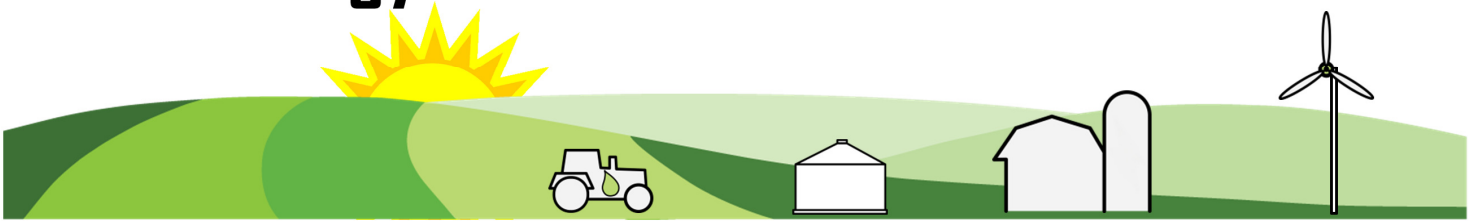
Farm Energy IQ



# Farm Pellet Production Module – Farmer Training Presentation

## PRESENTATION FILE

OnFarmBiomassPelletProduction_FarmerPres Final

This 15-minute presentation is intended for farmers and farm audiences, and is suitable for presentation by individuals who have completed the Farm Energy IQ training.

## EDUCATIONAL OBJECTIVES

Farmers who participate in the farmer presentation will learn how to manufacture biomass pellets using a small scale pelletizer. Major points to be covered include:

1. How a pelletizer works
2. Preparing feedstock for pelletizing
3. Running the pelletizer
4. Handling and storing pellets

## PRESENTATION SCRIPT

SLIDE 0: Farm Energy IQ

You can describe the Farm Energy IQ program here if you want, or just ignore this slide.

SLIDE 1. Title/Intro

Introduce yourself, and tell the audience that you'll be giving them an introduction to pellet production on the farm.

SLIDE 2. The local pellet concept

The whole idea behind farm-scale pellet production is that many farms are in a good position to produce pellets from grass or wood, either to use themselves or to sell. Many farmers have unutilized land or crop material that could be used for growing feedstock for pellet production. However, it does take skill and practice to make pellets.

SLIDE 3. What you need, how to do it, overview

Here's an overview of what we'll be discussing in this presentation: what equipment and materials you need to make pellets, and how the process is done.

SLIDE 4. What you need - woody feedstocks

Most commercially manufactured pellets are made from wood, and some farmers may have access to waste wood material such as sawdust or woodlot thinnings, or else you may consider growing a dedicated woody energy crop such as shrub willow.

SLIDE 5. What you need - herbaceous feedstocks

While wood is the most popular commercial pellet material, most farmers have easier access to herbaceous, or grassy, feedstocks. Feedstock could be perennial grasses such as switchgrass or Miscanthus, or crop residues such as corn stover or wheat straw. In either case, these materials can usually be obtained at pretty low cost and stored in bales until needed.

SLIDE 6. What you need – grinders

Your pelleting feedstock needs to be ground to a uniform size, and for that you need a grinder. Often, farmers will use a two-stage approach, with a tub grinder for the first stage and a hammermill for the fine grinding. The material should be ground to no larger than the diameter of the holes in the pellet die. For example, if the pellet die is 6 mm in diameter, you should grind the material using a 6 mm or smaller screen.

SLIDE 7. What you need - moisture content control

A steady, uniform moisture content between 12 and 18% is critical for most pelletizing equipment. Depending on your feedstock, you will have to either dry it or add water to get it into the critical range. That could mean something as simple as air drying, or as complex as a steam-injected drum dryer. Regardless, this is an important step that you really can't skip.

