Tri-Basin Irrigator

Volume 17, Issue 9 *September 14, 2017*

Program Information

EQIP & CSP:

EQIP – Sign-up deadline for 2018 funds will be October 20, 2017.

NSWCP: NSWCP funds are ONLY available for flow meters and soil moisture sensors at this time.

ENERGY EFFICIENCY GRANT: Signup deadline for 2018 funds will be October 31, 2017. For more information contact Kelley at Rural Development at the Kearney USDA Service Center at 308-237-3118, Ext. 4 or at 308-455-9837.

Calendar of Events

Sept 20: Grazing Cover Crop Field Day @ Kearney, NE
Oct 2: CNPPID Board of Directors Meeting - 9 am
Oct 10: TBNRD Board Meeting -1:30 PM

Flow Meter Tips for Accuracy!

> Install a pipe hump downstream of the meter to ensure full pipe flow. If the pipe is half full of water when going through the meter, propeller meters will read twice the amount of water.
> Installing continuous acting air vents will remove air in the pipe system, also ensuring full pipe flow. Depending upon the amount of air, air can cause propellers to spin faster.
> Install flow meters according to the manufacturer's spacing specifications. Non-jetting and jetting flow will cause propeller meters to register more water than what is actually flowing. Long straight runs of pipe are needed to get a good uniform flow through the flow meter. Straightening vanes are an excellent tool to ensure accurate readings.
> Install the meter upstream of any T's, valves, etc. that can change the direction of water flow. This will ensure all water pumped to be recorded. If in monitored or allocated areas, this can eliminate the cost of additional meters on a well.
> If removing a meter in the off season, always store in a dry place protecting it from rodents and the weather. Moisture can ruin meters. Rodents will chew on propellers and other parts. If stored in a place where the wind can blow, propeller meters can rotate in the wind thus recording water usage.
> Protect your meters from livestock. They can get brushed up against or used as a scratching tool.
> Keep meters protected from the weather. Some manufacturers make covers for their meters.
> For accurate readings on propeller meters, always time the totalizer for 10 minutes and calculate the flow. The dials are to be used as a guide.
> Regularly inspect your meters. Check for moisture leaks. Make sure moving parts move properly. Early detection may eliminate expensive repair bills. Always follow manufacturer recommendations.

There are various types of flow meters on the market that use different methods of measuring water. Always check with the manufacturer for proper installation, operation, maintenance, and safety requirements.

Curtis's Column

USDA United States Department of Agriculture
Natural Resources Conservation Service

EQIP, AWEP and CSP Contract Holders!!!
2017 Certification and Records need completed.

- **CSP:** This fall, all CSP contract holders will need to certify contract obligations and choose payment for calendar year 2017 or 2018. If wanting paid in 2017, all contract obligations need to be certified prior to Thanksgiving. Contact your local NRCS offices for more information.
- **EQIP/AWEP Irrigation Water Management (IWM) Records:**
  - All EQIP contract holders with irrigation practices need to submit their 2017 irrigation records to their local NRCS office. Payment forms will get signed and submitted after complete records have been submitted. Records include crop grown, soil moisture levels, flow meter readings, crop ET's, and rainfall.
  - All CNPPID AWEP contract holders need to submit their 2017 irrigation records to CNPPID. Contact Marcia Trompke at CNPPID for more information.
- **Water Use Reports:** The NRD requires your tillage info on these reports (acres of no-till, conventional till, etc). Deadline for submitting these reports to the **Tri-Basin NRD** is November 17, 2017.
- **Nitrogen Management Reports:** See tillage info requirements under Water Use Reports above. Deadline for submitting these reports to the **Tri-Basin NRD** is December 31, 2017.

SAM Registration REMINDER!!!

EQIP, CSP, or any other NRCS contract holders that will be receiving payments MUST maintain an active SAM Registration. Not maintaining this registration can cause you to be in violation with your contract. As a result, pay-backs and penalties could be enforced. So please do not let your SAM registration expire.

If your SAM expires this fall, now would be a good time to renew your registration before harvest sets in. Otherwise, harvest will get busy and if you are like me, it will get forgotten.

As a side-note, you do not need to pay to renew SAM. A lot of websites offer this option but you don't need to do that. Use the official website: *https://www.sam.gov/portal/SAM/#1#1*.

