The Newsletter of **Spring 2014**

Massachusetts Agriculture in the Classroom

Workshops on the Farm

$40 Each Workshop - 9 a.m. to 3 p.m

Technology on Dairy Farm & STEM
Tuesday, July 8th
Barstow Dairy Farm, Hadley

Fibers, Felting & Fun
Thursday, July 10th
Jensen Homestead, Worthington

Success on Farm and in Classroom
Tuesday, July 15th
Smolak Farm, North Andover

Managing Forests & Maple Sugaring
Tuesday, July 22nd
Mossman Homestead, Westminster

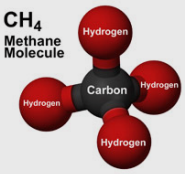
Animals, Minerals & Vegetables
Thursday, July 24th
Heifer International, Rutland

Benefits of Agricultural Education
Tuesday, July 29th
Norfolk Agricultural HS, Walpole

Summer Conference: Connecting the School Garden and the Curriculum
Tuesday, August 5th $50
Algonquin Regional HS, Northboro

Feature Topic:

Anaerobic Digestion on Dairy Farms



The mission of Massachusetts Agriculture in the Classroom is to promote agricultural literacy among educators and to provide them with the skills and support to integrate agriculture into the classroom.

Summer Educational Opportunities with MAC

Massachusetts Agriculture in the Classroom offers a number of terrific opportunities to connect classroom learning to the rich diversity of agriculture across the state. From the history of our cities and towns to the food we eat, agriculture is all around us every day. This summer explore Massachusetts agriculture while you gain activities and ideas for your classroom connected to the curriculum standards. We hope to see you at one of our summer educational programs.

Teachers experience agriculture first hand at our educational workshops on the farm and conferences. They are a terrific opportunity to learn from farmers as well as other educators who are bringing agriculture into the classroom and school garden.

Summer Workshops on the Farm: Spend an educational summer with MAC on farms across the state, learning about agriculture and connections to the classroom. Since 1996, MAC has offered more than 240 workshops on the farms bringing first-hand agricultural experiences to more than 3,200 educators. Eight additional farm workshops will be held this summer during July. Each workshop is unique and will provide an in-depth educational overview of one aspect of agriculture with related hands-on activities to help teachers take agriculture back to their own classrooms. It will also include a farm tour and the opportunity to meet the farmer and learn about the work that goes on at that farm. Ten professional development points are available with each workshop, after conducting a related classroom activity.

Summer Graduate Course: In 2014, MAC will offer our 9th Annual, Summer Graduate Course in collaboration with Fitchburg State University. The three-credit course will meet Tuesday, July 1 and Wednesday, August 7 at the Brigham Hill Community Farm in North Grafton from 9 a.m. to 3 p.m. Each participant must attend both sessions and also participate in six additional workshops during the summer, selected from eight farm workshops and our summer conference. Participants will also keep a journal of their agricultural journey, take a quiz and develop three lessons plans, one of which they will present to their peers on August 7. The fee for this eight day course is $500.

School Gardening Summer Conference: Our second Annual Summer Conference will be held on Tuesday, August 5th from 9 a.m. to 3 p.m. at Algonquin Regional High School in Northborough. Each workshop will be taught by a school garden educator and will offer connections from the classroom to the school garden. Four workshops will run concurrently throughout the day. There will also be the opportunity to harvest and prepare lunch from the school garden. 10 Pdp's are available with classroom activity.

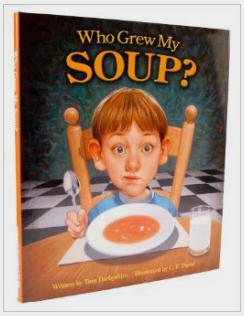
Mini Grants

Last spring, the MAC mini-grant committee awarded $700 to **Danielle Crescione** and the **Northeast Center for Youth & Families Program** at **Tri-County Schools** in **Easthampton.** A new backyard chicken program will teach 115 emotionally/behaviorally challenged students awareness of the animal industry issues while providing nutritious food for the cafeteria. Students will hatch the chicks, build the barnyard and pen and discover educational options and careers in agriculture. Funds provided the chickens, feed, building materials and educational resources.

