

Down To Earth: Reports from the Field

Innovative Small Farmers' Outreach Program (ISFOP)



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Generating Income Through Agroforestry

By Dr. Ajay Sharma, Assistant Professor of Forestry, and Reneesha Auboug, Farm Outreach Worker - East Central Region

If you look at the fields, woods, streamsides and fencerows on your farm and feel that these areas have not been fully utilized, you are probably right. Many agroforestry practices that introduce trees and shrubs into agricultural crops, and/or livestock, can add profits to your farm outputs. Agroforestry practices are environmentally beneficial as well. Combining trees with agricultural crops diversifies the farm production and insures against crop failure. Some of the common agroforestry practices include windbreaks, forest farming, alley cropping, riparian forest buffers and silvopasture (described below).

If the farmsteads, livestock areas or fencelines on your farm are unsheltered, you can grow one or more rows of trees, shrubs and/or grasses to form windbreaks (shelterbelts). These provide protection. They also increase production while generating marketable tree products. Trees and shrubs used for windbreaks yield wood, nuts, apples, cherries, blackberries and woody floral products. Some of the microclimatic (climate that is uniform in a small area) benefits of these shelterbelts are that they lead to improved crop, vegetable and fruit production and quality. For example, windbreaks have been shown to increase yields of corn and soybeans by about 13 percent, winter wheat by 23 percent and hay by 20 percent. In addition, windbreaks can reduce the cases of disease and mechanical injuries to agricultural crops; these include bacterial leaf spot in peppers, sandblast injury to tomatoes and diseases in snap beans.

Most of the woodlots owned by Missouri farmers are not

used. A little management would allow a grower to farm under a forest canopy that could offer diverse ways to enhance income. A managed woodlot not only produces high-quality lumber and firewood, it can also provide many specialty products. These include maple syrup, decorative ferns and shiitake or other mushrooms. Woodlots have an ideal microclimate to grow a range of medicinal plants. These include ginseng, goldenseal, black cohosh, bloodroot, etc. All of these plants can be grown in the shade under the forest canopy. The sale of these products can provide income while timber matures or where timber harvesting is not possible or desirable.

On marginally productive lands, alley cropping can be



Growing shiitake mushrooms on a small farm in Central Missouri

useful. To do so, trees or shrubs, such as black walnuts, pecans, oaks, chestnuts or other fruit-bearing trees, are grown in rows. However, vegetables, horticultural plants, forages (plants eaten by livestock) and traditional row crops are raised in alleys. Alleys are the wide spaces between the woody plants. Blueberries, chokeberries, elderberries, etc. have great potential when marketed as locally grown products. However, alley cropping calls for a good grasp of the system to get the most benefits. Therefore, farmers should talk to an agroforestry Extension specialist who

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knows about local tree and crop species. An expert will be able to provide field layouts to plan a suitable alley cropping system.

If the farm or ranch has streams, rivers or lakes, creating riparian (bank of a waterway) forest buffers can be a smart move. Riparian forest buffers are areas of trees, shrubs, forbs (an herb that is not a grass) and grasses on the banks along a waterway. Planting trees like walnuts, oaks and maples as well as some medicinal plants and food crops (berries, nuts and mushrooms) or fast-growing trees adds opportunities to make more profits. These buffers also have conservation benefits; they improve water quality, reduce flood damage and improve aesthetics. A riparian buffer system with diverse species greatly enhances habitat for game and nongame species. In such cases, hunting for a fee might be another way to increase income in a riparian buffer system.

Open pastures on your farm and ranch can be changed to silvopasture, where forestry and livestock are combined. This is done by adding widely spaced trees, such as various nut and fruit trees. Planting trees on open pastures lengthens the forage growing season. It also improves forage quality. If shade trees are spaced properly, they can help cattle relieve heat stress. This results in higher weight gain, improved milk yields, better conception rates and lower medical bills. In a University of Florida study, dairy cows that had shade

produced 10-19 times more milk than cows without shade. Similarly, a study done at University of Missouri (MU) found that shade increased the pregnancy rates of cattle by 40 percent. Trees also produced added income when they or their products are harvested.

