microBIOMETER® Calculated Results Explanation

Assumptions:

1. Soil microbial biomass consists of approximately 50% carbon
2. 1 acre of soil (furrow slice) weighs approximately 1 billion grams (assumed for average soil porosity)
3. Carbon to Nitrogen (C:N) ratio for fungi is 15:1
4. Carbon to Nitrogen (C:N) ratio for bacteria is 5:1

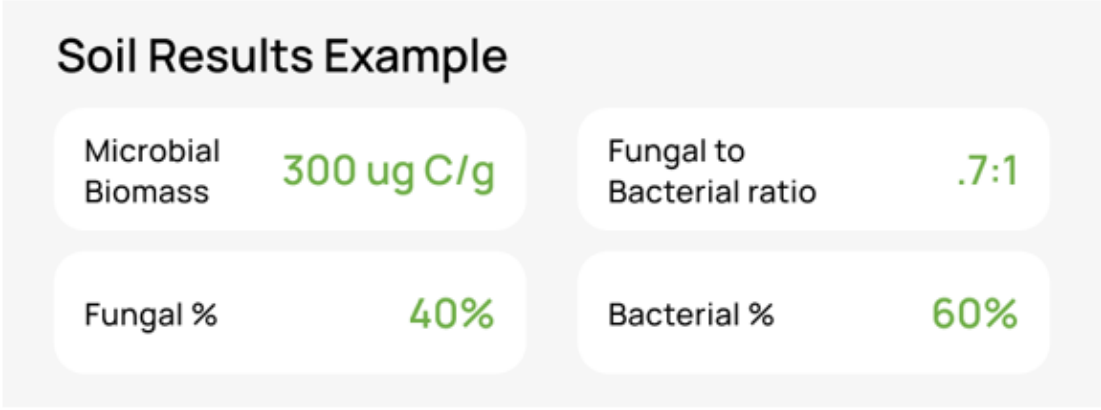
Conversion Factors:

1. 1 kg = 2.2 lbs
2. 1 hectare = 2.47 acres

Units / Unit Glossary:

1. C = carbon
2. N = nitrogen
3. g = grams
4. ug = micrograms
5. kg = kilograms
6. lbs = pounds

For these calculations, the example results below are used and microbial biomass refers to the combined biomass of fungi and bacteria.



To Determine Biological Carbon:

STEP 1: First, we determine the biomass of fungi by multiplying the microbial biomass value by the fungal percentage. Similarly, we also want to determine the biomass of bacteria by multiplying the microbial biomass value by the bacterial percentage.

$$\frac{300\ ug}{1\ gram} \times \frac{40}{100} = 120\ ug/g\ Fungi$$

$$\frac{300\ ug}{1\ gram} \times \frac{60}{100} = 180\ ug/g\ Bacteria$$

STEP 2: Then, we have to determine how much the fungi is contributing to carbon storage. Using **Assumption #1**, we convert fungal biomass to fungal biomass carbon by multiplying the fungal biomass value by 50% (0.5). Similarly, we want to determine how much the bacteria is contributing to the carbon storage, so, using **Assumption #1,** we convert bacterial biomass to bacterial biomass carbon by multiplying the bacterial biomass value by 50% (0.5).

$$\frac{120\ ug}{1\ gram} \times \frac{0.5}{1} = 60\ ug\ C/g\ Fungi$$

$$\frac{180\ ug}{1\ gram} \times \frac{0.5}{1} = 90\ ug\ C/g\ Bacteria$$

STEP 3: Next, we add the fungal biomass carbon and bacterial biomass carbon together to get the total microbial biomass carbon.

$$\frac{60\ ug}{1\ gram} + \frac{90\ ug}{1\ gram} = 150\ ug\ C/g$$

STEP 4: Using **Assumption #2**, we determine how many micrograms of carbon there are per acre, by multiplying the microbial biomass carbon by 1 billion grams.

$$\frac{150 \text{ ug C}}{1 \text{ gram}} \times \frac{1 \text{ billion grams}}{1 \text{ acre}} = 150 \text{ billion ug C/acre}$$

STEP 5: Then, we want to convert micrograms of carbon per acre to grams of carbon per acre, by dividing the result of Step 4 by 1 million.

$$150 \text{ billion ug C/acre} \rightarrow \frac{150 \text{ billon ugC}}{1 \text{ acre}} \div \frac{1 \text{ million}}{1} = 150{,}000 \text{ g C/acre}$$

STEP 6: Next, we want to convert grams of carbon per acre to kilograms of carbon per acre, by dividing the result of Step 5 by 1000.

$$150{,}000 \text{ g C/acre} \rightarrow \frac{150{,}000 \text{ gC}}{1 \text{ acre}} \div \frac{1{,}000}{1} = 150 \text{ kg C/acre}$$