Any Massachusetts teacher or school can apply for a mini-grant to support their agriculture in the classroom efforts. Each year MAC awards mini-grants, usually in the amount of $300 to $500, to teachers for agricultural education projects. Proposals are due the first of April, September and November. To receive a copy of our mini-grant guidelines, visit our website or send a letter to MAC.

Educational Resources Available from MAC

School Gardens & Their Community Partnership Manual	$10
Farm Field Trip Manual	$12
8 Lessons about Agriculture & the Environment Manual	$5



"Who Grew My Soup?" by **Tom Darbyshire** is being sold as a fund-raiser to support MAC's educational programs. This previously unavailable book, in a soft-cover edition, can be purchased for $15 with an additional $3 for shipping and handling. It is a great way to support MAC and also add a useful resource to your library or classroom.

President's Message

Farmers, ranchers and growers have often spent time explaining the wonder, joy, frustration, and anguish of working with the soil, elements and markets to those whose livelihood is not based in agriculture. When Agriculture in the Classroom was established in the early 1980s, the plan was to provide examples from agriculture that could be used in the classroom. Various types of programs were developed in each state, attracting the best and the brightest of teachers, by providing these educators with curriculum, books, games and knowledge of agricultural practices. The aim of all programs, then and now, was to increase agricultural literacy.

In the early days, most state programs began by developing materials for grades 4 to 6. Later, it was realized that younger children could gain immense value from agricultural lessons, and the emphasis of many educational non-profit programs turned to grades K-3 and eventually Pre-K. As Agriculture in the Classroom programs became more sophisticated, they tackled high school lessons and resources. The **Envirothon** is a competition among high school student. The 2014 topic is **"Sustainable Agriculture"**. Many state programs have contact with college courses that are training teachers.

Through our mini-grants, workshops and conferences we have cultivated teachers who have emerged as peer leaders. Farmers have offered facilities and spent time with interested teachers. Representatives from agriculture and education have provided time, talent and treasure. Today a garden on school property and a few chickens in the backyard are popular pursuits and I trust that efforts to understand the origins of our food will continue to be popular. This is a great time for young agriculturalists who are looking for ways to investigate connections with educators. Massachusetts Agriculture in the Classroom is considering a workshop for young farmers and growers in August. If you are interested, I would love to hear from you.

Marjorie Cooper, President

AgriScience Excellence Award

Anna Cynar from North Central Charter Essential School in Fitchburg (center) was presented with the award at our Winter Conference by Susan Lavoie, Vice President of Eastern States (left) and Marjorie Cooper, President of MAC (right).

The Board of Directors of MAC along with the **Massachusetts Trustees of Eastern States Exposition** are pleased to announce that our 2014 winner of the **AgriScience Excellence Award** is **Anna Cynar**, Life Science teacher (Biology, Ecology and Anatomy) at **North Central Charter Essential School** in Fitchburg. This award is given to a teacher who has done at outstanding job of bringing agriculture to the classroom. The prize is accompanied by a plaque, $200 classroom grant and a September trip to The Big E for teacher and her class.

Anna took our 2014 Summer Graduate Course, where we were all impressed with her dedication to her students. In addition to the course, she spent last summer and this school year working with a committee to plan the landscape and garden spaces to support a new building that will house the school.

There are a lot of agricultural based projects in the planning phase. Biology students propagated plants and Ecology students presented to administrators about "how we can design with Ecology in mind" in our future building. Students interviewed farmers, scientists, apiarists and non-profits, involved in sustainable agriculture design to form the landscape of where the school is moving next year. After the move, students will work to make some of those recommendations a reality. In the past, Anna worked with garden initiatives to help organizations plan, build, grow, and eat from raised bed gardens and through AmeriCorps she worked with high school students growing vegetables and caring for chickens. Congratulations, Anna!

Resources for Anaerobic Digestion

Mass. Dept. of Agricultural Resources
www.mass.gov/agr

Mass. Dairy Promotion Board
www.massdairy.com/stewards.html

Mass. Dept. of Environmental Protection
www.mass.gov/dep/

Environmental Protection Agency
www.epa.gov/agstar/anaerobic/index.html

MA Executive Office of Energy and Environmental Affairs
www.mass.gov/eea/agencies/massdep/service/energy/program/clean-energy-results-studies-and-sucessess.html

Jordan Dairy Farms
http://jordandairyfarms.com/digester/

Penn State Extension
http://extension.psu.edu/natural-resources/energy/waste-to-energy/resources/biogas

