

LEGUMES AND NUTRIENT CREDITING

LEGUMES ARE PLANTS WHICH SYMBIOTICALLY INTERACT WITH CERTAIN BACTERIA

RHIZOBIA BACTERIA "FIX" ATMOSPHERIC N IN ROOT NODULES AND THE PLANT SUPPLIES THE BACTERIA ENERGY DERIVED FROM PHOTOSYNTHESIS. ESTIMATED 2 MILLION TONS FIXED IN USA

NOT ALL LEGUMES ARE EFFICIENT N FIXERS

SOME FREE-LIVING MICROORGANISMS FIX N

SEVERAL TYPES OF LEGUMES ARE IMPORTANT AG. CROPS

FORAGE CROPS = ALFALFA, RED CLOVER, BIRDSFOOT TREFOIL

GRAIN CROPS = SOYBEAN

VEG. CROPS = SNAP BEAN, DRY BEAN

WHEN LEGUME CROPS ARE ROTATED THERE IS OFTEN SOME N MADE AVAILABLE FOR THE SUCCEEDING CROP

THIS N IS OFTEN CALLED A "LEGUME N CREDIT" RESEARCH HAS SHOWN THAT THERE IS ALSO A ROTATION EFFECT THAT MUST BE CONSIDERED.

PERHAPS A BETTER TERM IS "N FERTILIZER REPLACEMENT VALUE"

FORAGE LEGUME CREDITS

THREE FACTORS INFLUENCE THE CREDIT

- SOIL TEXTURE: SANDS WON'T HOLD MINERALIZED N SO CREDIT IS LOWER
- TIME OF CUTTING OR REGROWTH: SUBSTANTIAL REGROWTH CONTRIBUTES EASILY MINERALIZABLE N
- STAND DENSITY: THE MORE ALFALFA IN A STAND, THE GREATER THE N CONTRIBUTION

WISCONSIN FORAGE LEGUME CREDITS (lb N/a)

STAND DENSITY	MEDIUM	TEXTURED	SANDY	TEXTURED
	> 8" GROWTH	< 8" GROWTH	> 8" GROWTH	< 8" GROWTH
GOOD (70-100 %) > 4 plt/ft ²	190	150	140	100
FAIR (30-70 %) 1.5 - 4 plt/ft ²	160	120	110	70
POOR (< 30 %) < 1.5 plt/ft ²	130	90	80	40

NOTE: SECOND YEAR CREDIT FOR FAIR AND GOOD STANDS ON MEDIUM AND FINE TEXTURED SOILS IS 50 lb N/a

USE 80% OF THESE VALUES FOR RED CLOVER AND BIRDSFOOT TREFOIL

RESEARCH HAS SHOWN THAT CREDITS ARE VALID REGARDLESS OF STAND KILLING METHOD

- HERBICIDE
- TILLAGE
- WINTER KILL

CREDITS ARE ALSO INDEPENDENT OF TILLAGE

ALFALFA IS AN EFFICIENT SCAVENGER OF NITRATE N.

PRESIDEDRESS NITRATE TEST IS AN EXCELLENT TOOL TO CONFIRM CREDITS

SOYBEAN N CREDIT

SOYBEANS SHOULD BE INOCULATED WITH RHIZOBIA CULTURES AT PLANTING

THIS MAY NOT BE NECESSARY IN FIELDS IN WHICH SOYBEAN HAS BEEN GROWN, BUT IT IS STANDARD PRACTICE TO INOCULATE

SOYBEAN DOES NOT FIX AS MUCH N AS ALFALFA

STUDIES HAVE SHOWN THAT HARVESTED SOYBEAN GRAIN REMOVES MORE N THAN THE CROP FIXES LEADING TO A MUCH LOWER CREDIT THAN FORAGE LEGUMES

THERE IS AN APPARENT N REPLACEMENT VALUE ASSOCIATED WITH SOYBEAN WHICH IS LIKELY IN PART DUE TO A ROTATIONAL EFFECT

N CREDIT BASED ON SOYBEAN-CORN ROTATION AT THREE LOCATIONS (lb N/a)

YEAR	JANESVILLE	MARSHFIELD	HANCOCK
1	-11	79	0
2	188	21	13
3	20	--	-20
4	39	5	0
MEAN	59	35	-2

N CREDIT BASED ON N RATE DIFFERENCE NEEDED TO MAXIMIZE YIELD IN SbC AND CC ROTATION

THESE DATA SHOW THE VARIABILITY ASSOCIATED WITH DETERMINING A CREDIT

A MODEST CREDIT OF 40 lb N/a IS GIVEN FOR SOYBEAN GROWN ON MEDIUM AND FINE-TEXTURED SOILS

NO CREDIT FOR SOYBEAN GROWN ON SAND AND LOAMY SAND SOILS

VEGETABLE LEGUMES

MOST ARE INEFFICIENT N FIXERS

IN FACT SMALL AMOUNTS OF N (40-60 lb N/a) ARE RECOMMENDED FOR THESE CROPS DEPENDING ON ORGANIC MATTER CONTENT

A SUGGESTED CREDIT OF 20 lb N/a IS GIVEN FOR PEAS, SNAPBEANS, AND LIMA BEANS GROWN ON MEDIUM AND FINE-TEXTURED SOILS

NO CREDIT IF GROWN ON SANDS AND LOAMY SANDS.

GREEN MANURE

A GREEN MANURE IS ONE OF THE OLDEST AGRICULTURAL PRACTICES KNOWN TO MAN

A MAJOR OBJECTIVE IS SOIL IMPROVEMENT

- ADDITION OF ORGANIC MATTER
- ADDITION OF NITROGEN
- TRAPPING LEACHABLE NUTRIENTS
- WIND AND WATER EROSION PROTECTION

GENERALLY A LEGUME, OR CROP SUCH AS RYE, IS PLANTED FOLLOWING HARVEST OF ANOTHER CROP. THE LEGUME IS THEN PLOWED DOWN AFTER SOME GROWTH IS OBTAINED

IN WISCONSIN'S CLIMATE GREEN MANURING WOULD HAVE TO FOLLOW EARLY HARVESTED CROPS, SUCH AS VEG. CROPS THIS PRACTICE MAY BE MOST PRACTICAL ON SANDY SOILS AS ASSOCIATED WITH THE OBJECTIVES LISTED ABOVE

GREEN MANURES THAT ARE ALLOWED TO GROW VIGOROUSLY INTO THE SPRING MAY DEplete AVAILABLE SOIL MOISTURE

THE N CREDITS ASSOCIATED WITH GREEN MANURES ARE VARIABLE.

DEPEND ON WHAT CROP IS GROWN AND HOW MUCH GROWTH IS PLOWED DOWN. THEY APPLY TO ALL SOIL TEXTURES. USE LOWER VALUES FOR SANDS AND SHORTER GROWTH SITUATIONS.

<u>GREEN MANURE CROP</u>	<u>CREDIT (lb N/a)</u>
ALFALFA	60-100
RED CLOVER	50-80
SWEET CLOVER	80-120

CREDIT IS 20 lb N/a IF KILLED WITH < 6" GROWTH