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The Establishment of Sweet Clover In Dry Land Areas

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CONCLUSIONS and RECOMMENDATIONS

WINTER wheat has not been a satisfactory companion crop for the establishment of sweet clover. Although good, early spring stands of sweet clover have been obtained by broadcasting or drilling in late fall or drilling in the early spring over winter wheat, these stands have not consistently survived through the summer months. Even when surviving through the planting year the growth and vigor has not compared favorably with sweet clover planted with the spring grains. Sweet clover that germinates when planted at the same time as winter wheat has winter-killed.

Sweet clover drilled in alternate rows with spring grain has been the most successful method of establishing the crop and has resulted in higher sweet clover yields the second year when plowed down for green manure. Good stands of sweet clover have been obtained when drilled or broadcast with spring grain but the seedings have not made as much growth either the first or second year as when planted in alternate rows.

Sweet clover has not affected grain companion crop yields adversely. There has been ample moisture in the early spring for both the sweet clover and grain. During the latter part of the growing season, when the moisture is limited, the grain roots utilize soil moisture below the effective root depth of the sweet clover.

Grass stands and subsequent growth have not been considered sufficient to warrant the expense of seeding sweet clover-grass mixtures with the cereals as companion crops. Mountain Brome or Slender Wheatgrass drilled with sweet clover do well when a companion crop is not used. If established this way, legume-grass mixtures are desirable for the soil-building effects they give.

Barley and spring wheat have been equally good companion crops. Although oats have not been utilized as a companion crop in these trials there is no reason to believe that short-strawed, early maturing varieties would not do equally well.

Sweet clover green manure should be plowed early the fallow year, from 6 to 12 inches high, depending on average annual rainfall. If allowed to grow beyond this stage, soil moisture is depleted materially. Even when only 6 inches high, a good stand of sweet clover contains a considerable quantity of nitrogen. Under dryland conditions, it is much safer to plant the sweet clover more often in the rotation and plow it down early than to allow it to make abundant growth and run the risk of depleting soil moisture reserves.

The Establishment Of Sweet Clover In Dry Land Areas

FRANCIS H. SIDDOWAY and HUGH C. MCKAY*

THE loss of soil organic matter from the dryland wheat areas of southern Idaho, resulting from erosion and cropping, has been pointed out by McKay and Moss (1). As a result, the use of sweet clover as a green manure crop has been increasing. It is used as a means of supplying available nitrogen for subsequent crop use and as a means of maintaining or increasing the organic matter content of the soils. McKay and Moss (2) showed that yields and also the protein content of wheat produced in sweet clover-grass and alfalfa-grass rotations were increased during the 1944-1948 period by the use of the legume-grass mixtures in the rotation.

When first broken out of sod, many dryland soils have sufficient organic matter to supply ample nitrogen for the needs of the grain crop grown under the prevailing limited moisture conditions. However, as these soils are cropped and as the native fertility is decreased, the wise use of sweet clover and alfalfa in the cropping system, as well as the use of commercial fertilizers, has in some cases increased both the yield and protein content of the grain crop. This yield and protein response provides evidence of decreasing soil fertility. The productive capacity of dryland soil is determined not only by the existing moisture conditions during any given season but also by the fertility level of these soils. Likewise, the quality of the crop harvested is correlated with the nitrogen available for use by the plants.

The average annual precipitation at the Tetonia Branch Station is 13 inches. Sweet clover is being used to advantage in dryland areas where spring wheat is produced successfully. The data reported herein can serve as a guide to the establishment of the crop and the principles involved can be modified to fit local conditions. Results cover the 6-year period from 1947 to 1952.

Subject matter covered in this publication includes, in addition to method of establishing the sweet clover, discussions of varieties of sweet clover, the use of grass in combination with sweet clover, handling the clover green manure crop, seeding rates, and how to seed.

Purpose and Plan of Experiment

The main objective of the experiment was to evaluate the many possible methods of seeding sweet clover or sweet clover-grass mixtures with either winter wheat or spring grain. Grain as well

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as green manure crop yields were obtained. The method of establishing the green manure crop could affect grain as well as green manure yields. Sweet clover yields were taken the spring following the grain harvest, at a time when the growth from the most successful method of establishment was approximately 12 inches high. Methods of establishment which did not result in satisfactory stands of vigorously growing sweet clover or sweet clover-grass were eliminated from the study during its early phases.

Common yellow-blossom sweet clover was used in the seeding trials. The grass used in the sweet clover-grass mixtures was Mountain Brome.