Elementary Dairy Environment Video
(basic explanation of digestion for younger children)
http://www.discoverdairy.com/tl_files/videos/environment.html

Middle Dairy Environment Video
www.discoverydairy.com/tl_files/videos/dairyenvironment.html

School Biogas Kits
www.build-a-biogas-plant.com/School-Biogas-Kits.html

Aerobic vs. Anaerobic Digestion
http://water.me.vccs.edu/courses/ENV149/lesson4.htm

California Energy Commission
www.energy.ca.gov/biomass/anaerobic.html

National Non Food Crops Centre
http://www.nnfcc.co.uk/publications/nnfcc-renewable-fuels-and-energy-factsheet-anaerobic-digestion

A History of Anaerobic Digestion
http://extension.psu.edu/natural-resources/energy/waste-to-energy/resources/biogas/links/history-of-anaerobic-digestion/a-short-history-of-anaerobic-digestion

Bokashi Composting - Time to Recycle
www.timetorecycle.com/compost/bokashi.asp

Barstow's Long View Farm (Hadley)
www.barstowslongviewfarm.com

Pine Island Farm (Sheffield)
http://blog.mass.gov/wp-content/uploads/legacy-images/energy/6a0133ec786504970b0147e17ac133970b-pi.jpg

Information for this newsletter was taken from the resources listed above.

Anaerobic Digestion

An excellent opportunity to bring agriculture into your science classroom is to consider the topic of anaerobic digestion. **Anaerobic digestion** is the process by which biodegradable materials are broken down in the **absence of the oxygen.** The result of this reaction is a **biogas** that can be used to continue the digestion process or can be converted into fuel for electricity.

The use of these digesters, along with combined heat and power, to reduce organic waste and generate renewable energy is common in Europe and on the rise in the United States. Here in Massachusetts, farmers are exploring the possibilities of using anaerobic digestion to reduce waste and produce energy. But what is the process that takes manure and food products and produces fuel? How can this fuel be useful to the environment? Most importantly, how can you bring this into your classroom? We will answer these questions and more as we explore anaerobic digestion.

What is Anaerobic Digestion?

Anaerobic digestion is a **biochemical reaction that occurs in multiple steps initiated by microorganisms** that do not need a significant amount of oxygen to survive, if any. What these microorganisms do need is food, which farmers provide through manure and food wastes. The digester is heated to a temperature between 95 and 140 degrees Fahrenheit. This allows the microorganism to thrive and grow. The process of digestion can be broken down into 4 phases: Hydrolysis, Fermentation, Acetogenesis and Methanogenesis.

Fermentation (Acidogenesis): In this phase enzymes, bacteria, yeasts, or molds break down carbohydrates in the absence of oxygen.

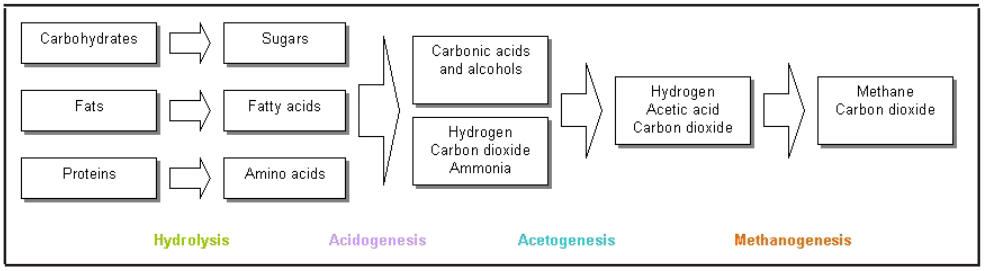
Acetogenesis: Acetogenic bacteria change the products left after fermentation into carbon dioxide and hydrogen in the third phase.

Methanogenesis: In the final phase methanogenic bacteria convert the carbon dioxide and hydrogen into methane gas. This gas can then be funneled off for other uses such as energy production and fuel.

A simplified chemical equation for this process is as follows:

$$C_6H_{12}O_6 \text{ --> } 3CO_2 + 3CH_4$$

Digestion takes approximately 3 to 4 weeks and the quantity of methane gas produced and the speed with which it is produced is dependent on the temperature within the vessel and the amount of organic material that is fed into the digester. The organic materials that are not converted into biogas, called the digestate, are rich in nutrients. It can be used as a fertilizer or composted. The biogas can be reused in the digester to help regulate temperature and create greater self-sustainability. Alternatively, the biogas could be used to power electric generators or converted to compressed natural gas and be used to fuel farm equipment and other vehicles.

