Explaining the Impact of Too Much Rain

Mais Kaalaman Article for October 2011
Written By: Allan C. Nieves, National Agronomy Manager, Pioneer Hi-Bred Philippines, Inc.
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Growers know that the wet season (from May to October) is not the best time of the year to earn money from corn. Ask corn growers, and they will tell you that they get 1-2 tons less from their 1 hectare cornfields as compared to the dry season (November to March). They will also tell you that their worst yield performance is during the rainy months, and they will attribute this to excessive rains and the resulting conditions.

They will also mention the possibility of lodging problems because of the strong winds and softened soil; the higher incidence of diseases and insect pests; and the absence of sunlight after harvest, which makes grain drying a problem.

I didn’t enumerate all these to discourage anyone but because we need to understand the challenges posted to both big- and small-time corn growers by planting during the wet season. In particular, these challenges are the impacts of flooding and the task of managing nitrogen losses.

These two can be easily related to the most common and most visible manifestations we see in the corn field during rainy days: (1) stunting and lanky plant appearance; (2) pale green or yellow plants; (3) small and often underdeveloped ears; and (4) a high incidence of disease. Diseases have been tackled in earlier articles, and I am sure drought is going to be the least of our worries (although drought can happen in the rainy months), so let’s talk about the impact of too much rain.

The Trouble with Flooding
Many upland crops such as corn are intolerant of flooding. Corn doesn’t even like to have prolonged saturated soil conditions as these can deplete oxygen in the soil and increase disease infection as well as
nitrogen losses. Studies of flooded soil show that oxygen levels are near zero after just 24 hours (although it was noted that moderate water movement allows some oxygen to get into the plants and causes less damage).

Oxygen is very important in the plant’s life sustaining functions such as respiration, water processing, and root growth, among others. Waterlogged conditions can also lead to the accumulation of certain compounds such as CO₂, which can be toxic to plants in high concentrations. Several studies have shown that corn can survive only two to four days of flooding, depending on the growth stage. Obviously, smaller, younger plants are more vulnerable to flooding, ponding, or saturated soil than more mature crops.

Another thing about flooded conditions is that they cause the stomata (natural openings in the plants) in affected plants to close and they may remain closed for long periods. This is not good as it can result in reduced respiration, transpiration and photosynthesis. When water recedes or subsides, farmers cannot expect plants to recover quickly because of these factors. In the long run, crops exposed to flooding become more predisposed to disease infection (particularly stalk and root rot). Root development is retarded, and this can limit access to available subsoil moisture later in the season.

**Dealing with the Impact of Flooding**

Is there a way to manage the adverse effects of flooding or prolonged soil saturation? I don’t really have a straight answer for this. But try to observe the weather conditions following flooding as these may have an effect on the chances of plant survival. It is very likely that cool, wet conditions favor disease development while very hot, windy conditions may dry soil too quickly, causing crusting and restricted plant growth. How a crop responds to excessive water may not be evident for several days after flooding, and you need to be patient when deciding what to do next. It helps to check on the plant’s growing point (meristems) to assess damage and recovery potential.

Ultimately, it will be up to the grower whether he or she will replant, or proceed with the current crop. The primary consideration should be dictated by reasons of economy, not emotional considerations. Take into account the yield potential of the reduced stand versus that of late-planted crop minus the additional costs of replanting.

If replanting looks like the better option, allow the soil to dry adequately first. If you plant wet, it will give the same problem as when soil is too dry. If the crop is worth keeping, cultivation helps open and aerate the soil and encourage root growth. I think many farmers with their practical sense in farming are aware of this. But again, be sure that soils are dry enough to allow this operation. Working soil that is wet results in compaction, and this may restrict root growth throughout the season.
The Factor of Nitrogen Loss

Nitrogen (N) is a component of all protein within the corn plant, and it is needed in high quantities. It must be available at the right time and in the right quantities to support proper plant growth. But during the wet season, preserving the soil’s nitrogen for plant use can be a challenging job. Excessive rains and our more-or-less steady temperature can leach out of the root zone. Leaching refers to the movement of dissolved materials downward through the soil through the action of percolating ground water. If you happen to have a more sandy or light-textured soil, leaching may probably be a problem you’re familiar with.

On the other hand, in heavier textured soils and in high rainfall areas where soil may become saturated, nitrogen can be lost by denitrification – a process that converts nitrogen into gaseous forms with the aid of certain microorganisms. Denitrification is heavily influenced by soil temperature and duration of soil saturation. The warmer the soil and the longer it is saturated, the bigger the loss of nitrogen by denitrification.

Managing Nitrogen Loss

Frequent and excessive rainfall can force some farmers to delay side-dressing of nitrogen (most likely from urea). This is understandable and correct from a practical perspective. However, there’s an optimum window for N application beyond which significant yield loss is expected. The critical N uptake period was found to be between the 5-leaf stage (~20 days after planting) to tasseling when the plant is at its most rapid growth phase.

So how do we manage the potential N loss during the wet season? It is recommended that we apply N at multiple times (split application) to spread the risk of N loss and crop deficiency. This approach can also improve profitability by reducing overall N rates by taking care of the potential loss. If the current practice is applying N fertilizer twice (at basal and after a month), it will help to split the application into 3 using the same level of fertilization. By experience, this split-application approach really works.
If one perceives that N loss has occurred, a supplementary application of urea is recommended as soon as the weather improves (keep in mind the optimum window). Studies have revealed that this can be done as late as the tasseling stage, and is no longer economically sound at the silking stage. Also, N losses are not likely to be uniform throughout the field. Hence, apply N fertilizers where needed to avoid unnecessary costs and potential future losses of excess N.

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