Official website link located on page 4.

Soil Health Series: Soil Respiration

Soil Respiration is one of the soil quality indicators that is used to determine the health of a soil. It is basically the measure of the biological activity taking place in the soil. As you have read numerous topics about soil health through this series in this newsletter, and even in other places, one basic thing holds true. Basically soil health involves less destruction of the soil through tillage. It also involves feeding the livestock we have below the soil surface. By not destroying the soil microbes, earthworms, organic matter, etc. then the soil respiration improves. I look at it like this, a dead soil can't breath but a healthy live one can.

Attached is a Soil Quality Indicator sheet providing information about soil respiration.

CNPPID NOTES

2018 Water Supply:

As the 2017 irrigation demand ends, the volume of storage water remaining in the Platte Basin becomes a good indicator of the 2018 surface water supply. Three of the Reclamation reservoirs upstream of McConaughy in Wyoming are large; Seminoe, Pathfinder and Glendo. Current water data in acre-feet (AF) from those reservoirs follow.

Unit	Storage	To Fill
Seminoe	822,516	194,757
Pathfinder	810,449	259,501
Glendo	93,045	398,977

Today, 853,235 AF of storage room is available and normal snowpack runoff is near 1,000,000 AF. If snowpack is above normal, they may need to spill water to McConaughy next spring; that is unknown. Reclamation irrigators will have a full supply of water and so return flows to the river that become inflows to McConaughy look good. Reclamation will begin moving water downstream to Glendo as hydropower generation is needed; that creates room in the upper reservoirs for the snowpack runoff. Also, Reclamation will release water to McConaughy soon for the 2018 supply for five Glendo canals.

McConaughy, helped by generous rainfall, finished this season well, storing 1,269,000 AF or 72.8% of capacity. This assures Central producers a full supply of water for their 2018 contracts. Central irrigator's average, non-allocated year use in the Tri-Basin area, 2000-2016, is 10.16 acre-inches/acre. Any annual water not delivered is retained in McConaughy for future drought protection and it provides lake recreational benefits.

TRI-BASIN NRD NEWS

Flow Meter Readings for Water Use Reports:

As the irrigation season winds down and you are picking up irrigation pipe or bedding down irrigation engines, remember to record the ending meter readings for your Irrigation Water Management (Water Use) Forms. We have the Water Use forms printed and ready to be filled out! You can stop in our office to pick them up or call us at 1-877-995-6688 to have them mailed to you.

Tri-Basin Staff to Inspect Meters:

With irrigation season winding down, Tri-Basin NRD staff members are beginning annual irrigation meter inspections. Each year, we take readings from meters in about one-third of the townships in the district.

This year we will be doing inspections in the following townships: Kearney County: 5N-14W, 6N-14W, 7N-14W, and 8N-14W; Phelps County: 5N-18W, 6N-18W, 7N-18W, 8N-18W; and Gosper County: 5N-22W, 6N-22W, 7N-22W, and 8N-22W.

If you have irrigation wells in these townships and you put your meters in storage for the winter, you can call the Tri-Basin NRD office at 1-877-995-6688 to schedule an inspection. If there is no meter at the site when we come to inspect, you will receive a letter requesting access to the meter for inspection.

NEBRASKA EXTENSION EXTRAS

Predicting Final Soybeans Maturity:

Soybean reproductive stage (R7), also known as soybean physiological maturity stage, is the equivalent of black layer formation in corn. R7 is the important developmental stage for deciding when to cease irrigating soybeans, since additional watering will no longer increase yield.

Therefore the usual question during this time of year is: "How long should I irrigate my soybeans?" Generally, there are several ways to answer this question. First, GDD's (growing degree days) and computer plant growth simulators may help determine when soybeans reach maturity. The challenge with these methods are that late season heat stress can cause the soybean plants to mature much more rapidly than the GDD formulas predicts.

Secondly, irrigators maybe cease irrigating when the soybean plants begin the R7 stage with at least one pod turning brown or tan on the soybean plant. The challenge with this method is that not all pods on the R7 plant have lost their green color.

Others may strictly follow field soil moisture sensors for determining when the plants cease growth. The problem is that mature soybean plants may still wick moisture from the soil after they have stopped feeding the seeds in the pods. So, some late irrigations may be raising costs and water usage without further increasing yields.