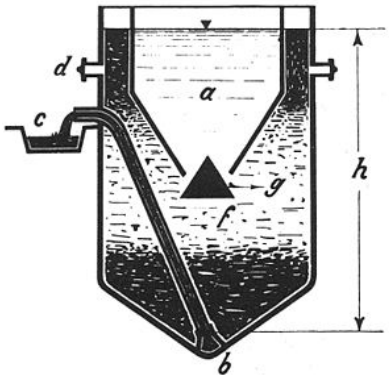


Hydrolysis: Organic matter is decomposed into simple molecules that dissolve in water. Chemical bonds between the substances are broken.

History of Anaerobic Digestion

The use of anaerobic digesters for energy production may be new, but the idea that waste could be used for energy is not. This possibility gained attention as early as 1808, when **Sir Humphry Davy** proved that methane was present in the gases produced by cattle manure. The first anaerobic digester was built in 1859 in a leper colony in Bombay, India. In 1895, a sewage treatment system was used to generate biogas to fuel the street lamps in Exeter, England Later in the 1930s, more manure and agricultural waste were utilized to generate methane.

The first patent for a digester was issued in Germany in 1907. Engineer **Karl Imhoff** created a system for waste water treatment that allowed for a slow digestion process, typically 6 to 9 months. Digestion occurred in a two chambered cone. The outer cone allowed the sewage materials to separate with the sludge sliding into the lower chamber for digestion.



Since the 1940s, digesters have been used in Massachusetts wastewater treatment plants to reduce solids that would otherwise be sent to landfills or incinerated. One of the first farms to utilize this technology was Jordan Dairy Farms in Rutland, MA.

In 2010, Jordan Dairy Farms joined four other Massachusetts farms to form AGreen Energy, LLC, this partnership allowed the farmers to work together to establish more sustainable waste removal practices. Each of the five farms will build a digester, with Jordan's building the first one in the group. According to the Mass. Executive Office of Energy and Environmental Affairs, the Jordan facility takes in 9,125 wet tons of manure and 16,425 tons of source-separated organics per year. The system has a capacity of 300 kilowatts and is estimated to generate 2.24 million kWh of electricity per year, enough to power the farm and 300 homes. One cow at Jordan Dairy Farms produces slightly more electricity than is needed to power one average home.

Anaerobic Digesters on Massachusetts Dairy Farms

Massachusetts is on the cutting edge of finding ways to reduce our food waste carbon footprint. There has been significant investment within the state for the building of digesters, as well as a heavy push from the legislature for companies to reduce their food waste in landfills. Starting in July of 2014, large companies will no longer be able to send organic food waste to landfills. Instead, they will have to find alternative options such as commercial composting or sending wastes to local farms for use as animal feed or using their food waste to help power one of the states anaerobic digesters.

These efforts will help to combat an increasingly problematic issue for the environment. Decaying food waste produces methane, a greenhouse gas that has negative effects on the environment. Massachusetts is leading the charge for more regulation on wastes but also solutions that will help to lessen the effect on the environment, as well as create jobs and income for Massachusetts farmers and green industry.

Anaerobic Digester at Jordan Dairy Farms in Rutland, Massachusetts

Jordan Dairy Farms (Rutland): One of the first farms to utilize an anaerobic digester was Jordan Dairy Farms in Rutland, MA starting in 2011. It is estimated that in one day the digester offsets 5,500 pounds of CO_2 emissions and produces enough electricity to power the average home for 134 days.

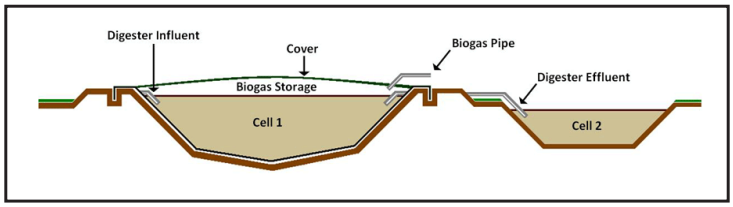
Pine Island Farm (Sheffield): A family-owned and operated dairy farm in Berkshire County, Pine Island Farm spans 1,300 acres of cropland, and houses approximately 1,000 head of Holstein cattle. In November 2011, Pine Island Farm began using the manure to produce energy to cover all the electricity needed to run the farm, heat water, and run the digester, while also allowing the farm to sell energy back to the grid. The feedstock for the digester is mostly manure, but is also partly excess whey from regional producers. View images of the Digester at Pine Island Farm in Sheffield at http://blog.mass.gov/wp-content/uploads/legacy-images/energy/6a0133ec786504970b0147e17ac13 3970b-pi.jpg.

