LINN COUNTY FARMERS AND ANNUAL RAINFALL
Research Report for WR227
Coon, Emma
Winter Term 2017
# Table of Contents

Table of Contents ........................................................................................................................................ 2
Introduction .................................................................................................................................................. 3
Linn County’s Main Crops .......................................................................................................................... 3
    Annual Ryegrass .................................................................................................................................. 3
    Tall Fescue .......................................................................................................................................... 3
    Wheat .................................................................................................................................................. 4
Water Relocation ......................................................................................................................................... 4
    Ditches .............................................................................................................................................. 4
    Tiling .................................................................................................................................................. 4
    Windmills .......................................................................................................................................... 5
Summary .................................................................................................................................................... 6
Works Cited .................................................................................................................................................. 8
**Introduction**

Nestled between the Pacific North West Costal range and the Cascade Mountains there is a beautiful place known as the Willamette Valley. The Willamette Valley is lush and green because of its notorious wet winters. Linn County is located in the mid southern half of the Willamette Valley. For Linn County grass seed farmers, the annual rainfall plays a major role for their industry. Annual rainfall has been measured and recorded in Linn County since the late 1800s by farmers and organizations (Hyslop Weather Station). Linn County farmers have based the very crop that they grow to maximize the amount of annual rainfall that this region of the Willamette Valley receives. Crops such as ryegrass, tall fescue, and wheat are non-irrigated crops in Linn County that yield at optimal levels with just the annual rainfall. This paper reports on the symbiotic relationship that farmers have with the areas rainfall. It will focus on the crops that make Linn County the grass seed capital of the World. It will explore why those crops have been selected for this area and how grass seed farmers deal with the ebb and flow of annual rainfall.

**Linn County’s Main Crops**

Linn County is a very agrarian region that is conducive to numerous crops. Out of the 1.5 million acres that make up Linn County, 255,658 of those acres are farmed. About 75% of those farmed acres are grass seed (“Agricultural Statistics of Linn County”). The top produced grasses in Linn County are annual ryegrass, tall fescue, and wheat (“Agricultural Statistics of Linn County”).

**Annual Ryegrass**

In 2012, annual ryegrass was the top agricultural commodity in Linn County (“Agricultural Statistics of Linn Country”). Annual ryegrass is planted in the early fall and is harvested in mid July. Annual ryegrass is highly valuable for turf blends because it establishes itself quickly making the consumer’s lawn appear green and lush while the longer lasting grasses develop. Annual ryegrass is also a favorite among ruminate livestock because of its high digestibility (Hall). Annual ryegrass requires no extra irrigation in Linn County due to sufficient rainfall.

**Tall Fescue**

Tall Fescue is a perennial crop in Linn County. It is planted in the spring. Tall fescue takes twenty months to establish before producing its first crop. This crop grows optimally with a complete saturation followed by a period of dryness (Cook). In Linn County, periods of dryness are not always a possibility due to the abundance of rainfall during fall, winter, spring, and sometimes summers. It is necessary to plant tall fescue on drainable soil.
Wheat

Linn County farmers plant wheat in the fall and the spring depending on the variety. Fall-planted wheat should be planted no earlier than mid October due to cooler ground temperatures and expected rainfall around planting. Water is directly related to grain yield (FAO). Wheat requires a steady amount of water. Too much can be just as detrimental as too little water. Due the delicate ratio, wheat must be planted on well drained soil.

Water Relocation

While rain is vitally important to plant health, Linn County’s over-abundance of rain can become a hindrance. Over-saturated fields make the soil constitution soft and waterlogged. This restricts the farmers from going onto the field to spray or fertilize effectively. Saturated ground also restricts plant growth. If the water level is too high, the roots will grow a shallow root system. Shallow roots limit the plant’s access for adequate nutrients and weaken the plants durability. For optimal harvest, water should be relocated. Rainwater can be managed with three techniques: ditches, tiling, and windmills.

Ditches

This method of water relocation is based off the natural topography of the field. To some extent, all farmers use ditches to move water or to accumulate it away from growing areas. Natural slopes and gravity increases the water to follow the path of least resistance. There are several techniques that farmers use to enhance the effectiveness of ditches. The two most common are gradual ditches and direct ditches. Gradual ditches are made in pre-existing low spots where water pools. Scrapers and paddle-wheel shovels remove soil from the ditch to increase water capacity while still being gradual and flush with the field. A laser level is used to indicate a gradual decline to direct the water out of the middle of the field and towards a water outlet. Direct ditching is done with a chain ditcher. The chain ditcher makes a cut directly into the topsoil up to three feet in depth and up to 12 inches wide. The empty space from the removed soil allows water to freely flow into it from the saturated field. It is then redirected out of the field and towards a waterway.

