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Evaluate The Effect Of Harvest Date On Cover Crop Dry Matter Production And Residue Quality

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ABSTRACT

In the Aegean Region of India, Over the course of two growing seasons, the productivity and quality of cotton lint were studied, along with the effects of using various tillage techniques and winter cover crops. Compared to the first year, the second year saw a 40 % increase in the dry matter production of cover crop root residues in the conventional tillage system and a 60 % increase in the no tillage system. Soil organic matter output from residues was also shown to increase. The conventional tillage method yielded greater amounts of dry matter and organic matter in soil harvest leftovers than the no tillage approach. Both common vetch and hairy vetch combined with oats produced the greatest amount of dry matter and organic matter in soil harvest residues of any cover crop treatment. Cover crop densities varied by CC, SR, and year, with values between 131 and 854 plants m-2. Cover crop (CC) research over the long run is essential for developing efficient crop rotation plans. There was a strong relationship between the number of growing degree days (GDDs) and seasonal dry matter output.

KEYWORDS Harvest, Dry Matter, Cover crop, Organic.

INTRODUCTION

Cover crops have less time to take advantage of optimal growing conditions when they are planted later in the fall. The average air and soil temperatures are falling, and the quality and amount of light are decreasing, all of which are averse to the growth rate of cover crops. Soil trafficability, essential for operating equipment and sowing the cover crop, may also decrease when soil moisture increases. Biomass growth, nitrogen buildup, and grazing potential are all aided by early sowing after harvest of the preceding commercial crop. The best method to get the most out of cover crops is to plant them early in the season, but this isn't always practical since it all relies on when the previous crop is harvested. Crops that are harvested early, such as winter barley, make early sowing more practical; however, this does not account for all cycles that leave land fallow during the winter before planting in the spring. As a result, if the N fertiliser rate is inadequate, it may have an effect on spring barley grain yields.

Despite the lack of published research, the possibility for growing sun hemp in the Texas High Plains is attractive because of the plant's heat- and drought-tolerance. Root systems with deep taproots and extensive laterals may get water even in dry soil (Duke, 1981). Plants need minimal water once established, and may reach a height of 3–5 m in about 60–90 days.

LITERATURE REVIEW

Michael T. Sindela (2018) The disposal of agricultural waste on a large scale, whether for feeding cattle or making biofuels, may have an adverse effect on soil quality and water availability. It's possible that a hybrid approach to resource management is necessary in an era of rapidly changing weather patterns. Soil water and energy balance may be disturbed when maize (Zea mays L.) residue is removed, however using cover crops (CCs) might mitigate this effect. Corn residue was removed and CCs were employed in an experiment conducted in south central Nebraska on a no-till, irrigated corn crop. Except for water infiltration and soil thermal characteristics, all soil parameters were tested at 5 and 6 years following the start of the experiment. Soil organic C content rose ($p = 0.10$) from the surface to the first five centimeters when cover crops were introduced, but hydraulic and thermal parameters were unaffected. However, There was a constant effect on soil characteristics between 0 and 10 centimeters deep when maize residue was removed. From the surface to 5 centimeters below, there was a 25% drop in the soil's organic C content, a 19-28% drop in soil thermal conductivity, and a 23-28% drop in the soil's specific heat capacity. When water was scarcer as a result of residue clearing, the organic carbon content of the soil reduced, as did the stability of its wet aggregates. After the residue was cleared away, the soil's thermal conductivity decreased because of changes in the soil's water content, soil organic C, and bulk density.

Antoine Couëdel et.al (2018) The effectiveness of crucifer-legume cover crop mixtures in delivering S-related functions is less well understood. Our research set out to evaluate the efficacy of many bispecific crucifer-legume mixes formulated to act as soil S catch-crops and S green-manures. By acting as a cover crop, crucifers help keep valuable minerals in the soil where they may be utilised by the next cash crop. Less is known about how well crucifer-legume cover crop mixes perform in providing S-related services. S catch-crop service was similar for crucifer-legume combinations and crucifers grown alone (12 kg S ha1), but it was double the amount given by legumes grown alone (4 kg S ha1). The S green-manure service given by crucifer-legume mixes (5.5 kg S ha1) was almost identical to that provided by crucifer solo cover crops (6.5 kg S ha1). Our growth circumstances have not shown any significant cultivar influence for the same cover crop species.