An agroforestry design can be made to fit the landowner's property, conditions, goals and other factors. Extension educators at Lincoln University or at the MU can help you to develop a plan for your farm. In the upcoming issues of this newsletter, we will discuss in detail some of the practices mentioned in this article.

The Center for Agroforestry at MU (www.centerforagroforestry.org) and the National Agroforestry Center (www.nac.unl.edu) at Lincoln, Nebraska, have a variety of agroforestry resources for farmers. ■



A pecan-based silvopasture in Central Missouri.

Owning a Breeding Male Versus Artificial Insemination

By Phillip Boydston, Farm Outreach Worker

Small acreage owners are looking for ways to diversify their operation or simply to start livestock production. As a result, ownership of a herd of cattle or hogs is becoming more and more common. Owning livestock means knowing about many management topics. This includes everything from nutritional requirements to fencing to handling facilities and breed selection. With a breeding herd, one of the most important topics is reproduction. Otherwise, a breeding herd can easily become unprofitable.

Many livestock producers own a breeding male. It might be a boar for their swine herd or a bull for their cattle herd. Owning live male animals to complete the breeding

process seems a given. However, there are other options for swine and cattle owners. Artificial insemination (AI) is a breeding technique that dates back at least to the 14th century for racehorses. The process was refined in the late 1930s and has been updated since then. It is now an agricultural industry of its own. While AI is used on some goats and sheep, it is much less common than with cattle or swine. Recent research by the United States Department of Agriculture (USDA) shows that nearly 13 percent of beef cattle and over 70 percent of swine and dairy cattle in the U.S. are bred using AI.

Listed on page 3 are some of the pros and cons of AI.

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Artificial Insemination: Pros

1. Biosecurity

- Eliminating all breeding male animals can drastically reduce the risk of fungi, viruses or sexually transmitted and other diseases.
- AI eliminates the need for one more (male) animal that would need a special pen, needing to be cleaned and supplied with fresh feed and water.

2. Planned calving/farrowing (birthing piglets) times

- AI provides a way to know exactly when an animal will calve or farrow based on when it is bred. AI also allows a more timely pregnancy check to know if breeding occurred.
- With timed or synchronized AI (versus natural heat AI), an entire group of animals can be bred to calve or farrow on the same day to allow better labor planning, facility use and marketing of offspring.

3. Safety

- There are no dangerous/hormonal male animals that need to be securely penned most of the year.
- There is no need for the general handling, transportation, capture and sorting of these males from the group one or more times per year.

4. Improved genetics

- AI provides an option to use improved genetics from some of the best proven herds from around the world.
- AI drastically reduces the risk of inbreeding. Just 1 percent of inbreeding in a dairy cow can result in a loss of 775 lbs. of milk in her lifetime (Smith et al. 1998).
- AI gives producers a chance to choose offspring that show more maternal traits for replacement females. These traits include reproduction, calmness, milking ability, growth, size and muscling for terminal markets.
- AI also offers the ability to use sexed semen in cattle. A user has a 95 percent chance of selecting either a male or a female calf.

Artificial Insemination: Cons

1. Handling facilities

- For a cattle producer, a chute and/or catch area is needed to gather and then tightly hold the female while breeding. With synchronized heat, the facility will need to be used three times to complete the AI process.

2. Increased management

- For AI to be successful, a producer must keep excellent records and carefully watch animals for signs of heat.
- AI tools and semen must be clean and properly stored for AI to be successful.
- It is necessary to coordinate with a hired AI technician to complete the job or take an AI certification course.

3. AI is not foolproof

- In addition to added time and labor, AI breeding often does not result in 100 percent conception. Swine routinely offer the best results at 85-90 percent conception rates. This is typically done by an AI servicing that is followed by a second one within 12 hours during natural heat. Beef cattle average around 60 percent conception (during a single AI servicing during natural heat). Dairy cattle come in lower, at about 45 percent; this is mainly due to the increased demands of heavy lactation.