Dr. James Specht, Nebraska Extension Soybean Specialist Emeritus Professor, says that any of these methods may be helpful, but observing conditions within the soybean pods is still the most reliable method. For example, the soybean plant will continue to feed the seed until the pod-wall membrane ceases clinging to the seed coat. See illustration R7.1 (middle pod) in the photo below.

Note that the soybeans seeds may still be green with chlorophyll when they separate from the pod-wall membrane. Once this seed separation occurs within the pod; continued irrigation will not increase yield; even though field soil moisture levels may decline and plants continue to transpire.

Soybean Harvest Aids:

Our Nebraska Extension "2017 Guide for Weed, Disease, and Insect Management in Nebraska," publication EC130 on pg. 128 lists three herbicide options for produces needing to burndown green weeds in soybeans prior to harvest. These products include: Aim®; Gramoxone SL®; and Sharpen®.

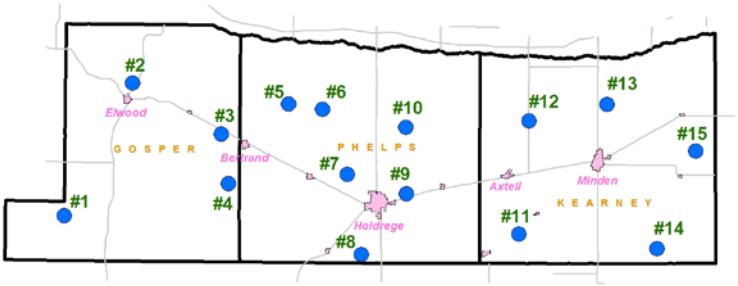
Even though, temperatures above 85ºF are hard on soybeans; weeds like Palmer amaranth may continue to thrive. Since herbicides may quickly kill both weeds and soybeans, it may important to monitor if seeds are separating from pod-wall membranes in the majority of soybean pods before applying desiccant products. For example, the Sharpen® product allows soybeans to be harvested within 3 days after application. And, most labels recommend at least 65% of the pods being brown prior to herbicide application.

NAWMN Crop ET Information

Additional Information and other ET resources can be found at websites listed under "ET Information Sites" below.

Inches of Crop Water Use (ET) = Evaporation x Kc

	Aug 28 – Sept 3		Sept 4 – Sept 10	
Site	Evaporation	Rain	Evaporation	Rain
1	1.50	0.06	1.50	0.00
2	1.50	0.00	1.30	0.00
3	1.10	0.00	1.80	0.00
4	1.20	0.00	1.30	0.24
5	1.10	0.00	1.30	0.05
6	1.10	0.00	1.00	0.01
7	1.10	0.00	1.40	0.00
8	1.60	0.00	1.50	0.00
9	1.10	0.00	1.30	0.05
10	1.20	0.00	NA	NA
11	1.40	0.00	1.10	0.00
12	1.40	0.00	1.20	0.03
13	1.40	0.02	1.40	0.00
14	1.40	0.00	1.20	0.00
15	1.40	0.00	1.20	0.00



2017 Map of NAWMN Sites across the Tri-Basin NRD.

Crop Coefficients (Kc)

Corn Stage	Kc	Soybeans Stage	Kc
2 leaf	0.10	Cotyledon (VC)	0.10
4 leaf	0.18	1st Node (V1)	0.20
6 leaf	0.35	2nd Node (V2)	0.40
8 leaf	0.51	3rd Node (V3)	0.60
10 leaf	0.69	Beg. Bloom (R1)	0.90
12 leaf	0.88	Full Bloom (R2)	1.00
14 leaf	1.01	Beg. Pod (R3)	1.10
16 leaf	1.10	Full Pod (R4)	1.10
Silk – Beg. Dent	1.10	Beg. Seed (R5)	1.10
¼ Milk Line	1.04	Full Seed (R6)	1.10
Full Dent (½ Milk)	0.98	Yellow Leaf (R6.5)	1.00
¾ Milk Line	0.79	Beg. Mat. (R7)	0.90
Black Layer	0.60	Full Mat. (R8)	0.20
Full Maturity	0.10	Mature	0.10

Crop Stage Information

Corn (R5-1/4 Milk Line to R5.8-3/4 Milk Line stage): Corn at ½ milk line needs 2.25 inches of moisture to reach maturity. On Holdrege Silt Loam at 70% moisture drawing from 4 feet, you are done irrigating.
Avg. daily water use from Sept 4 – Sept 10 was 0.12"-0.22".