An 18 x 7″, fluted feed, single disk, press wheel grain drill with small seed box attachment was used for all drilling and broadcasting operations for both the green manure and grain crop.

The following 14 methods of establishment have been evaluated in these trials:

1. Sweet clover broadcast in late fall over winter wheat. (Broadcast the same year winter wheat was drilled and late enough to prevent germination in fall).
2. Sweet clover broadcast in early spring over winter wheat.
3. Sweet clover drilled in early spring over winter wheat. (This drilling operation was done just as early as possible).
4. Sweet clover drilled in alternate rows* with winter wheat.
5. Sweet clover broadcast at the time of drilling winter wheat.
6. Sweet clover drilled with winter wheat.
7. Sweet clover and grass drilled with winter wheat.
8. Sweet clover drilled in alternate rows with grass and winter wheat. (Grass mixed with winter wheat and both drilled in the same row).
9. Sweet clover broadcast with spring grain.
10. Sweet clover drilled in alternate rows with spring grain.
11. Sweet clover drilled in alternate rows with grass and spring grain.
12. Sweet clover and grass drilled with spring grain.
13. Sweet clover drilled with spring grain.
14. Sweet clover drilled alone in the spring on fall-plowed stubble.

* Where sweet clover was drilled in alternate rows, 14-inch row spacings were used. All other spacings were 7 inches.

Results and Discussion

The most successful method of establishing stands of small-seeded legumes and grasses is to drill in the spring on summer fallow. Drilling in the spring on fall-plowed stubble is almost as effective. However, employment of these two methods necessitates a sacrifice in grain acreage, while the establishment of the green manure crop with a grain companion crop results in maximum use of the land.

Biennial sweet clover and sweet clover and grass were planted by the 14 previously listed methods with the 1947-48 winter and spring wheat crops. The yields of grain for 1948, the condition of the sweet clover stand in the early fall of 1948, and the yields of the sweet clover in the early spring of 1949 prior to plowing are given in table 1.

Table 1.—The 1948 yields of winter wheat (W.W.) and spring wheat (S.W.), evaluation of sweet clover (S.C.) established by the methods designated, and the 1949 sweet clover yields prior to plowing under the crop on June 1.

Methods of establishing sweet clover	1948 wheat yields per acre	1948 sweet clover stands evaluations	1949 sweet clover yields per acre
Companion crop—Winter wheat	**bu.**	**rating**	**tons**
1. S. C. broadcast in late fall over W. W.	28.1	fair	0.5
2. S. C. broadcast in early spring over W. W.	25.2	fair	0.3
3. S. C. drilled in early spring over W. W.	28.1	good	0.9
4. S. C. drilled in alternate rows with W. W.	24.9	poor	0.3
5. S. C. broadcast at time of drilling W. W.	26.8	poor	0.4
6. S. C. drilled with W. W.	27.8	poor	0.3
7. S. C. and grass drilled with W. W.	27.5	poor	0.1
8. S. C. drilled in alternate rows with grass and W. W.	23.7	poor	0.5
Average yields	26.5		0.35
Companion crop—Spring wheat			
9. S. C. broadcast with S. W.	35.8	good	0.7
10. S. C. drilled in alternate rows with S. W.	33.0	excellent	1.4
11. S. C. drilled in alternate rows with grass and S. W.	31.7	excellent	2.0
12. S. C. and grass drilled with S. W.	33.3	good	1.6
13. S. C. drilled with S. W.	33.5	good	1.4
Average yields	33.5		1.42
14. S. C. drilled in spring on fall plowed stubble			2.00

In comparing the winter wheat yields, the average yield of the regular 7-inch space drilling was 27.2 bushels per acre. The average yield from the alternate-row 14-inch spacing was 24.3 bushels per acre, or 2.9 bushels per acre less than the solid seeding. The same seeding rate was used for both methods. Spring grain yields for the solid seeding averaged 34.2 bushels per acre. Alternate row seedings averaged 32.3 bushels, or 1.9 bushels per acre less than the

solid seeding. The high yields for this year are accounted for by the high June precipitation of 2.3 inches. Average precipitation for the crop year 1947-48 was only 11.2 inches, or 1.8 inches below normal.