Binod Ghimire et.al (2017) The decline in SOC and its effects on crop productivity under conventional farming raises questions about how to maximize SOC sequestration and enhance agricultural sustainability via alternative management approaches. The purpose of this research was to examine the dynamics of SOC mineralization as amended by various cover crop (CC) residues. Soil samples were collected from a barren area and three CC plots. Zero, five, and ten milligrams per hectare (Mg ha 1) of the appropriate CC residues were added to soil samples from the CC plots. SOC mineralization was tracked for all soil samples over the course of eight weeks in an incubator, and then labile SOC and the decomposition rate constant were calculated using first order kinetic and parabolic equation models fitted to the observed data. The first order kinetic model was utilized to make further comparisons between the fitted model parameters. C 0 was shown to be residue-dependent, whereas k was found to be CC-specific.

Edmar I. Teixeira et.al (2016) We went out to discover what causes such variety in New Zealand's Canterbury Plains. First, we investigated local field testing to determine how much efficacy in reducing N leaching by cover crops varies by location. We employed a biophysical model that we calibrated to determine the causes of this variance. We zeroed emphasis on crop management, soil water retention, and seasonal climate change. The interquartile range was somewhat large (6-75%), while the median decrease in N leaching was about 50%. The average efficacy of cover crops was shown to decrease from >80% for March-sown crops to 25% for June-sown crops in the modeling research. There was also considerable variation from year to year for any given "sowing date by soil WHC" scenario. This was due to the random influence of climate change between growing seasons on the relationship between crop N requirements and soil N availability. Our findings also emphasize the need of using supplementary techniques, such as biophysical modeling, to increase the scope of particular field investigations' inferences.

Denise M. Finney et.al (2016) Increasing plant diversity in agroecosystems via the use of cover crops is a practical method to improve agricultural ecosystem services, and further diversification of cover crops may give even larger advantages. A two-year field research in central Pennsylvania compared the productivity and ecological services of conventionally tilled maize with 18 treatments of cover crops. Cover crop biomass rose with species richness (R2 = 0.15). Weed control, reduced nitrate leaching, and increased aboveground biomass N were all favorably connected with increasing cover crop biomass, but inorganic N availability and corn production were adversely influenced. Cover crop C/N ratio was a negative predictor of inorganic N availability and corn output but positively correlated with nitrate leaching avoidance. However, the fact that the mixtures tested did not produce more biomass than high yielding monocultures suggests that opportunities to increase biomass-driven services with mixtures may be limited, even though the study supports the idea that increasing biomass from cover crops can improve some of the ecosystem services they provide. Furthermore, the relevance of functional characteristics beyond biomass in forecasting ecosystem services from cover crop combinations is highlighted by the association between biomass C/N ratio and ecosystem services reported in this study.

METHODS

Heavy rains in November and December prevented the planting of cover crops during the 2015–2016 growing season, whereas cotton was seeded in April and May. The soil was characterized as sandy loam with the following chemical and physical properties: pH 8.07; lime percentage 1.208%; organic matter 0.945%; P205 2.1-2.2 ppm; K20 195-205 ppm. Condition reports on the soil highlighted low lime and organic matter levels.

The average mean daily temperature over the growth seasons for both cover crops (10.95-11.67oC) and cotton (24.50-26.12oC) was quite stable. It rained less in the second year than the first (477.5 mm vs. 654.6 mm).