While the pros and cons are somewhat static, the economics of AI can vary. They must be figured for each specific producer to find the true value of AI.

In swine, semen is often overnight airmailed in its fresh, liquid form. Depending on the breed and chosen genetics, this can cost as little as \$10 per dose but could easily cost 2-3 times more. Typically, a female requires two doses during a traditional AI servicing. Also, most companies offering swine semen will send one-time-use AI tools free of charge or at little cost. For cattle, semen comes frozen. It must be kept frozen until immediately before use. As with swine, doses can be delivered for about \$10 each. However, only one

dose is used per breeding.

In contrast, when using live breeding males, there is the cost of feeding and maintaining them. There are also only a certain number of females that each male can service per year. Usually, a bull can handle 25-30 cows for a breeding season; a boar can typically service 16 sows (or 30-35 breedings per year). If you have a small herd, you need to decide if you would get your money's worth out of that animal. Consider the following questions: How many years can you use that male before he is inbreeding? Could you use that pen or pasture for another female? *(continued on page 4)*

Artificial Insemination (continued from page 3)

Table 1. Annual cost estimates of breeding a small herd of females during natural heat using semen from an improved sire (AI) versus maintaining a breeding male.

Swine AI	Estimated Cost	Your Cost	Swine with Boar	Estimated Cost	Your Cost
Semen (2 doses) (price varies)	\$25 ea x 2 = \$50		365 days of feeding (avg. 5.5 #/hd/day)	\$225/ton feed x 1 tons = \$225	
One-time use tools	\$5		Boar cost per year (purchase-cull value)/2 years service life	$(\$370-76)2 = \147	
Extra time to detect heat and breed	1 hr. x \$12/hr. = \$12		Extra time to put in and take out male from herd for two breedings	6 hrs x \$12/hr = \$72	
Above total divided by average conception	$\$67/90\% = \74		Divide above total by number of breedings per year	\$444 for use on 3 sows twice yearly (\$444/6 breedings)	
Cost of each breeding per sow	\$74		Cost of each breeding per sow	\$74	
Cattle AI	Estimated Cost	Your cost	Cattle with bull	Estimated cost	Your cost
Semen (1 dose) (price varies)	\$25		365 days of feed/hay/pasture (6.5 tons of hay/forage and 1 ton of supplement)	\$702	
Multiyear AI tools or hire an AI technician	\$9		Bull cost per year (purchase-cull value)/3 years service life	$(\$3500-\$1350)/3 = \$717$	
Extra time to detect heat and pen animal	2 hrs. x \$12/hr. = \$24		Extra time to put in and take out bull from the herd	3 hrs. x \$12/hr. = \$36	
Above total divided by average conception	$\$58/60\%$ average conception = \$97		Divide above total by number of breedings per year	\$1435 for use on 15 cows (\$1435/15 breedings)	
Cost of each breeding per average conception	\$97		Cost of each breeding	\$97	

Artificial Insemination (continued from page 4)

A final note: While this article focuses specifically on the value of AI versus owning a breeding male, there are other options. It might be possible to rent or share a breeding male. Use the same process to evaluate all options to find the best value for getting your female livestock bred.

All livestock producers reading this article are encouraged to figure out their out-of-pocket expenses. While the estimated figures presented here are based on actual values, they need to be specific to your farm. It is also worthwhile to discuss the added values and risks for each of the pros and cons listed, not just the out-of-pocket expenses. Improved management, safety, genetics, etc. can also be valuable for your operation.

For more information on artificial insemination, consult your local veterinarian and/or Extension personnel. Also, you might want to check out the following resources:

For swine:

<http://extension.missouri.edu/p/G2312>

http://www.swinegenetics.com/downloads/ai_manual.pdf

http://extension.usu.edu/files/publications/publication/AG_Swine_2007-03pr.pdf

Cronje, R., ed. 1998. *The Swine AI Book: A Field and Laboratory Technicians' Guide to Artificial Insemination in Swine*, 2nd ed. Raleigh, NC: North Carolina State University.