Sweet clover stands were consistently better in the spring wheat than in the winter wheat. All of the sweet clover seedings, made at the same time winter wheat was drilled in the fall of 1947, were poor and the only seedlings surviving were those that did not germinate until the spring of 1948. The main reason sweet clover stands were better when planted with spring than with winter wheat can be accounted for by the lesser competition offered by the spring wheat. Winter wheat was already established and used surface moisture before sweet clover germinated, while sweet clover planted with spring wheat germinated at the same time as the wheat and had an equal chance to utilize available moisture. This is very important to the development of vigorous sweet clover plants and to their ability to survive through the dry summer months.

The only method of establishment using winter wheat as a companion crop comparing favorably with spring wheat was drilling in the early spring over winter wheat. Late fall broadcasting of sweet clover over winter wheat gave the second highest yield of sweet clover when winter wheat was the companion crop.

Seeding sweet clover at the same time as winter wheat resulted in poor yields for all methods. All methods of establishing sweet clover with sring wheat, except broadcasting, compared favorably with sweet clover planted alone in the spring on fall-plowed stubble land. Drilling sweet clover in alternate rows with spring wheat and grass yielded as much as sweet clover drilled alone. When costs were considered, the inclusion of grass with sweet clover and grain had little if any extra value compared with straight sweet clover and grain. None of the grass survived when planted with winter wheat and the amount surviving when planted with spring wheat was negligible. Sweet clover-grass mixtures seeded without a companion crop do well, but under dryland conditions grass has not been a satisfactory competitor with grain. Sweet clover-grass mixtures have more favorable soil effects than sweet clover alone, however, the establishment of such mixtures under very dry conditions demands elimination of the companion crop.

More seedings of sweet clover were made in the fall of 1948 and the spring of 1949. Some of the methods tried during the previous year were discontinued and only those showing promise were retained. The winter wheat crop was damaged by frost during the spring of 1949, making reliable yield comparisons impossible. However, the competitive properties of the winter wheat were not altered so as to effect the sweet clover established with it. Spring frost damage counteracted the otherwise favorable climatic conditions of the 1948-49 crop year. Precipitation for August 1948

through July 1949 was 15.1 inches, or 2.1 inches above normal. Exceptionally heavy May rains, totalling 3.4 inches, were responsible for the recovery and fair yield of spring wheat.

Differences between the yields of spring wheat, given in table 2, were relatively small. The spring wheat seeding rate in 1949 was reduced to 30 pounds per acre for the alternate-row seedings. All other solid seedings were drilled at the conventional 60-pound rate per acre.

It is interesting to note that the reduced seeding rate did not result in corresponding yield decreases, in fact, one alternate-row method of seeding gave the highest spring wheat yield.

Stand counts of sweet clover were made in 1949 to determine the relative ability of the plants to survive the normal summer dry period. The data in table 2 shows why spring wheat is a much better companion crop than winter wheat. Even though good germination and emergence resulted from almost all of the winter wheat plots the sweet clover was not well enough established or vigorous enough to withstand the competition of the winter wheat.

Very meager stands of sweet clover were obtained with winter wheat when broadcast or drilled at the same time as winter wheat. Broadcasting or drilling in late fall or drilling early in the spring over winter wheat resulted in good early spring stands, however, the sweet clover seedlings did not compete as successfully with the winter as with the spring wheat. The amount of sweet clover growth the second year, when the sweet clover had been plowed, was more dependent upon seedling vigor the first or seedling year than on the stand.

Sweet clover survival was good with every method of establishment for spring wheat, although it showed more vigor when planted in alternate rows than in solid seedings.

June rainfall in 1950 was 0.4 inches higher than normal and good sweet clover yields resulted even though rainfall for the 1949-50 crop year was 2.1 inches below the 13.0 inch normal. This was the only year winter wheat proved to be a satisfactory companion crop for the 3 years the experiment was conducted. The sweet clover green manure yields are shown in the last column of table 2.

The most successful methods of establishing sweet clover with winter wheat have been late fall broadcasting and early spring drilling. Both methods enabled the sweet clover to utilize early spring moisture and to compete more favorably with winter wheat. Sweet clover planted later in the spring after the winter wheat had started to grow could not compete successfully for the surface moisture.

Although broadcasting or drilling sweet clover with solid seedings of spring wheat resulted in stands equally as good as alternate-row seedings of spring wheat the green manure yields the follow-

Table 2.—1949 spring wheat yields, stand counts of sweet clover made in June and September showing relative survival, and 1950 green manure yields.