Barstow's Long View Farm (Hadley): Barstow's Longview Farm, partnered with Quasar Energy Group and other investors to form AGreen Energy, LLC. The anaerobic digester has been operational on the site since December 2013.

Types of Digesters

There are many different kinds of anaerobic digesters, below are descriptions of the three most common types.

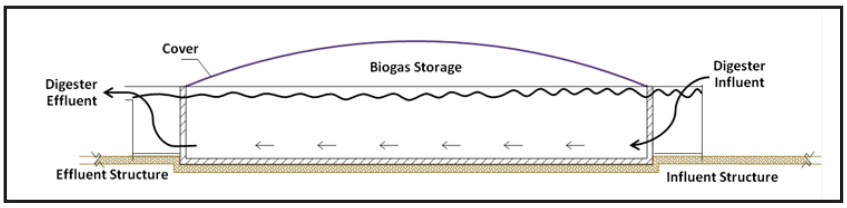
Covered anaerobic lagoon: An anaerobic lagoon is sealed with a flexible cover, and the methane is recovered and piped to the combustion device. Some systems use a single cell for combined digestion and storage. This type of digester is not heated and thus requires a warm climate to be truly effective. Lagoon digesters are less suited for cooler climates because the digestion process is not consistent thus increasing the smell and reducing the quality of the gas that is produced.



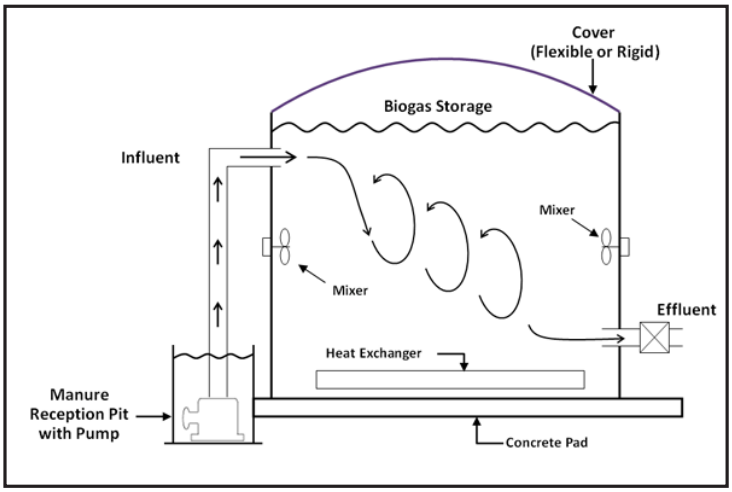
Covered Anaerobic Lagoon model above and working system below.

Plug flow digester: A plug flow digester has a long, narrow concrete tank with a rigid or flexible cover. The tank is built partially or fully below grade to limit the demand for supplemental heat. As there is no agitation within the vessel, plug flow digesters are used only at dairy operations that collect manure by scraping.

Plug Flow Digester working system above and model below.



Complete Mix Digester: A complete mix digester is an enclosed, heated tank with a mechanical, hydraulic, or gas mixing system. The model is insulated to keep a consistent high temperature. Complete mix digesters work best when there is some dilution of the excreted manure with water. Most frequently the biogas produced in this model is reused to maintain the temperature for a constant digestion process.



Complete Mix Anaerobic Digester model above and working system below.

Common digester misconceptions include that anaerobic digestion and the resulting biogas production will reduce the quantity of manure and the amount of nutrients that remain for utilization or disposal. On an average, only 4% of the material is converted to biogas. The remaining 96% leaves the digester as a stable nutrient-rich, weed-seed free, reduced or pathogen free and nearly odorless effluent.

All anaerobic digestion model and system images are courtesy of AgStar, an EPA partnership program. They can be found at http://www.epa.gov/agstar/anaerobic/ad101/anaerobic-digesters.html.

