ONLY place in the document that should identify your names/organization/location is on the cover page and letter of support. No other pages should have identifying information to maintain a blind review.**

1. **A COVER PAGE stating the following:**
    - Your team name (Create a clever team name)
    - Your affiliation (School district, TSA club, 4H chapter, etc.)
    - Adult Sponsor Name, Address, Phone, and Email Address
    - Names of all individuals involved in the plan and their grade levels
    - Division that you are seeking to enter (i.e., A, B, or D)

2. **EVIDENCE OF THE DESIGN PROCESS used to create the design plan, which minimally includes:**
    - Statement of the problem
    - Research documentation
        - Provide links to any online resources consulted
        - Include citations for any physical items (e.g., books or other resources)
    - Evidence of having considered at least 3 different initial designs (e.g., thumbnail sketches of different design options)
    - Clear drawing(s) of the chosen system to build with components labeled and overall dimensions to help communicate about your idea and how it will work
        - Photos of any 3D models you create are optional, but highly recommended

3. **LIST OF ITEMS ON HAND, DONATED, or RECYCLED**
    - Detailed list of what items you will be providing that have no additional cost involved

4. **ITEMIZED BUDGET following the format of the table below**
    - **IMPORTANT NOTE: Teams are REIMBURSED for their purchases after you have made the purchases. Teams must submit receipts for all purchases to request reimbursement.**

Item	Price Per Unit in US $	Quantity Needed	Overall Cost in US $	Link to website or store where purchased

5. **DEMONSTRATED NEED documentation.** The intended purpose of this competition is to expand the number of sites with robust hydroponic and aquaponic systems. In this section, teams should explain what systems are already at the school/site/district, as well as how the new system would benefit students in the program**.**

6. **LETTER OF SUPPORT** from an adult who can confirm that permission is granted to build/test this system at the location specified in your proposal and indicate where this system will be housed, if funded (e.g., letter from mentor, principal, leader). **This must be a separate document.**

What to Submit for Division C

Your submission must be **IN A SINGLE PDF FILE** (except for #5 – Letter of Support). This document must include the following sections. **The ONLY place in the document that should identify your names/organization/location is on the cover page and letter of support. No other pages should have identifying information to maintain a blind review.**

1. **A COVER PAGE stating the following:**
   - Your team name (Create a clever team name)
   - Your affiliation (School district, Club name, 4H chapter, etc.)
   - Adult Sponsor Name, Address, Phone, and Email Address
   - Names of all individuals involved in the submission and their grade levels
   - Division that you are seeking to enter (i.e., Division C)

2. **DEMONSTRATED STUDENT INTEREST in the system.** While it is acceptable for adults (i.e., teachers, leaders) to develop this submission, there needs to be evidence that students are aware of what the system is and have interest in the proposed plan. Show evidence that children have been engaged in some meaningful way.

3. **DEMONSTRATED NEED documentation.** The intended purpose of this competition is to expand the number of sites with robust hydroponic and aquaponic systems and to promote sustainable agriculture. In this section, teams should explain what systems are already at the school/site/district (if any), as well as how the system would benefit students in the program. Stronger applications would include ways of reaching out beyond the immediate classroom as well**.**

4. **CURRICULUM PLAN** describing how the STACK system (aquaponics system to be given to winning team) will be used to educate students and promote sustainable agriculture. Identify academic standards to be focused upon, how the system would be integrated into

the curriculum, and how students would be directly engaged in using the system. Day-to-day lesson plans are not needed. However, there should be clear evidence that you've thought through how to use the system in meaningful ways within the curriculum**.**

5. **LETTER OF SUPPORT** from an adult who can confirm that permission is granted to acquire, have the system installed and used. This letter should indicate where this system will be housed, if funded (e.g., letter from mentor, principal, leader). **This letter must be a separate document.**

How to Submit

- Submit your completed submission via a direct message in Slack to Tommy Kuhns.
- Title your submission as "**YOUR TEAM NAME_Final Submission.**"
- **Submit your entry no later than 5:00 p.m. on Friday, November 21, 2025**.

Other Criteria and Information

1. This competition is for Pennsylvania Schools/Organizations only.
2. The design plans submitted for Divisions A, B, and D should represent the work of the middle or high school students, not the adult mentor(s). The mentor is certainly welcome and encouraged to provide input, advice, and feedback to the students, but the submission should represent the work of the students. It is anticipated that adults (i.e., teachers, mentors) will develop the submission for Division C. However, as noted earlier, there must be evidence that elementary students have been engaged.
3. All design plans that are aquaponic systems may be considered for the Aquaponic Division (D) even if you specify Middle or High School divisions A or B.
4. The cover page and letter of support are the ONLY PLACES in the document that should indicate your name(s) or affiliation. The cover page and letter of support will be removed for judges. Judges should not know whose plan is being reviewed when reading the submission.
5. When winning designs are chosen, teams will be provided with feedback from the judges and/or Tommy Kuhns that should be considered when moving forward with the plan.
6. One submission per school/site/district may be eligible to win across divisions A, B, and D. If multiple submissions from the same school/site/district are selected as winners in separate divisions, the submissions will be shared with a panel of 3 judges who will review all entries from that school/site/district and determine which entry will be allowed to go forward as the winning team. Division C is not subject to this rule.
7. Mentors may only work on one submission.