A split plot with four replicates was used for the experiment. Tillage (conventional and no-till) and cover crops (sub-plots) served as the principal treatments. Each plot was 4.2 x 6 meters, and there were 6 rows and 0.7 meters between them.

together other cases, oat was mixed together with common vetch or hairy vetch as a cover crop. Planting densities for common vetch and hairy vetch were 120 and 40 kg ha-1, respectively, with vetch/oat planting at 80 kg ha-1. Diammonium phosphate, a pre-emergence starter fertilizer, was sprayed at 30 kg N and 60 kg ha-1. Cotton was the only crop for which the various tillage techniques were used. Both years' harvests occurred on the 15th of April for the conventional tillage plots and the 30th of April for the NT plots. Since the conventional tillage plots had their soil tilled before to planting, their harvest occurred 15 days earlier than the NT plots. Soil profiles measuring 0.4 x 0.3 x 0.25 m were obtained after cover crop harvest in both tillage regimes to collect cover crop residue samples. Old crop residue, weed residue, and cover crop residue were each counted independently throughout the measuring process. Cover crop leftovers were used in the present as a byproduct of the harvest. After drying the samples for 24 hours at 105 degrees Celsius, the dry matter yields (in kilograms per hectare) were calculated. For organic matter analysis, the Walkley-Black method was used to the same samples.

The conventional tillage plots were tilled and dike-ed, whereas the no-till plots used zero-till, direct sowing, and irrigated after planting. Nazilli-84 (Gossypium hirsutum L.) cotton, the industry standard in Turkey's Aegean area, was utilized. The standard methods of culture were used throughout the vegetation era. Quality metrics in cotton included fiber length (FL; mm), fiber fineness (Mic.), and fiber strength (pressley; pressley) utilizing HVI (High Volume Instruments, motion control 4000). Agronomic parameters included leaf area index (LAI; m2/m2) and lint yield (LY; kg/ha). The percentage of plants showing signs of early leaf senescence (LS;%) was recorded across all plots. The latest version of SPSS (v9.0) was used to examine the data.

Cover Crop Planting and Management

Disc harrowing, spring tooth harrowing, spading, and ring rolling were used to mix previous crop residue into the field in preparation for sowing cover crops. However, spading was the dominant tillage strategy since it maximized residue assimilation with the fewest field passes and kept soil from migrating across experimental plots. Commercial harvest machinery compacted the furrows, making it necessary to tear the lettuce and broccoli to a depth of around 1 m. Aside from the fourth year, when cover crops were planted within two days following residue digestion, there was more than a 10-day gap between flail mowing the previous crop residue and planting the cover crops (Table 2).

Twelve consecutive passes were done over the field using a 4.6 m wide grain drill to plant the cover crops. For accurate SR management of individual plots, the drill was outfitted with four belt cones in addition to its standard 28 double disc openers and 28 rubber press wheels. To avoid spaces between passes, adjacent passes overlapped by about a row. Because of constraints on the seed supply,

Table 1. Dates for cover crop management activities and sampling

Year	Winter period	Previous crop residue incorporation†	Planting	Population density count	Last cover crop irrigation	Cover crop dry matter sampling	Cover crop termination
1	2003–2004	30 Sept.	16 Oct.	5 Nov.	25 Nov.	18 Dec., 15 Jan., 3–4 Mar.	8 Mar.
2	2004–2005	≈ 11 Sept.	15 Oct.	4 Nov.	24 Nov.	1 Dec., 24 Jan., 24 Feb.	11 Mar.
3	2005–2006	21–29 Sept.	17 Oct.	7-9 Nov.	17 Nov.	14–15 Dec., 11–13 Jan., 7–8 Feb.	11 Feb.
4	2006–2007	30–31 Oct.	2 Nov.	20 Nov.	5 Nov.	18–20 Jan., 15–16 Mar.	18 Mar.
5	2007–2008	4 Oct.	15 Oct.	13–14 Nov.	8 Dec.	17–18 Jan., 13–15 Feb.	19 Feb.
6	2008–2009	29 Sept.	15 Oct.	5 Nov.	21 Nov.	16 Jan., 10–11 Mar.	13 Mar.
7	2009–2010	7–8 Oct.	29 Oct.	24 Nov.	24 Nov.	16 Jan., 16–17 Mar.	18 Mar.
8	2010–2011	14 Oct.	27 Oct.	8 Dec.	18 Nov.	12–14 Jan., 7–9 Mar.	10–11 Mar.