Why Anaerobic Digestion?

The repurposing of manure and food wastes into fuel has benefits for the environment and for farmers. The first advantage of anaerobic digestion is that the process converts waste products that may have ended up in landfills or as water pollutants into a useful alternative. This is helpful to the farmer as well, as this biogas can be reused in the farm to continue running the digester.

The methane that is found in manure, if left to natural processes, will escape into the atmosphere Alternatively, if there is excess it can be sold back to energy companies. This reduces the need for fossil fuels while also creating extra income to support the farm.

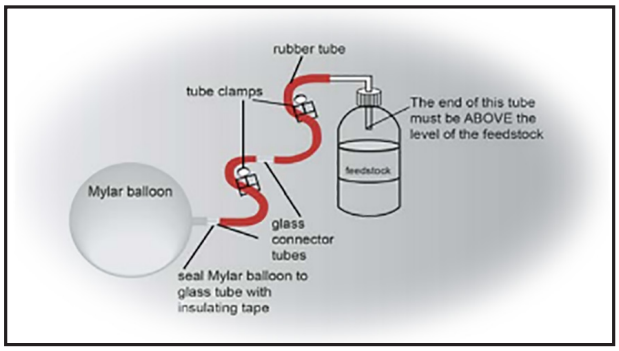
Another advantage for the farmer, as well the environment, is the use of the residual solids for fertilizer. This reduces the need for chemical fertilizers, decreasing the probability of runoff getting into the water supply while reducing soil erosion. The solids can also be made into products that can be sold to consumers, such as potting soil and biodegradable planting pots.

Methane digesters have been used in Europe for many years, but is increasing in popularity in the United States. Small scale digesters are being used in developing countries to provide sustainable fuel sources for cooking and heating. In non-agricultural applications, the most common usage of anaerobic digestion has been in sewage treatment to help reduce waste and sludge in the environment.

This educational resource on Anaerobic Digestion was funded by a grant from the Massachusetts Dairy Promotion Board.

Massachusetts Agriculture in the Classroom
P.O. Box 345 Seekonk, MA 02771
www.aginclassroom.org

Integrating Anaerobic Digestion in the Classroom: Build your Own Biogas Generator



In this activity students design and construct a biogas generator from household materials, collect the gas produced over a number of weeks and test it. Biogas generators can be constructed from materials such as soda bottles, and the gas burnt using a Bunsen burner. A list of possible materials is provided below.

- Water cooler bottle or soda bottles
- Rubber tubing
- Clamps
- Measuring cylinder
- Tape
- Plastic tubes
- Mylar/foil balloon (rubber balloons are porous and allow the gas to escape)
- A variety of organic matter such as grass clippings, leaves, waste fruit and vegetables, tea bags
- Bunsen burner and heatproof mat

Designing and constructing a biogas generator makes an ideal project for students to express their creativity and problem-solving skills. Ideally students should design their own system, but if time does not allow, the system above could be used. It can take up to six weeks to produce enough biogas to burn. This could be a great science fair project!

First of all introduce the background to biogas production and explain the objective. Provide students with a schematic of an actual biogas generator and discuss the function of parts of the generator. You may want to show contrasting examples of biogas generators such as those used in developing countries for cooking and those used to generate electricity in power stations. Provide a list of organic material available for use in generating biogas and discuss the pros and cons before beginning construction of the generator. If students are designing their own biogas generator you will need to check their plans and ensure they have considered and can demonstrate how they will undertake the investigation safety.

Bokashi Composting: A New Idea in Composting

At our April 26 Day of Garden Skills Workshops and Demonstrations for the School Garden, **Paul Pieri,** science teacher at the **Wheeler School** in Providence, introduced us to a new method of composting in which all food waste can be composted together. This includes all non-plant based foods. Yes, that means cheeses and meats can go together with all your other food scraps! Paul is experimenting in his classroom with this new method of composting to test its effectiveness and explore the possibility of reducing waste at his school. This method is known as Bokashi composting.

Bokashi means "Fermented matter" in Japanese and has been practiced by farmers in Japan for centuries. Only recently has Bokashi made it's way to the U.S. As the name implies, this method of composting uses natural fermentation to reduce waste and produce useful compost. While traditional composting uses heat and soil microbes to break down plant matter, Bokashi composting uses anaerobic microbes to break down food scrapes. In order to do this micro-organisms are introduced to the food materials in bran to help begin the fermentation process. Bokashi composting can be done inside or outside as there is very little odor produced in the process.