SLIDE 8. What you need - pelletizers

The pelletizer is the machine that makes the pellets. These machines use rollers to push the feedstock through holes in a die, creating heat and pressure that fuses the material into a pellet. Smaller machines usually use a flat-plate die, but some farmers use ring-die machines as well. Pelletizers can be driven by electric motors, standalone diesel engines, or PTO drives from tractors.

SLIDE 9. What you need - cooling and bagging

When they exit the pelletizer, pellets are hot and soft. They need to cool, dry out, and harden. For small operations, a simple drying rack of hardware cloth on a wood frame is often sufficient.

SLIDE 10. What you need - patience

Pelleting is a finicky process, and it will take some time before you have the "ins and outs" of your machine figured out. Plan on spending time learning what works and what doesn't, and keep records on the changes made so that you can repeat the things that work.

We're now going to move into the second half of the presentation, titled "how to do it." These tips and hints will help you improve your chances at successful pellet production, and shrink the duration of your learning curve.

SLIDE 11. How to do it - prepping the feedstock

Preparing the feedstock is very important if you want decent success with pelletizing. The two key parameters are particle size and moisture content. Particle size should be no larger than the diameter of the holes in the die. Otherwise, you run a chance of not having the material feed into the holes. Moisture content is also very important, and should be in the 12-18% range for most feedstocks and pelletizers. You may need to experiment a little bit to see what works best for your feedstock and machine.

SLIDE 12. How to do it – roller pressure

Roller pressure is another important parameter. If the rollers are too loose, they won't be able to push the material down through the holes. If they are too tight, they will wear the die and may even prevent the die from moving. Our experience has been that, with screw-tightened rollers, "finger tight plus ¼ turn" works well.

SLIDE 13. How to do it – starting with a pre-mix

Depending on your feedstock, you may need to use a pre-mix to get the pelletizer going before you add your main feedstock. We have found this to be necessary, especially for switchgrass pellets. In our experience, using a pre-mix of one part switchgrass to two parts distiller's dried grains causes the die to build up enough back pressure so that pellets can be formed when pure switchgrass is fed into the machine.

SLIDE 14. How to do it – adding the feedstock

Theoretically, a slow, steady feed of material into the hopper should be best. However, our experience is that this causes the feedstock to dry out before it gets into the die proper. Therefore, we recommend that, on open hopper systems, you dump the feedstock into the hopper in a batch and keep at least enough material in the hopper to keep the rollers nearly covered.

SLIDE 15. How to do it – machine speed

Here's a neat little trick that might be useful for you. If you are using an inverter-duty electric motor to run your pelletizer, a variable speed drive can be used to slow it down. This causes the material to move more slowly through the die, which gives it more time under pressure. As a result, the hardness of the pellets is increased. The down side, of course, is that the machine runs more slowly.

SLIDE 16. How to do it – additives?

Many people have talked about using special additives to improve pellet quality or performance. In general, we haven't noticed any significant improvements in pellet quality due to additives. One thing we have noticed, however, is that if a small amount of oil is added to the feedstock, power use by the machine goes down.

SLIDE 17. Will it pay off?

The economics of the whole operation are very difficult to pin down, and it will depend a great deal on the specifics of your situation. For example, if you have an old barn available to house your pelletizer, you'll be much more economical than the farmer who needs to build a building for the operation. Thankfully, it is possible for

many farmers to get involved in pelleting at a small scale with a fairly modest investment, so that you can "see as you go" to determine how the operation is working for you. An analysis of one farmer's operation in Pennsylvania came up with an estimated cost of $85-150 per ton to grow and manufacture pellets, with the breakdown of costs as you see here.

SLIDE 18. Conclusions

And so, with a little equipment, a little patience, and a little know-how, farmers throughout the region have the opportunity to become pellet manufacturers for themselves or their communities.

SLIDE 19: Questions

Here's where you can ask for questions and comments from the audience (if there is time available).

This project supported by the Northeast Sustainable Agriculture Research and Education (SARE) program. SARE is a program of the National Institute of Food and Agriculture, U.S. Department of Agriculture.