DATA ANALYSIS

Cover crop residue dry matter: There was no significant difference in the production of dry matter and organic matter in the cover crop harvest residue between tillage regimes in either year (Table 2). However, dry matter yields were greater using the CT technique in both the first and second years (Table 2). There was a 15-day head start on harvesting the cover crops under the CT system. Thus, it may be concluded that the reduced root biomass and organic matter in soil harvest residues in NT cotton resulted from the later harvest of cover crops. Soil dry matter production from residue rose by 40-60% in the second year in both tillage schemes.

Table 2. Comparison of wet and dry matter output in harvest leftovers throughout two growing seasons.

Tillage system	2015-2016 Dry matter yield ($kg\ ha^{-1}$)	2015-2016 Organic matter yield ($kg\ ha^{-1}$)	2017-2018 Dry matter yield ($kg\ ha^{-1}$)	2017-2018 Organic matter yield ($kg\ ha^{-1}$)
Conventional	2.50	1.52	3.45	1.81
NT	1.78	1.36	3.01	1.42
LSD0.05	1.44	0.87	1.77	1.44
Cover crop				
Common vetch	1.44	0.90	2.25	1.28
Hairy vetch	1.20	0.89	3.49	1.71
Com. Vetch + oat	3.35	2.06	4.09	1.76
Hairy vetch + oat	2.42	1.64.	3.34	1.78
Natural cover	2.28	1.72	2.97	1.55
LSD0.05	1.14	0.64	1.27	0.62
Harvest time	ns	ns	ns	ns
Cover crop	**	**	*	ns
İnteraction	ns	ns	ns	ns

Table 3. Statistics for two growing seasons' worth of lint output and quality.

Tillage system	2015-2016				2017-2018			
	LY	FL	FS	FF	LY	FL	FS	FF
Conventional	1.17	27.28	90.36	5.27	1.50	28.25	91.0	5.58
NT	1.16	28.03	90.53	5.38	1.37	28.11	89.1	5.53
LSD0.05	0.27	2.32	4.62	0.19	0.79	0.68	2.8	0.15
Cover crop								
Common vetch	1.24	27.65	91.35	5.32	1.41	27.42	89.33	5.52
Hairy vetch	1.08	27.47	90.23	5.28	1.66	28.23	90.25	5.60
Com. Vetch + oat	1.11	28.03	91.03	5.43	1.58	28.17	91.17	5.67
Hairy vetch + oat	1.24	27.73	90.97	5.38	1.22	28.55	90.77	5.43
Natural cover	1.14	27.40	88.63	5.20	1.30	28.52	88.65	5.57
LSD0.05	0.19	0.75	4.11	0.43	0.62	1.07	4.43	0.24
Harvest time	ns	ns	ns	ns	ns	ns	ns	ns
Cover crop	ns	ns	ns	ns	ns	ns	ns	ns
Interaction	ns	ns	ns	ns	ns	ns	ns	ns

Soil organic matter output from residues also increased. Cover crop harvest residue organic matter yield was greater in the CT system than in the NT tillage system in both years, and although the organic matter yield of CT system harvest residue increased by 20% in the second year, this rise was not identified in the NT tillage system. contrasted the NT's organic soil growth to that of standard moldboard tillage, and found that it doubled in only 6 years. The CT system's organic matter contribution in our research was more than that of the NT cotton in both years.