(From Time to Recycle at http://www.timetorecycle.com/compost/bokashi.asp)

Workshops on the Farm

Join us for one of more of our summer workshops and gain knowledge and resources while you explore local farms. Each workshop runs from **9 a.m. to 3 p.m.,** offers classroom-ready activities and focuses on one unique aspect of agriculture with exploration of the work that takes place at that farm. The fee of $40 includes pdp's, lunch and materials. **Two additional workshops can be found on the MAC website.**

On **Tuesday, July 8**, increase your knowledge of dairy cows and the economics of dairy farming in Massachusetts at **Barstow's Dairy Farm** in **Hadley.** Meet the new dairy lessons available on the MAC website and learn about classroom composting. The day includes an opportunity to see how an anaerobic digester works and why this is becoming so popular in Massachusetts. Instructors will demonstrate ways to correlate this information with STEM education in the classroom.

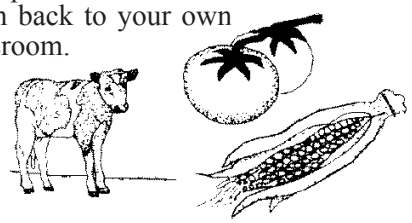
This workshop offers and orientation to fiber basics using various natural fibers to produce yarns, card, spin and drop-spin. **Cynthia Jensen,** high school teacher and fiber enthusiast, invites you to her home in **Worthington** on **Thursday, July 10.** You will also have the opportunity to use natural dyes, felt and even harvest some of the fibers, while you enjoy practical, hands-on experiences that can be applied in the classroom. In the afternoon, we'll visit fiber animals at nearby **Phantom Farm.**

Smolak Farms in **North Andover** is 300 years old and covers 155 acres. The farm produces fruits and vegetables and also offers many activities and festivals to the public. On **Tuesday, July 15**, learn the farm's history and about the varied ways that farming here has changed through the generations of family managers. You'll have the chance to explore what it takes to keep a farm successful and viable today. **Ken Oles** will lead discussion on how new ideas can be included in your classroom.

Travel to **Curtis Farm** in **Westminster** on **Tuesday, July 22,** where we'll hear from owners **JoAnn** and **Chris Mossman** about how they manage the responsibility that comes with a historical family farm. They'll cover how they are preserving its authenticity while planning for the future. Learn about managing and preserving the health and resources of this unique woodland, as well as maple syrup production. Science lessons with STEM connections relating to trees will be shared. In the afternoon, we will travel to a nearby school garden, where we'll learn how they connect STEM lessons to the garden.

Thursday, July 24th takes us to **Rutland**, where we'll start the day with a brief orientation to the history and philosophy of **Heifer International's** mission. Then livestock manager **Donna Kilpatrick**, will demonstrate how raising animals and caring for them can be related to classroom activities. Our afternoon tour of the vegetable gardens with an emphasis on new garden bed preparation methods will enable us to view the variety of foods grown at Heifer International and inspire us for our own school gardens!

Spend **Tuesday, July 29** exploring the benefits of Agricultural Education at **Norfolk County Agricultural High School** in **Walpole.** We'll tour the newly expanded facilities as this special school that offers students the opportunity to explore agriculture and natural resources along with a traditional education. Learn how agriculture is woven into the curriculum and the benefits of an the educational experience at an agricultural high school and the many majors that are offered to students. Learn why this may be the perfect choice for some of your students. Instructors will provide appropriate lessons ideas that can be taken back to your own classroom.



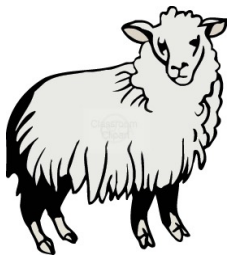
Annual Fall Conference

Mark your calendar. Our 6th annual **Fall Conference for Educators** will be held **November 8th** at the **Clay Science Center** of **Dexter & Southfield Schools** in **Brookline.** Tours of the School and **Allandale Farm** and a choice of concurrent workshops during four workshop sessions. Each will focus on gardening, composting, natural resource conservation and local foods. $50 fee includes lunch, materials and ten professional development points with classroom activity.

Scholarships are available for new and urban teachers and farm educators thanks to a grant from Farm Credit Northeast AgEnhancement.