METHOD	1949 yield of companion crop per acre	Sweet clover plants per 1.5 sq. ft. 1949		Survival	1950 green yields per acre
		June 29	Sept. 19		
Companion crop—Winter wheat (W.W.)	bu.	no.	no.	%	tons
S. C. broadcast late fall over W. W.	——	19	8	42	1.8
S. C. broadcast early spring over W. W.	——	25	6	24	.8
S. C. drilled early spring over W. W.	——	30	10	33	1.2
S. C. drilled in alternate rows with W. W.	——	4	2	50	.6
S. C. broadcast with W. W.	——	6	3	50	.8
Averages	——	16.8	5.8	39.8	1.0
Companion crop—Spring wheat (S.W.)	14.9	29	26	90	1.8
S. C. broadcast with S. W.					
S. C. drilled in alternate rows with S. W.	16.3	31	30	97	2.4
S. C. drilled in alternate rows with grass and S. W.	14.9	28	27	96	2.4
S. C. and grass drilled with S. W.	14.3	23	20	87	2.0
S. C. drilled with S. W.	14.6	22	18	82	1.8
Averages	15.0	26.6	24.2	90.4	2.1
S. C. drilled alone in spring on fall-plowed stubble land	——	——	——	——	3.4

Figure 1.—Poor growth and meager stand of sweet clover resulting from the broadcasting of seed at the time of seeding winter wheat (left), as contrasted to full stand and a vigorous growth of sweet clover drilled solid with spring wheat (right).

Figure 2.—Good vigorous stands of sweet clover obtained by seeding in alternate rows with spring wheat (left), and by seeding sweet clover alone without the use of a companion crop (right).

ing year were not as high. When planted in alternate rows, sweet clover made more vigorous growth, because it was better established, and competed more favorably with the spring grain companion crop.

Figures 1 and 2, show the relative sweet clover growth made as a result of four of the different methods of establishment.

Additional seedings were made in 1950-51, using winter wheat, spring wheat, and barley as companion crops. Precipitation was 15.8 inches, or 2.8 inches above normal. Grain yields and green manure yields are shown in table 3.

The spring of 1951, spring wheat and barley seeding rates for the alternate-row seedings were reduced by half. The solid seeding of wheat was 60 pounds and solid seeding of barley was 70 pounds per acre. Alternate-row seedings of wheat were 30 pounds per acre and alternate-row seedings of barley were 35 pounds per acre. Winter wheat seeding rate was maintained at 60 pounds per acre for all methods. The effect of seeding rate is dependent on moisture conditions during the crop year. During the period of study, reduced seeding rates of the cereals have not resulted in significant reductions in grain yields.

Sweet clover stands established with winter wheat were adequate for all three methods of seeding in the spring of 1951. However, the seedlings failed to survive the summer. On the other hand, sweet clover planted with spring wheat or barley was able to com-

Table 3.—Grain yields for 1951 and resulting 1952 sweet clover yields for methods of establishment.

METHOD OF SEEDING	1951 grain yields per acre	1952 sweet clover yields per acre
	bu.	tons
Companion crop—Winter wheat (W. W.)		
Sweet clover broadcast late fall over W. W.	20.5	0.0
Sweet clover broadcast early spring over W. W.	20.7	0.0
Sweet clover drilled early spring over W. W.	21.3	0.0
Companion crop—Spring wheat (S. W.)		
Wheat seeded alone	27.1	....
Sweet clover broadcast with S. W.	30.9	0.9
Sweet clover drilled alternate rows with S. W.	26.0	2.0
Sweet clover drilled solid with S. W.	28.0	1.5
Companion crop—Barley		
Barley seeded alone	28.3	....
Sweet clover broadcast with barley	29.5	0.9
Sweet clover drilled alternate rows with barley	33.9	1.5
Sweet clover drilled solid with barley	29.7	1.2

pete with the two crops, survive the summer months, and become well enough established to yield a good green manure crop the spring of 1952. Again the alternate-row method of seeding proved superior to either drilling or broadcasting in solid stands of spring grain. Obtaining adequate stands with the broadcasting method is highly dependent upon the amount of moisture received subsequently. Broadcasting does not place the seed in contact with soil moisture as does drilling.

Sweet clover seeded with grain has had no adverse effects on the yields of companion grain crops. Under dryland conditions, the root system of the sweet clover seedling is not extensive enough to compete effectively for moisture with the grain crop. Sweet clover makes most of its growth during the early spring, when the moisture supply is usually sufficient to meet the needs of both the grain and sweet clover. As the growing season progresses the faster growing grain draws the moisture from the sub-soil and the sweet clover becomes more or less dormant. If rains are received after the grain crop is removed, sweet clover again resumes growth and becomes more firmly established.

