

Cover Crop Plant Available Nitrogen (PAN) Calculator

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Introduction

Leguminous cover crops can contribute significant amount of nitrogen to crop production. However, farmers need a better tool to accurately estimate the nitrogen contribution from legumes so as to precisely reduce fertilizer rates. A simple calculator to address this issue was developed for Idaho and Oregon farmers with high success rate (<http://smallfarms.oregonstate.edu/calculator>). This project is adapting this concept for tropical climates and soil types in the Pacific Islands. **Although cover crops can fix or accumulate nitrogen (N) in plant tissues, not all the N in the tissue will be released into plant available form. Plant Available Nitrogen (PAN) from the cover crop is depend on climate conditions, soil types, microbial activities in your soil, cover crop species, farming practices (till vs no-till) and time after cover crop termination.** Much more locations in Hawaii need to be assayed and added to this data base. This poster only show one location as a sample on how this calculator work. This calculator is available in Excel Spread Sheet and can be available upon request.



Randomly collect cover crop biomass from at least 3 one-sq ft cover crop area about 2-3 months of growth at cover crop termination.



No-till



Sorghum-sudangrass



Oat (TAM 406)

Cover Crop PAN CALCULATOR

PLANT Available N

Poamoho

N that will be available from cover crops will depend on soil type, growing season, tillage practice, cover crop species, and the biomass accumulated.

- Use a 1ft² quadrat to estimate cover crop biomass (best around 2-3 month old) from 3 to 4 randomly selected cover crop spots in your field, record its average biomass in lb/sq ft.
- Key in the biomass estimated on the particular cover crop species if present in this calculator (under the season or tillage selection listed). The calculator will estimate the amount of NO₃ that will release at 28 or 70 days after cover crop termination. This estimation could further be complicated by the microbial activities of a soil. None-the-less, it could provide a rough guidance to reduce N fertilization.

Cover Cropping Practice				Cover Crop Tissue			28 Days		70 Days	
Season/tillage	Cover Crop	Fresh Weight (lb/ft²)	Dry Content (%)	Dry Weight (lb/Acre)	Tissue N (%)	Total N (lb/A)	PAN (%)	Actual PAN (lb/A)	PAN (%)	Actual PAN (lb/A)
Winter/Till	Sunn hemp	1.2	23.10%	12074.83	1.66	200.44	55.24	110.72	67.82	135.54
Winter/Till	Cowpea (Blackeye #5)	1.04	13.70%	6206.43	2.87	178.12	63.74	113.54	75.17	133.50
Winter/Till	Lablab	0.78	14.89%	5055.15	2.75	139.13	62.72	87.26	75.22	104.65
Winter/Till	Pigeon pea	0.55	20.47%	4904.20	3.47	170.18	66.14	112.55	81.69	138.02
Winter/Till	Woollypod vetch	0.55	9.21%	2206.53	4.43	97.75	70.52	68.93	84.19	82.30
Average		0.82	16.27%		3.036		63.672		76.818	119.16
Winter/No-till	Sunn hemp	1.07	24.62%	11475.19	2	229.50	56.85	130.47	66.72	153.12
Winter/No-till	Cowpea (Blackeye #5)	1.47	14.20%	9092.71	2	181.85	56.6	102.93	65.42	118.97
Winter/No-till	Lablab	1.02	16.20%	7197.85	2.02	145.40	56.38	81.97	66.28	96.37
Winter/No-till	Pigeon pea	0.58	21.99%	5555.73	2.31	128.34	60.11	77.14	67.32	86.40
Winter/No-till	Woollypod vetch	0.83	8.80%	3181.62	2.52	92.90	62.08	57.67	70.43	45.43
Average		0.99	17.10%		2.25		58.404		67.234	104.06
Summer/No-till	Sunn hemp	0.72	21.34%	6692.91	2.72	182.05	60.54	110.21	75.14	136.79
Summer/No-till	Cowpea	1.54	14.24%	9552.53	2.83	270.34	67.57	182.67	74.43	201.21
Summer/No-till	Lablab	0.34	13.31%	1971.26	3.13	61.70	78.05	48.16	81.51	50.54
Summer/No-till	Sudex	0.96	16.02%	6699.18	1.33	89.10	43.48	38.74	54.95	48.56
Summer/No-till	Oat (TAM406)	0.51	14.72%	3270.14	1.84	60.17	46.25	27.83	62.55	37.64
Summer/No-till	Oil Radish	0.55	6.40%	1533.31	2.49	38.18	70.8	27.03	77	25.40
Average		0.78	14.34%		2.39		61.12		71.00	84.09
Average [Overall]			15.83%		2.55		61.07	86.11	71.64	101.29

Now you can estimate how much N fertilizer to cut back based on the fertilizer recommendation for your soil and crop by subtracting B from A as shown below:



Oil radish

Total N requirement for your crop:
(Recommended by ADSC)

N available from your cover crop:

Amount of N you need to fertilize for your crop:

A =

B =

Calculate how much N fertilizer you can cut back based on recommendation for your crop and soil (e.g. from ADSC).



Sunn hemp



Cowpea



Lablab



Woollypod vetch



Pigeon pea

Summary

- ✓ Although Plant Available N (PAN) release rate (%) at 70 days after cover crop termination (green bars on second last column) were similar among all legumes and oil radish tested, actual PAN released (blue bars) varied mainly due to the biomass generated. **Thus, it is a good practice for farmers to estimate the cover crop biomass.**
- ✓ Gramineaceous cover crops generally had lower PAN%, resulted in lower actual PAN regardless of the biomass generated.
- ✓ Majority of the PAN were released during the first 28 days after cover crop termination, thus **additional fertilizer should be added there after.**

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