For cattle:

<http://msucare.com/pubs/publications/p2628.pdf>

http://animal.ifas.ufl.edu/ans3319/lab_notes/docs/lab_12_artificial_insemination_cattle.pdf

A.I. Management Manual, 6th ed. Vol. 1. 2011. DeForest, WI: ABS Global, Inc.

Smith, L. A., Cassell, B. G., and R. E. Pearson. 1998. "The Effects of Inbreeding on the Lifetime Performance of Dairy Cattle." *Journal of Dairy Science* 81, no. 10: 2729-2737. ■

Minimizing On-farm Food Waste

By Joyce Rainwater, Farm Outreach Worker - East Central Region

One of the biggest questions in agriculture today is how farmers are going to feed the growing world population, an estimated 9 billion people by 2050. Increasing food production might seem to be the solution. However, in the U.S. today, we currently throw out 40 percent of what we grow. So why not start there? Below are a few simple tips for reducing waste from what you produce on your farm.

Start with the right variety

In each fruit and vegetable category, some varieties are recommended for eating fresh, and others, for storage. Choose the variety or a combination that meets your market needs. Select a variety that grows well where you farm. Choosing a variety that is not well suited to your soil type, climate or market will lead to less produc-

tion and/or more waste. For instance, one can choose to grow a green, ripe tomato variety. However, if your consumers will not buy these tomatoes, they will end up as waste.

Grow what you can sell; sell what you can grow

Talk to potential buyers before and during your planning process. If you do not have a market for 400 pounds of squash, do not plant that much. This will cut waste in and out of the field. On the other hand, if you are very good at growing high-quality squash or have the perfect soil for squash, try to market this product through various channels. It might be sold to chefs, restaurants and/or schools.

Plant and maintain crops

Use proper spacing in rows and

between rows of crops to promote proper airflow. Pruning plants as they grow can help prevent loss of fruit and damage to crops due to disease and pests. Limiting the moist, humid conditions in which pests like to hide and grow also reduces loss. All of these procedures decrease waste.

Monitor pest and disease pressure

The general population does not understand that a small imperfection on produce is natural. It does not affect consumption. Instead, the majority of consumers want the picture-perfect produce that they see on many grocery store shelves. Inform your customers about your farming methods and what causes these small blemishes. Maybe you have chosen to spray less pesticide or grow organically. This benefits consumers.

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Swine Production on Small Farms

By David Middleton, Farm Outreach Worker - Southwest Region

For many years, hogs have been known as the “mortgage lifters.” This is because a few pigs could do more than supply the yearly meat. As a source of income, they literally paid the mortgage. Today, farms are more specialized. Diversified farms, especially small farms, have become more dependent on fewer ventures. Thus, farms are more susceptible to changing markets, weather and the economy. Adding livestock to a crop or vegetable farm or adding more than one livestock species is more likely to increase income while also spreading risk.

Before discussing how to add swine to your farm, let’s tackle some terminology. A boar is a male pig of any age; a castrated boar is a barrow. A young female is a gilt, and a sow produces piglets. Farrowing is the term for giving birth. Pigs will breed all year. They come into estrus every 21 days. The sow is in gestation for 112 days. She is capable of producing two litters per year, with an average litter of eight pigs. Commercial pork producers wean early (from 10 to 21 days), but most small farmers wean at eight weeks. Boars raised for meat must be castrated as there is a taint to their meat. There is also the possibility of death or injury from boars fighting.

What does it take to add swine to your farm? There are several swine production models. The simplest is to purchase feeder pigs—pigs weighing around 60 to 70 pounds. Feed them to market weight, 240 to 260 pounds. They can then be sold. Or, they can be butchered for farm use or marketed to family and friends. This enterprise typically is completed by the fall, so there

are no winter chores. The second model is the production of feeder pigs. This involves owning a boar and sows. Farrowing sows and selling weaned pigs to others to raise is a year-round endeavor. More facilities are required, including buildings and pens. Plus, water must be supplied to multiple locations. The last model is farrow to finish. This means owning the breeding stock and raising the piglets to market weight. It requires more pens and buildings to separate boars, sows, farrowing sows and growing pigs. Other



expenses include housing, feeders and waterers.