Sweet Clover Varieties

The variety being used at present is common yellow-blossom sweet clover. It is recommended over white blossom because of its finer stems and shorter growth.

A new variety coming into the picture is Madrid, also a yellow-blossomed sweet clover. It is more drought resistant than the common yellow and makes faster growth in the spring of the second year. These are very important characteristics, especially where moisture is a limiting factor.

Sweet Clover and Grass Seedings

The use of grass with sweet clover to add organic matter and improve physical stability of the soil is an accepted practice in areas of high rainfall. Under climatic conditions similar to the Tetonia Branch Station, little growth from grass can be expected where it is seeded with a companion crop. It has been possible to obtain a stand of grass but it lacked vigor the second year and made very little growth before sweet clover was ready to be plowed. Good stands of grass can be obtained when sweet clover and grass are seeded alone, especially if the grass is seeded in alternate rows with sweet clover. In areas of over 16 inches of rainfall sufficient growth has been obtained from grass to be of benefit, even when it was established with a companion crop. Mountain Brome and Primar Slender Wheatgrass make sufficient growth the first year to be used satisfactorily in combination with sweet clover.

Handling the Clover Green Manure Crop

To obtain the greatest benefit from sweet clover as a green manure crop, the available moisture and nitrogen must be kept as nearly in balance as possible. In areas where moisture is the limiting factor, care must be exercised not to allow sweet clover to exhaust sub-soil moisture before the crop is turned under. When this occurs, the wheat crop following suffers from lack of moisture and grain yields are reduced. In rainfall areas of over 16 inches this effect is not so critical.

In tests conducted at the Tetonia Branch Station it has been found that when sweet clover is plowed down early there is a much more favorable balance of moisture and nitrogen than when the sweet clover is allowed to reach a height of 3 feet. Table 4 gives height and pounds of sweet clover turned under, pounds of nitrogen in the sweet clover and the inches of available moisture remaining in 6 feet of soil. Average rainfall for this 2-year period was 0.4 inches above normal.

As shown in table 4, when sweet clover was plowed at a 6-inch height an average of 2655 pounds of green manure, containing 69 pounds of nitrogen, was returned to the soil. The major portion of this nitrogen is readily available to the following grain crop and under southern Idaho dryland conditions is normally more than ample to meet the crop's nitrogen requirements. At the 14-16 inch height, sweet clover contained over 2 tons of dry material with a nitrogen content of 109 pounds. Allowing the sweet clover to grow beyond the 14-16 inch stage supplies little additional nitrogen. In

Table 4.—Pounds of dry matter and nitrogen per acre in sweet clover top growth at various heights, and inches of available moisture remaining in 6 feet of soil at the designated heights. 1950-51.

Height of plants at time of plowing	Pounds of sweet clover per acre on dry basis*	Pounds of nitrogen per acre in the sweet clover	Inches of available moisture in 6 ft. of soil
6 inches	2655	69	7.11
14-16 inches	4507	109	6.11
22-24 inches	6877	119	4.65
34-36 inches	8065	123	1.48
Fallow	——	——	7.88

* Average of 2 years.

the drier areas this is the critical stage for moisture remaining in the soil, as shown in table 4.

Table 4 shows almost as much available moisture remaining when sweet clover is plowed at the 6-inch height as compared to normal fallow. Allowing the sweet clover to reach a height of 14-16 inches before plowing resulted in the use of 1.77 inches of additional moisture compared to normal fallow. With normal precipitation this moisture deficit will be replenished. However, in extremely dry years plowing at this height may exhaust soil moisture that will not be replaced by subsequent precipitation and the following wheat crop may suffer some drouth injury. This has occurred at the Tetonia Branch Station for 3 out of 13 years.

There was a deficit of 3.23 inches of available moisture as a result of allowing the sweet clover to reach a height of 22-24 inches. To replenish this amount of moisture requires much more than average precipitation. The grain crop following the plowing of this much sweet clover usually burns. Only 1.48 inches of available soil moisture remained for use by the following grain crop when the sweet clover was plowed at the 34-36 inch height.

In the higher rainfall areas (over 16 inches), it would be safe to allow the sweet clover to make more growth before plowing because chances of renewing the sub-soil moisture are much greater.

Regardless of the time of plowing, it is essential that a good job of plowing and summer fallowing be done. All of the sweet clover must be killed so there will be no volunteer plants to use the subsoil moisture, set seed and cause volunteers in later grain crops.