Farm Credit Northeast AgEnhancement

REGISTRATION ... DONATION.... MATERIAL ORDER FORM



Please fill out this form and return it to: MAC, Inc. P. O. Box 345 Seekonk, MA 02771

Name _____

School or Organization _____ Address _____

City _____ State _____ Zip _____

Phone Number (day) _____ (evening) _____ e-mail _____

I am registering for the following workshop (s): ☐ $40 enclosed for each workshop registration, ☐ please send directions

☐ July 8, Barstow's Dairy Farm, Hadley
☐ July 15, Smolak Farms, North Andover
☐ July 24, Heifer International, Rutland
☐ July 10, Fibers, Felting and Fun in Worthington
☐ July 22, Mossman Homestead in Westminster
☐ July 29, Norfolk Coounty Agricultural HS, Walpole

☐ I am registering for the August 5, Summer Garden Conference ☐ $50 is enclosed (Make Check payable TO MAC)
☐ I am registering for the Summer Graduate Course ☐ $500 is enclosed (Make Check payable TO MAC)

Please send information on: ☐ Summer Graduate Course; ☐ Summer Conference on Aug 5; ☐ Fall Conference on Nov. 8;

I'd like to make a tax-deductible donation in the amount of: ☐ $50; ☐ $25; ☐ $10 Other donation _____

Calendar

- **May 15, "Plant Something"** from MNLA & MA Flower Growers Assns. at www.plantsomethingma.org.
- **May 15 - Mass. Envirothon,** focus on Sustainable Ag. at Sholan Farm, Leominster www.maenvirothon.org.
- **May 18th - Great Tomato Giveaway & Heirloom Plant Sale** at Old Sturbridge Village, visit www.osv.org.
- **May 24-25 - 40th Annual MA Sheep & Woolcraft Fair,** Cummington Fair-Grounds visit www.masheepwool.org.
- **May 31st- Tower Hill Botanic Garden Plant Sale,** Boylston, For information, visit www.towerhillbg.org.
- **June 23-27, National Agriculture in the Classroom Conf.,** Hershey, PA. Visit www.agclassroom.org.
- **August 8-10, 40th Annual NOFA Summer Conf.,** UMass, Amherst, at www.nofasummerconference.org.
- **September 13th - 28th - Eastern States Exposition** in W. Springfield. at www.thebige.com. MA Day - Sept. 18,
- **Sept. 30 - Oct. 4, MA Harvest for Schools** www.mass.gov/agr/markets/Farm_to_school/.

Resources

- **"School Gardening Blog"** from MAC at http://aginclassroom.org/School%20Gardens/blog.html.
- **"New Dairy Lessons - Gr. 1-4"** from MAC at www.aginclassroom.org/For%20Educators/Dairy_Lesson_Plans/dairy_lessons.html .
- Build a Dairy Farm to School Connection with MooNews. Visit NewEnglandDairyCouncil.org and click on Moo News.
- **"Farmer's Almanac Themed Lessons"** at www.agintheclassroom.org/TeacherResources/Lesson%20Booklets/Farmers'%20Almanac%20Lessons.pdf.
- **"Soil Testing Laboratory"** at Umass at http://soiltest.umass.eduM also **Vegetable Crops** with specific recommendations at http://extension.umass.edu/vegetable/.
- **"Four Week Embryology Program**" for Schools from UMass http://mass4h.org/programs/embryology.
- **"Farm Recipes"** from the Mass. Federation of Farmer's Markets as well as a list of local markets at www.massfarmersmarkets.org/FMFM_Main.aspx.

- **2014 Massachusetts Agriculture Calendar Photo Contest.** Now is the time to start taking pictures for the 2014 Massachusetts Agriculture Calendar Photo Contest. Photos must be at least 4" by 6" and no larger than 8" by 10" and must have been taken in Massachusetts in the past three years. Send photos (no e-mail files) of local rural scenes, farm animals, and more by June 1 to Photo Contest, Mass. DAR, 251 Causeway Street, Suite 500, Boston, MA 02114. For more information, e-mail to Richard.LeBlanc@state.ma.us. The twelve winners will be featured in the 2015 Massachusetts Agriculture Calendar and posted on MAC's website. For details visit www.mass.gov/agr/.

To receive more information, add a name to our mailing list or give us your comments:

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