8. Previous winners may not apply; however, they are encouraged to help mentor other teams.
9. For any email communications, please specifically state the division you are planning to enter in the subject line so that your email can be easily directed to the right person. **For example: "Division A Question."**
10. Timeline at-a-Glance

Event	Date	Time
Informational Zoom Meeting (Optional)	2/28/2025	4:00 PM
Final Submissions Due	11/21/2025	5:00 PM
Winners Announced	12/01/2025	5:00 PM (Approximately)
Winners Visit to Millersville University	2/27/2026	10:00 AM – 3:00 PM
Winners Final Documentation Due	5/08/2026	5:00 PM

Judging

- Judges will consist of selected Millersville University faculty and students.
- Blind judging will be utilized to ensure impartiality.
- Disqualification of a team and/or point penalties may be levied for any violation of the rules stated in this document. This will be determined based upon the severity of the rule violation by the competition director.

Judging criteria for divisions A, B, and D will be as follows:

Design Process Submission demonstrates that students are engaged in the design process. There is documentation that students did research, considered solutions and potential issues, created a solution, etc.
Effective use of budget Submission shows efficient and well-thought-out use of budget.
Constructability The system that is designed can be feasibly constructed. Specialized parts should be clearly marked to indicate how they will be acquired or produced.
Functionality The system will likely function and be able to grow plants.

Creativity The system demonstrates that the students created their own solution and did not just copy an existing design.
Effective use of technology Submission demonstrates the use of appropriate technologies in developing the plans for the system (e.g., CAD drawings, 3D printing designs, research, word processing).
Demonstration of Need Submission explains any existing systems in place and shows how this new system would benefit students.

Judging criteria for division C will be as follows:

Demonstrated Student interest The submission demonstrates that students are excited and engaged with the idea of a new aquaponics system.
Demonstration of Need The submission explains any existing systems in place and shows how this new system would benefit students. Stronger applications would include ways of reaching out beyond the immediate classroom as well.
Curriculum Plan Curriculum plan effectively describes how to integrate the aquaponics system into student learning with connections made to multiple areas of the curriculum (e.g., science, technology, engineering, math). Evidence of support for grade-appropriate educational standards. Clearly explains how students will interact with the aquaponics system and how the system will be monitored during long holidays and summer break.

Resources

1. There are many online resources that provide useful information. YouTube is a great source.
2. Look for books available on both hydroponics and aquaponics.
3. Consider viewing other successful systems that you may know about in your region.
4. Questions about the competition process and rules should be directed in the Slack channel "Ask a Competition Director." Competition directors will not address technical questions.
5. There is an **optional informational zoom meeting** scheduled on **Friday, February 28, 2025 at 4:00 PM.** See below for access information. Participating students must have an adult representative present.

Optional Zoom Meeting Information

Topic: Farm in the Classroom Informational Meeting
Time: Feb 28, 2025 4:00 PM Eastern Time (US and Canada)

Join Zoom Meeting
https://millersville.zoom.us/j/95680609689
Meeting ID: 956 8060 9689

Stack System Information

(For Division C Winner)

The STACK System boasts a compact design with dimensions of 24” x 48”, meticulously crafted for efficient utilization of classroom space.

The aquatic ecosystem is anchored by a 40-gallon fish tank, creating a dynamic environment for a diverse range of freshwater fish. Offering versatile growing space, the 50-gallon INTAG Media Bed is designed to cultivate various crops, from leafy greens and herbs to edible flowers and fruiting crops. The system ensures optimized plant growth through the inclusion of two LED grow lights, maintaining a stable and robust environment with the necessary light spectrum for photosynthesis.

Additionally, user-friendly features allow educators and students to initiate the aquaponics experience promptly, with easy operation facilitated by intuitive controls and a user-friendly interface for hassle-free management. This standalone product is perfect for any and all classroom environments!

For the Latest competition Information, please join the Competition Slack.

Contact Information

If you have competition or Slack questions, please contact:

Mr. Tommy Kuhns
Technology & Engineering Education
Teacher Education Student & Competition Director
Millersville University
Dept. of Applied Engineering, Safety & Technology
farmintheclassroom@millersville.edu

For any email communications, please specifically state the division you are planning to enter in the subject line so that your email can be easily directed to the right person.
For example: "Division A: Question."

We look forward to seeing your competition entry!