Facilities do not have to be elaborate. Pigs are easily trained to an electric fence, so these animals can be moved from one paddock to the next with relative ease. A small pen with hog panels might be needed as a catch pen. Pigs also require buildings, especially during the winter. Bedding must be used to keep the pigs warm. Sows can farrow outside in the summer with no protection as they will build their own nests. However, it is better to have shelter for protection from the sun and rain. Growing pigs do well in a wooded area in the summer without shelter but will need some protection in the winter. Homemade or commercial feeders and waterers can be used. Or, water



fountains can be purchased.

Some farmers choose to build a feeding floor to raise the market hogs. These structures can be built with a wooden floor spaced for the manure to drop through. A shed, feeder and waterer can be placed on the platform, with a fence to confine the pigs to the feeding floor. Pigs can be raised without much land. All that is needed is one of the following: an unused wooded area, a small spot in a barn for a few pigs, a fallow production field or an area unfit for crop or vegetable production.

Nutrition is very important in swine production. Hogs are monogastric animals, meaning that they have a simple stomach like humans. While raising pigs outdoors is important to most producers, pigs cannot eat forage (grasses and plants) as their main source of food. So, it is vital to provide a diet that has protein, vitamins and minerals. Most swine rations consist of corn or milo along with a protein source (typically soybean meal) as well as vitamins



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Swine Production on Small Farms (continued from page 6)

and minerals. Breeding stock can be limited fed to achieve the desired body condition; however, nursing sows and growing pigs need to have unlimited access to feed. There are many types of commercial feed, and they are developed for different stages of life. It takes about 650 pounds of feed to raise a pig from 60 to 250 pounds, so this is the most costly aspect of raising swine.

There are eight major breeds: Berkshire, Chester White, Duroc, Hampshire, Landrace, Poland, Spots and Yorkshire. All of these date back over 150 years, so they are all heritage breeds. Then there are the minor breeds: Red Wattle, an offshoot of Duroc; Mulefoot, a genetic mutation selected for a solid foot; Hereford; Tamworth; Large Black; Gloucester, a forerunner of Spots; Wessex Saddleback and Ossabaw Island. The white breeds are considered to be maternal; the colored breeds are more likely to be bred for carcass traits. A good cross is a dark boar on a white sow

to achieve heterosis (hybrid vigor). This cross provides the benefits of mothering ability and fast-growing pigs that will have an acceptable carcass. So what breed works best? Whatever you like, can source and enjoy raising is the right breed for you. Talk to someone already producing or raising hogs, and decide what seems to fit your situation.

When adding a new enterprise, it's best to think of the end first: How will I market my production? There are many avenues when it comes to marketing. Maybe you will consume products yourself or sell some to friends and neighbors. You can place ads on Craigslist or in local newspapers. You can also distribute flyers in feed stores or farm supply stores. Whether selling feeder pigs, market hogs or pork, there is a market in most areas. There is also a market for purebred breeding stock for producers wanting to source genetics to add to their herds.

Here are some interesting facts about

pigs. Pigs do not sweat. That is why they like to cool off by wallowing in the mud. They are as intelligent as dogs and can be easily trained and housebroken. When given the opportunity, they will designate an area to use for waste and keep the rest of their pen clean. They have a keen sense of smell and have been trained to find truffles. Baby pigs will fight to claim a dinner spot and will only nurse from that spot until weaned. Pigs dig to make a cool place to lie or to find supplements that their diet lacks. Because pigs are anatomically similar to humans, they have been used in medical research and heart valve replacement surgeries.

The versatile pig is an excellent way to diversify your small farm. You can increase income, raise your own meat and turn discarded produce into protein. Pigs offer a unique opportunity to those wanting to be more efficient and profitable on today's small farm. ■

Minimizing On-farm Food Waste (continued from page 5)

Handle produce less

Although this is not always easy, with less handling, produce lasts longer. Also, harvest at the correct time of day to keep plants healthy.