Soybeans (R6.5-Full Seed/Yellow Leaf to R7-Beginning Maturity stage): Soybeans beginning to yellow needs 1.9 inches of moisture to reach maturity. R7, Beginning Maturity needs 0.0 inches of moisture for yield.
Avg. daily water use from Sept 4 – Sept 10 was 0.14"-0.21".

Sept 4 – Sept 10 (14 of 15 NAWMN sites reporting): Average weekly rainfall was 0.03 (range 0.00 to 0.24). Average weekly ET for corn was 1.10 and for soybeans was 1.22.

ET Information Sites

NAWMN Sites:
- http://www.cnppid.com/news-info/weatheret-data/nebraska-agricultural-water-management-network/
- https://nawmn.unl.edu/ETdata/DataMap

CropWatch: http://cropwatch.unl.edu/gdd-etdata
CNPPID: http://www.cnppid.com/news-info/weatheret-data/
Water Use Hotline: 1-800-993-2507

Corn Stage		DESCRIPTION
R5.5	Full Dent 1/2 Milk Line	Starch line is 1/2 the way down the kernel. Top 1/2 is hard and bottom 1/2 is softer near the cob.
R5.8	3/4 Milk Line	The starch line is 3/4 of the way down the kernel (3/4 hard kernel, 1/4 soft kernel near the cob).
R-6	Black Layer	The starch line has advanced to the cob. Physiological Maturity. Black layer formed, kernel moisture is between 25%-35% moisture. 0.0 inches needed for yield.

Soybean Stage		DESCRIPTION
R6.5	Full seed Yellow leaf	Leaves begin to yellow, beginning in the lower canopy and progressing upwards.
R7	Beginning Maturity	At least one (normal) pod that has attained its final mature color (tan or brown, depending on variety) is present on any main stem node. 0.0 inches needed for yield.
R8	Full Maturity	95% of the pods have reached their mature pod color.

Lake and River Levels

CNPPID Reservoir Elevation and Platte River Flow data listed below and other locations can be found on CNPPID's website at *http://cnppid.com/wp-content/uploads/2016/06/lakeRiverData.html*.

	Sept. 14, 2017, 8:00 AM	1 Year Ago
Capacity of Lake McConaughy	72.7%	NA
Inflows to Lake McConaughy	2191 cfs	1888 cfs
Flows on the North Platte at North Platte	380 cfs	1231 cfs
Flows on the South Platte at North Platte	119 cfs	200 cfs
Flows on the Platte at Overton	435 cfs	2424 cfs

You give but little when you give of your possessions. It is when you give yourself that you truly give.

- Kahlil Gibran

Websites of Interest

Soil Health:
www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/

Climate	*agclimatenebraska.weebly.com*
SAM Registration	*www.sam.gov*
NRCS Nebraska	*www.ne.nrcs.usda.gov*
Central Irrigation District	*www.cnppid.com*
TBNRD Home Page	*www.tribasinnrd.org/*
Farm Service Agency	*www.fsa.usda.gov*
UNL Cropwatch	*cropwatch.unl.edu*
UNL Extension	*extensionpubs.unl.edu/*
K-State SDI Website	*www.ksre.ksu.edu/sdi*
No-till On The Plains	*www.notill.org*

Rainfall

Rainfall amounts listed below and other locations come from NeRAIN which can be found at website *https://nednr.nebraska.gov/NeRain/Maps/maps*.

