Management Considerations for Post Flooding Soils

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Abstract
Farmland in western Iowa and eastern Nebraska affected by flooding early this year and not planted to any crop has potential economic and soil environmental consequences if the soils are left unattended. Long-term damage to soil in areas of significant flooding need to be considered when planning for next season’s crop.

Several changes that take place when soil is under saturated conditions for an extended period of time can be carried into the next season. One of these potential changes is the change in biological health of the soil, with the greatest concern being when soil is left unplanted to any crop or cover crop. The existence of growing plants in such areas will help build up the microbial community in the root zone, which is essential to nutrient cycling, especially phosphorous.

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Management Considerations for Post Flooding Soils

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Farmland in western Iowa and eastern Nebraska affected by flooding early this year and not planted to any crop has potential economic and soil environmental consequences if the soils are left unattended. Long-term damage to soil in areas of significant flooding need to be considered when planning for next season’s crop.

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Biological, chemical and physical soil health

Flooded soil may experience what is called “post flood syndrome,” similar to the fallow syndrome, where the land is left unplanted to any crop for the entire season. Flooded soils will encounter problems caused by the reduction of soil arbuscular mycorrhizae (AM) fungi colonization rates next growing season.

The AM fungi are colonized around the root systems of crops in a mutually beneficial (symbiotic) relationship. The fungi benefit from the host plant roots, the crop benefits from the increased nutrient uptake zone developed by the fungal hyphae (threads that make up the mycelium of fungi). Unplanted flooded areas can potentially be affected next season due to the absence of a root system that is essential to maintaining this microbial community that contributes to nutrient cycling.

In addition to potential biological changes that will be caused by flooding and the absence of active root system, there are some other chemical and physical changes that can occur when soil is flooded and left without any growing crop. Most of the chemical changes will be induced by temporary changes in oxidation and reduction conditions. However, physical-chemical-biological changes in soil such as aggregate stability, soil structure, pH, etc., can be significant, especially if there is no growing crop.

Measures to manage previously flooded soils

Research documents that growing plants such cover crops, row crops and even weeds can increase the AM recolonization and ultimately the availability of phosphorous, which is the most affected nutrient due to reduction in mycorrhizae population. The following are a few management aspects need
to be considered:

**Land Leveling and Sand Cleaning** – Sand cleaning depends on the depth of accumulation.

- Few inches (i.e. 2-4 inches) can be incorporated in soil using normal field operations. Otherwise, minimum soil disturbance is advisable to promote even weed growth till next spring.
- If sand is up to 6 inches deep, then moldboard plow to a depth twice the sand depth to incorporate.
- Sand 8-24 inches, it is advisable to consider spreading to areas with less sand and incorporate with special deep tillage equipment. However, it is advisable not to move sand to fill lower or severely eroded areas in the field without proper top soil to cover the sand.
- Sand above 24 inches deep, evaluate cost of removing sand or stockpile to decide whether to remove the sand.
- In case of severe erosion and deep cuts, top soil from surrounding fields should be used to fill such areas.

**Soil Testing**

- Soil testing should be conducted after any land leveling is done.
- Soil samples should not be collected immediately after soils dry, and may need to be collected in the spring.
- Need to allow time for P reactions after soils aerate.
- Potassium (K) deficiency can occur due to soil compaction.
- Soil tests could increase from sediment deposition.

**Cover Crop**

- Use a cover crop immediately after soil dries to promote growth of microorganisms that are essential for nutrient cycling.
- Planting conditions should provide good soil seed contact for cover crop success.
- Consider overwintering cover crops to provide additional benefits of continuous growth in the spring prior to planting.
- When planting soybean, as a precaution seed should be inoculated with Bradyrhizobium japonicum to ensure nodulation and N fixation.
- AM fungi inoculation of soil is not feasible.
- Once soils become aerobic, soil microflora will recover naturally.

**Observations**

- Corn growing on flooded soils showed purple leaves that were disappeared in a week.
- Flooded fields with weeds or without tillage showed less purpling than those tilled to control weeds.
- Fields with high manure application history (i.e., feedlots) showed no adverse effect for flooded soils on crop.
- Crops planted after a fallow/flood period grew poorly.
- P deficiency symptoms in crops – for corn it is slow early growth and purple coloration.
- Flooded soils may have normal P test level and low AM population.
- To alleviate P deficiency, high banded P rates needed – twice or more than the normal recommended rate.

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