The early plowing of the green manure crop also allows for the retention of sufficient moisture in the surface areas of the soil to enable the development of a moist, firm seedbed. This is very important to the establishment of the wheat crop after sweet clover.

Seeding Rates

An advantage of alternate-row establishment of sweet clover as compared to other methods of seeding is the reduction in the amount of seed necessary to secure stands. Adequate stands have been obtained with the use of 3 or 4 pounds of sweet clover seed per acre when drilled in alternate rows with spring grain. Six to 8 pounds per acre have been required to insure an adequate stand when drilled solid or broadcast with spring grain.

If sweet clover is planted alone in the spring on fall-plowed stubble land it can be drilled at 4 pounds per acre. If sweet clover is planted without a companion grain crop, 4 to 6 pounds of either Mountain Brome grass or Slender Wheatgrass should be included with the sweet clover.

How to Seed

A 6 or 7-inch single or double disk drill with a grass seed box attachment is required to establish sweet clover in alternate rows with spring grain. Every other opening in the grain box is plugged and alternate openings in the small seed box attachment are likewise plugged. It is usually advisable to remove the spring tension from the disks that seed the sweet clover to prevent placing the seed too deep. The alternate-row method allows a wider range of depth adjustment than other methods because the same disks or spouts are not used for both the sweet clover and grain.

If sweet clover is drilled in the same row with spring grain, care must be taken with depth adjustment so the seed is not placed deeper than 1 inch. A small seed box attachment is preferred for this method of seeding, but if one is not available, the sweet clover seed can be mixed with the grain. If the sweet clover seed is mixed with the grain some settling of the sweet clover within the seed box will interfere with the uniform distribution of the seed.

A small seed box attachment is necessary if the broadcast method is used. When the seed is broadcast ahead of the disks and press wheels, some seed is mixed with the soil. Where possible, drilling is preferred to broadcasting.

A drill with press wheels is recommended for all methods of seeding. Press wheels pack the soil around the seed and help prevent soil drying until the seed has germinated.

The use of a 14-inch deep-furrow drill limits the method of seeding to either drilling or broadcasting. To use this drill for alternate-row seedings would leave a space of 28 inches between grain rows, which would probably result in decreased grain yields.

Although winter wheat is not generally recommended as a suitable grain companion crop, if it is utilized as such and extra seeding operation is required to seed sweet clover. When broadcast or drilled in the late fall or drilled in the early spring over winter

wheat no damage to the winter wheat has been sustained provided the winter wheat is 3 inches or more high. In fact, some small weeds were killed by this operation.

A firm, weed-free seed bed is desirable for sweet clover and grass seedings. The sweet clover and grass should not be planted any deeper than 1 inch and preferably between ¾ and ½ inch. When planted on summer fallow with spring grain, no extra tillage has been employed at the Tetonia Branch Station to firm the seed bed.

When sweet clover or grass has been planted without a companion crop in the spring on fall-plowed stubble land it is usually necessary to harrow and pack the soil with a roller to assure a firm seed bed and aid in placing the seed at a uniform depth. It is desirable to clip the weeds once or twice during the season to reduce competition and to prevent them from going to seed. Clipping should be done 4 to 5 inches above the ground to minimize the damage to the sweet clover and grass.

Literature Cited

1. McKay, Hugh C., and Moss, W. A.
Stubble mulch farming in southern Idaho. Idaho Agri. Exp. Sta. Bull. No. 256, 1944.
2. ———————————.
High protein wheat with conservation farming. Idaho Ext. Bull. No. 181, 1949.

Other University of Idaho Publications for Farmers in the Dry Land Areas

The recommendations for the establishment of sweet clover in dry land areas reported in this bulletin constitute another important contribution from the tillage studies at the Tetonia Branch Station. These studies have been carried on for approximately 15 years, in cooperation with the Agricultural Research Service, U. S. Department of Agriculture.

Other publications coming out of the investigations at the Tetonia Branch Station that will be of interest to farmers in the dry land areas include:

Stubble mulch farming in Southern Idaho. Experiment Station Bulletin No. 256.

High protein wheat with conservation farming. Extension Bulletin No. 181.

Green manure crops for Idaho farms. Extension Circular No. 105.

Crop rotations pay dividends. Extension Circular No. 113.

Copies may be obtained from the University of of Idaho, College of Agriculture, Moscow; from the University Agricultural Extension Serivce, State House, Boise; or from county argicultural agents.