Location:	Aug 31 – Sept 13	May 1 – Sept 13
Arapahoe 6.9 NW:	0.26	18.60
Bertrand 6.1 mi. SE:	0.45	11.74
Funk 4.1 mi. NNE:	0.00	16.01
Minden 0.855 mi. W:	0.00	17.26
Minden 8.8 mi. ESE:	0.00	15.57

Average Rain for May-Sept. in Holdrege = 16.38 Inches

****** If you wish to receive this newsletter via e-mail, or have any questions, comments or ideas, feel free to contact Curtis Scheele at the NRCS office in Holdrege or you can email him at curtis.scheele@ne.usda.gov. ******

USDA - Natural Resources Conservation Service

USDA United States Department of Agriculture Natural Resources Conservation Service

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309 Smith Street
PO Box 41
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308-785-3307, Ext. 3

1005 South Brown Street
Minden, NE 68959-2601
308-832-1895, Ext. 3

Central Nebraska Public Power & Irrigation District

CENTRAL Nebraska Public Power and Irrigation District

415 Lincoln Street
PO Box 740
Holdrege, NE 68949
308-995-8601

Tri-Basin Natural Resources District

Tri Basin Natural Resources District

1723 Burlington Street
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308-995-4222

PO Box 146
Elwood, NE 68937

308-785-2390

424 North Colorado
PO Box 31
Minden, NE 68959
308-832-0645

Soil Quality Indicators

Soil Respiration

Carbon dioxide (CO_2) release from the soil surface is referred to as soil respiration. This CO_2 results from several sources, including aerobic microbial decomposition of soil organic matter (SOM) to obtain energy for their growth and functioning (microbial respiration), plant root and faunal respiration, and eventually from the dissolution of carbonates in soil solution. Soil respiration is one measure of biological activity and decomposition. The rate of CO_2 release is expressed as CO_2-C lbs/acre/day (or kg/ha/d). It can be measured by simple field methods (e.g. fig. 1) or more sophisticated field and laboratory methods. During the decomposition of SOM, organic nutrients contained in organic matter (e.g., organic phosphorus, nitrogen, and sulfur) are converted to inorganic forms that are available for plant uptake. This conversion is known as mineralization. Soil respiration is also known as carbon mineralization.

Figure 1. Draeger-Tubes® are used to measure CO_2 released from the soil surface as an indicator of decomposition and soil respiration.

Factors Affecting

Inherent - Like all organisms, soil microbes have optimal conditions in which they thrive. Soil respiration rate depends on the amount and quality of SOM, temperature, moisture, and aeration. Biological activity of soil organisms varies seasonally, as well as daily. Microbial respiration more than doubles for every 10°C rise up to an optimum of about 35 to 40°C (95 to 104°F), beyond which high temperature becomes limiting. On the other hand, SOM decomposition and microbial activity virtually cease below about 5°C (41°F) (biological zero).

Soil respiration increases with increasing soil moisture up to the level where low oxygen concentration (lack of aeration) interferes with an organism's ability to respire (fig. 2) The optimum soil moisture content for soil respiration varies from site to site, but values as high as 60% water- filled pore space have been reported. In dry soils, respiration declines because the soil moisture deficit limits microbial activity. Conversely, in extremely wet soils, low oxygen levels results in poor organic matter decomposition and respiration rates. In these soils, anaerobic by-products are produced, such as methane or sulfides. Medium textured soils (silt soils) are often favorable to soil respiration because of their good aeration and moisture content. In clay soils, a sizeable amount of SOM is protected from decomposition by clay particles and other aggregates. In reality, soil respiration responds to the coupled action of temperature and moisture, especially to the most limiting of either factor.

Dynamic - Soil management practices that affect SOM, moisture, aggregation, and pH influence soil respiration. Practices that leave crop residues at the soil surface, such as no-till, use of cover crops, or other practices that add organic matter, usually promote soil respiration. Crop residues with a low carbon to nitrogen (C:N) ratio, such as that from legumes, decompose faster and produce higher CO_2 rates than residues with a high C:N ratio (e.g. wheat straw). High C:N ratio crops coupled with added N (from any source) increase decomposition and accrual of SOM. Practices that increase SOM also improve soil aggregation and porosity, and therefore, aeration and soil moisture content. Conversely, continuous cultivation and other conventional tillage methods that remove, bury, or burn crop residues diminish SOM content and microbial activity by reducing aggregate stability and porosity, and increasing erosion of surface layers that are normally highest in SOM and populations of organisms that are the key to soil respiration. Irrigation in dry conditions and drainage of wet soils can significantly boost soil respiration.