Storage is important

Store your freshly harvested produce at the correct temperature and humidity. Tomatoes should be kept in cool but moist conditions. In contrast, hot peppers should be kept warm and dry. Maintaining harvested produce in recommended storage conditions extends shelf life, which cuts waste. Cornell University has a useful farm storage guide for fruits and vegetables at [\[sheets/vegetables/storage.pdf\]\(http://www.gardening.cornell.edu/fact-sheets/vegetables/storage.pdf\). The University of Minnesota also has a guide that is geared more toward the home gardener. It can be used as a market handout to help customers waste less. You can find this guide at <http://www.extension.umn.edu/garden/yard-garden/vegetables/harvesting-and-storing-home-garden-vegetables/>.](http://www.gardening.cornell.edu/fact-</p></div><div data-bbox=)

Preserve for your own use

Learn how to properly freeze, dry and/or can your excess produce for your use throughout the year. The University of Missouri Extension web page (<https://extension.missouri.edu/>) offers many resources on these topics. You can also ask

for help from local Extension staff. If you are already skilled in these techniques, consider teaching a short course on home preservation to your customers. That way they can buy more of your produce! Also, many markets allow vendors to sell dried herbs. This might be another marketing opportunity to explore.

By following these simple tips, you can easily reduce waste on your farm. And by educating your customers, you might also help them change their food-wasting habits. As always, if you have a question, please contact your local Farm Outreach Worker. ■

About Our Program...ISFOP

If you are a small farmer and need information, please contact an ISFOP Farm Outreach Worker (FOW). FOWs live and work in your community. They can provide information on ways to better manage your resources, reduce expense and increase income. They can also provide information on other programs and resources that may increase your income and the overall quality of life for you and for your family.

You are eligible to participate if you meet the following requirements:

- Your family lives on a farm, rural or urban.
- Farm products or income from the farm are necessary for you to live where you do.
- Your family provides the management and most of the labor for your farm.
- Your total annual family income is less than \$50,000.

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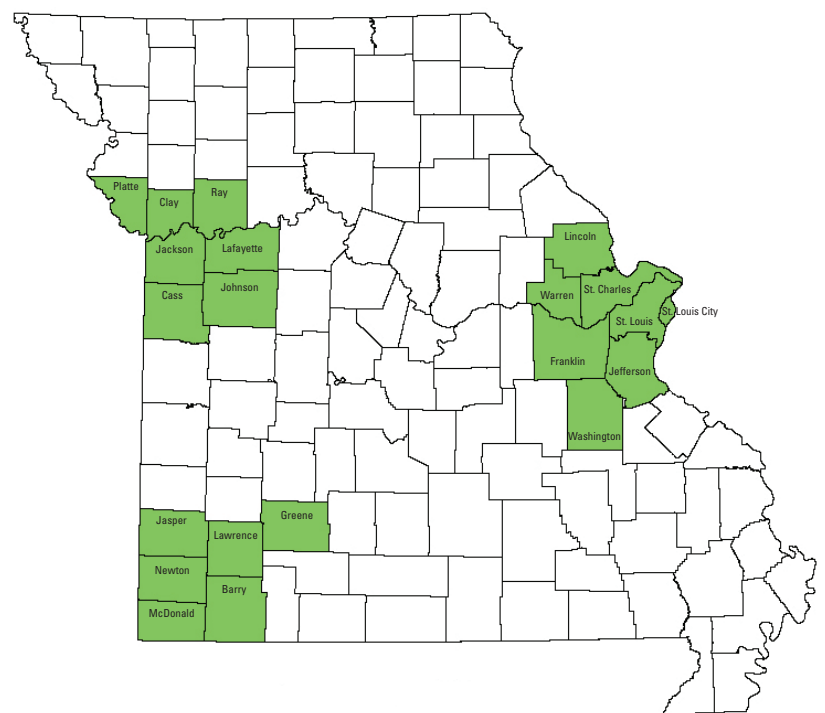
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