Dry matter output varied significantly amongst cover crops in both years after harvest. However, Table 3 shows that the organic matter output varied significantly amongst cover crops only in the first year. In both years, the common vetch and oat blend had the maximum dry matter yield from harvest residue. The first year was a combination of common vetch and oats, the second year was a mixture of hairy vetch and oats, and the third year was a natural cover of hairy vetch and oats. The maximum organic matter output in the first year was achieved by natural cover, common vetch + oat, and hairy vetch + oat. Second-yield organic matter yields were comparable across all cover-crop combinations with the exception of hairy vetch. Dry and organic matter yield in cover crop harvest residue indicate high values for root biomass of mixes. It was discovered that the requirements of the agricultural system should be taken into account when deciding which crop species to employ as a cover crop. The Aegean area of India is home to two varieties of vetches and oats: common and hairy. As a result, you may grow these crops, or a combination of them and oat, to use as organic matter in cover crop harvest residue.

Total Cover Crop Dry Matter Production

The total dry matter (DM) yield from cover crops at each harvest date exhibited significant two-way interactions (Table 4), whereas the total DM yield towards the end of the growing season (February/March) exhibited significant three-way interactions.

Table 4. Importance of total cover crop density as tested by fixed effects and interaction

Effect	Total cover crop density	Dry matter harvest period Dec.†	Jan.	Feb./ Mar.
Cover crop‡	***	***	***	***
Seeding rate§	***	***	**	ns¶
Year	***	***	***	***
Cover crop × seeding rate	ns	**	ns	ns
Cover crops × year	***	***	***	***
Seeding rate × year	ns	ns	ns	ns
Cover crop × seeding rate × year	ns	ns	ns	***

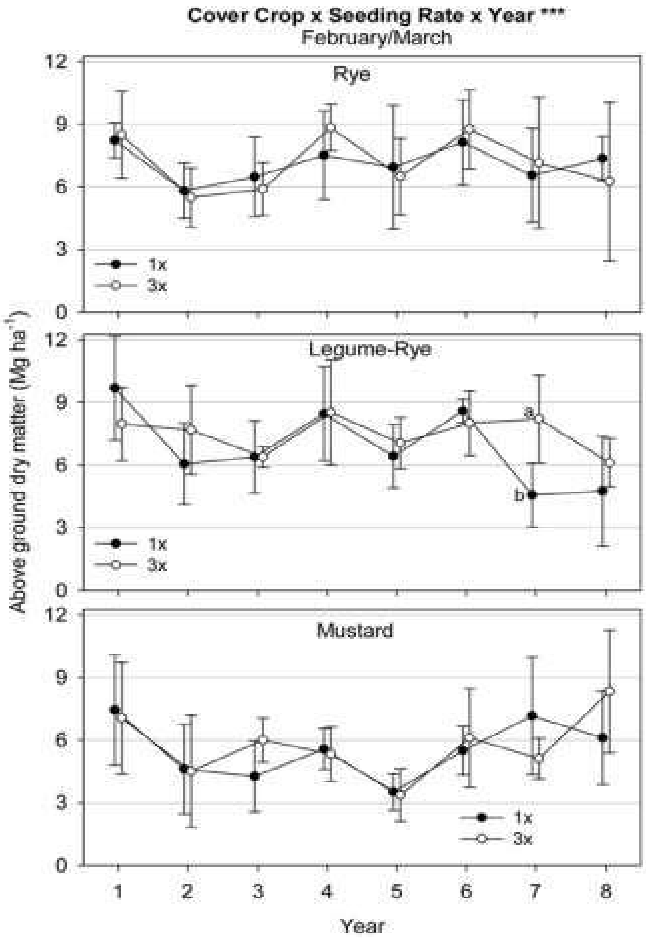

Fig. 1. Interaction between cover crop, sowing rate, and year for final harvest dry matter in February/March

CONCLUSION

If climate change leads to more erratic weather patterns, it may be more vital to make long-term efforts to build management scenarios that deliver the most constant benefits. The legume component of the legume-rye combination responded most strongly to an increase in planting rate, it seems reasonable to use a greater SR with this cover crop than with the others. There is a need for further study into the potential of legume-cereal mixes in high-value vegetable production systems to lessen the reliance on fertilizers made from non-farm sources of nitrogen.

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