Tiling

Similar to ditches, tiling relocates water to waterways. However, tile lines intercept water below ground instead of above. Tiling is generally a contracted job. From an interview with contractor and owner of Agricultural Drainage Corporation David Neil, the business of tiling was explained. Despite their name, tile lines are actually plastic piping that can vary from 4 inches to 18 inches in diameter. They are laid into the ground with a drainage plow that simultaneously rips the ground and sets the tile line. The ditches have to be precise, level, and smooth. Guiding the drainage plow is a GPS leveler that ensures all three necessities. The tile lines are laid out on a grid that is determined based on topography, soil type, and drainage coefficient. The drainage
The drainage coefficient is the number of gallons of water per acre that the farmer needs to remove from the field to have an optimal crop (Neil). The standard formula is 1 inch of standing rain water is equivalent to 27,000 gallons per acre (Coon). Before implementing a tiling system, a farmer must first determine the needs of the crop based on the drainage coefficient, the soil type, and the best use of the natural topography to help move water.

Tiling benefits the farmer by lowering the saturation point. Saturation point is the height of standing water in a field. By lowering the saturation point, the plant’s root system is able to stretch out further for water and nutrients and establishes a strong root system (see figure 1).

![Figure 1. The Benefits of Tile Lines (Blann)](image)

Deeper root systems help aerate the soil, allowing natural insects back into the ecosystem. Tiling also allows chemical applications to saturate more effectively, due to lack of water dilution or over saturation causing the chemicals to run off instead of penetrating the soil (Coon).

**Windmills**

Another very effective technique to move water off the field is with a wind operated pump known as a windmill. Linn County windmills are an accessory to tile lines. For tile lines to move water on flat ground, they must have a 1 ft. per 1,000 ft. slope (Neil). For example, if a perfectly flat field has a 5,000 ft. tile line, the tile line must drop 5 ft. deeper underground in order to have water flow out of the field. The problem with a perfectly flat field is that the drained field water now has nowhere to go because it is already 5ft below ground. In this scenario, the field is a perfectly flat and there is no natural slope to cause the water to flow away. If the water pools and has no place to naturally run towards, the tile lines will be completely full,
and the field will become saturated again. The solution is to pump the water away from the field with either an electric pump or a windmill pump. The pump will create a void in the tile line. The void space will allow the tile line to be able to accept more water from the saturated field.

Donald Coon, a fifth-generation farmer and partner at Oak Park Farms, is the only farmer in Linn County to incorporate a windmill pump. His operation uses wind instead of electricity because it is more cost effective. At the tile line outlet, a cistern collects the water from the field (see figure 2).

![Windmill with Tile Lines](image)

**Figure 2. Windmill with Tile Lines (Iron Man Windmill CO.)**

The windmill is built on top of the cistern. Attached to the windmill is a pump rod with one-way valves. When the windmill is operational, the pump rod is forced into the well which forces the one-way valves to open allowing water to flow through the piston. Once the pump rod has reached the bottom, the pump rod starts to return up which forces the one-way valves to close. The water that is trapped on top is now lifted up. This creates a void of water directly underneath the piston that allows more water to enter into the bottom of the well. That is one rotation of the windmill blades. The piston pump keeps bringing the water up until it is out of the well and flowing towards a water outlet (Coon).

**Summary**

The Linn County farmers have built the grass seed industry around this area’s rainfall. Ryegrass, tall fescue, and wheat have been selected as the region’s main crops. These crops grow so easily in Linn County, and Linn County farmers have been able to utilize the areas rainfall to optimize crop production. However, the reliability of rainfall being sufficient or over-abundant
can never be predicted. Because so much of the grass seed industry relies on Linn County annual rainfall, farmers have developed ways of working the fields to optimize every square foot of the land. Naturally sloping topography and ditching techniques help guide water surplus to flow naturally out of the field and into a water way. If this is not feasible, a network of tile will be placed under the field by contractors to help direct water surplus toward waterways. The use of the old technology of windmills has been utilized in a new way to pump the water out of lower areas and into waterways. As weather changes, Linn County farmers will learn to adapt.
Works Cited


Coon, Donald. Oak Park Farms Vice President Emma Coon. Shedd, 26 February 2017.


Neil, David. Agricultural Drainage Corporation Owner Emma Coon. Shedd, 4 March 2017
Coon, Emma