Soil pH regulates nutrient availability and distribution, activity of soil organisms responsible for SOM

decomposition, and other processes contributing to soil respiration. Chemical fertilizer may stimulate root growth and nourish microbes; however, at high concentrations, some fertilizers can become harmful to microbes responsible for soil respiration because of changes in pH and their potential toxicity. Similarly, organic amendments with high concentrations of heavy metals, as well as pesticides and fungicides, may be toxic to microbial populations leading to reduced microbial diversity, abundance, and respiration.

Relationship to Soil Function

Soil respiration reflects the capacity of soil to support soil life including crops, soil animals, and microorganisms. It describes the level of microbial activity, SOM content and its decomposition. In the laboratory, soil respiration can be used to estimate soil microbial biomass and make some inference about nutrient cycling in the soil. Soil respiration also provides an indication of the soil's ability to sustain plant growth. Excessive respiration and SOM decomposition usually occurs after tillage due to destruction of soil aggregates that previously protected SOM and increased soil aeration. Depleted SOM, reduced soil aggregation, and limited nutrient availability for plants and microorganisms can result in reduced crop production in the absence of additional inputs. The threshold between accumulation and loss of organic matter is difficult to predict without knowledge of the amount of carbon added.

Problems with Poor Function

Reduced soil respiration rates indicate that there is little or no SOM or aerobic microbial activity in the soil. It may also signify that soil properties that contribute to soil respiration (soil temperature, moisture, aeration, available N) are limiting biological activity and SOM decomposition. With reduced soil respiration, nutrients are not released from SOM to feed plants and soil organisms. This affects plant root respiration, which can result in the death of the plants. Incomplete mineralization of SOM often occurs in saturated or flooded soils, resulting in the formation of compounds that are harmful to plant roots, (e.g. methane and alcohol). In such anaerobic environments, denitrification and sulfur volatilization usually occur, contributing to greenhouse gas emissions and acid deposition.

Improving Soil Respiration

The rate of soil respiration under favorable temperature and moisture conditions is generally limited by the supply of SOM. Agricultural practices that increase SOM usually enhance soil respiration. The following practices have the potential to significantly improve SOM and indirectly soil respiration when other factors are at an optimum:

- Conservation tillage (no-till, strip-till, mulch till, etc.)
- Application of manure and other organic by-products
- Rotations with high residue and deep-rooted crops
- Cover and green manure crops
- Irrigation or drainage
- Controlled traffic

Measuring Soil Respiration

Soil respiration is measured using the Draeger-Tube® method described in the Soil Quality Test Kit Guide, Chapter 2, p 4 - 6. See Section II, Chapter 1, p 52 - 54 for interpretation of results.

References:
Parkin TB, Doran JW, and Franco-Vizcaíno E. 1996. Field and Laboratory Tests of Soil Respiration. In: Doran JW, Jones AJ, editors. Methods for assessing soil quality. Madison, WI. p 231-45.

Zibilske LM. 1994. Carbon Mineralization. In: Weaver WRW et al., editors. Methods of soil analysis. Part 2. Microbiological and biochemical properties. Madison, WI. p 835-63.

Buchmann N. 2000. Biotic and abiotic factors controlling soil respiration rates in *Picea abies* stands. Soil Biology and Biochemistry 32:1625-35.

Specialized equipment, shortcuts, tips:

Draeger-Tubes® (fig. 1) contain chemical reagents that change color in the presence of CO_2. The length of the color change indicates the measured concentration of CO_2. Before using a Draeger-Tube®, check its expiration date and always store them at the recommended temperature. Another popular assessment method is the Solvita® Soil test. *Mention of commercial products does not constitute an official endorsement by the U.S. Department of Agriculture.*

Time needed: 30 minutes

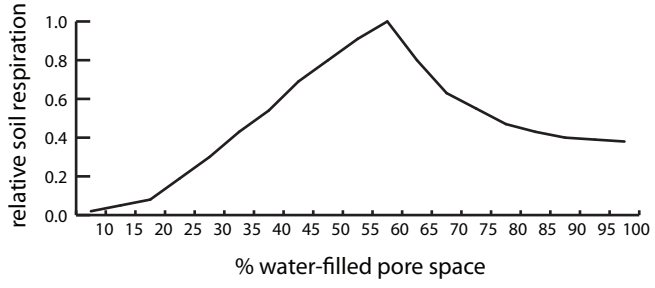

Figure 2. Soil respiration in relationship to water-filled pore space. After Parkin et al., 1996.