STEP 7: Finally, we want to convert kilograms of carbon per acre to pounds of carbon per acre, by multiplying the result of Step 6 by 2.2. Similarly, we also want to convert kilograms of carbon per acre to kilograms of carbon per hectare, by multiplying the result of Step 6 by 2.47.

$$150 \text{ kg C/acre} \rightarrow \frac{150 \text{ kgC}}{1 \text{ acre}} \times \frac{2.2 \text{ lbs}}{1 \text{ kg}} = 330 \text{ lbs C/acre}$$

$$150 \text{ kg C/acre} \rightarrow \frac{150 \text{ kgC}}{1 \text{ acre}} \times \frac{2.47 \text{ acres}}{1 \text{ hectare}} = 370.5 \text{ kg C/hectare}$$

See more information on the next page below

To Determine Biological Nitrogen:

STEP 1: First, we determine the biomass of fungi by multiplying the microbial biomass value by the fungal percentage. Similarly, we also want to determine the biomass of bacteria by multiplying the microbial biomass value by the bacterial percentage.

$$\frac{300\ ug}{1\ gram} \times \frac{40}{100} = 120\ ug/g\ Fungi$$

$$\frac{300\ ug}{1\ gram} \times \frac{60}{100} = 180\ ug/g\ Bacteria$$

STEP 2: Then, we have to determine how much the fungi is contributing to carbon storage. Using **Assumption #1**, we convert fungal biomass to fungal biomass carbon by multiplying the fungal biomass value by 50% (0.5). Similarly, we want to determine how much the bacteria is contributing to the carbon storage, so, using **Assumption #1,** we convert bacterial biomass to bacterial biomass carbon by multiplying the bacterial biomass value by 50% (0.5).

$$\frac{120\ ug}{1\ gram} \times \frac{0.5}{1} = 60\ ug\ C/g\ Fungi$$

$$\frac{180\ ug}{1\ gram} \times \frac{0.5}{1} = 90\ ug\ C/g\ Bacteria$$

STEP 3: Then, we determine how much the fungi is contributing to nitrogen storage. Using **Assumption #3**, we convert fungal biomass carbon to fungal biomass nitrogen by dividing the fungal biomass carbon value by 15. Similarly, we want to determine how much the bacteria is contributing to nitrogen storage, so, using **Assumption #4**, we convert bacterial biomass carbon to bacterial biomass nitrogen by dividing the bacterial biomass carbon value by 5.

$$\frac{60 \text{ ug C}}{1 \text{ gram}} \div \frac{15}{1} = 4 \text{ ug N/g Fungi}$$

$$\frac{90 \text{ ug C}}{1 \text{ gram}} \div \frac{5}{1} = 18 \text{ ug N/g Bacteria}$$

STEP 4: Next, we add the fungal biomass nitrogen and the bacterial biomass nitrogen together to get the total biomass of nitrogen.

$$\frac{4 \text{ ug N Fungi}}{1 \text{ gram}} + \frac{18 \text{ ug N Bacteria}}{1 \text{ gram}} = 22 \text{ ug N/g}$$

STEP 5: Using **Assumption #2**, we determine how many micrograms of nitrogen there are per acre, by multiplying the total nitrogen by 1 billion grams.

$$\frac{22 \text{ ug N}}{1 \text{ gram}} \times \frac{1 \text{ billion grams}}{1 \text{ acre}} = 22 \text{ billion ug N/acre}$$

STEP 6: Then, we want to convert micrograms of nitrogen per acre to grams of nitrogen per acre, by dividing the result of Step 5 by 1 million.

$$\text{22 billion ug N/acre} \rightarrow \frac{\text{22 billon ug N}}{\text{1 acre}} \div \frac{\text{1 million}}{\text{1}} = \text{22,000 g N/acre}$$

STEP 7: Next, we want to convert grams of nitrogen per acre to kilograms of nitrogen per acre, by dividing the result of Step 6 by 1000.

$$\text{22,000 g N/acre} \rightarrow \frac{\text{22,000 g N}}{\text{1 acre}} \div \frac{\text{1,000}}{\text{1}} = \text{22 kg N/acre}$$

STEP 8: Finally, we want to convert kilograms of nitrogen per acre to pounds of nitrogen per acre, by multiplying the result of Step 7 by 2.2. Similarly, we also want to convert kilograms of nitrogen per acre to kilograms of nitrogen per hectare, by multiplying the result of Step 7 by 2.47.

$$\text{22 kg N/acre} \rightarrow \frac{\text{22 kg N}}{\text{1 acre}} \times \frac{\text{2.2 lbs}}{\text{1 kg}} = \text{48.4 lbs N/acre}$$

$$\text{22 kg N/acre} \rightarrow \frac{\text{22 kg N}}{\text{1 acre}} \times \frac{\text{2.47 acres}}{\text{1 hectare}} = \text{54.34 kg N/hectare}$$