A COMPARISON OF PROCEDURES USED IN HARVESTING ALFALFA AND ALSIKE CLOVER SEED

by

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INTRODUCTION

The actual harvest of small legumes is accomplished by several different methods, or a combination of methods. It has been apparent that considerable seed is lost in the harvesting process but the degree of loss associated with different methods has been mostly conjecture.

Experiments carried on in Europe indicate that frequently the losses during harvesting and threshing amount to a considerable portion of the total possible yield.

Lack of similar information for Michigan and the surrounding area prompted the present investigation.

REVIEW OF PREVIOUS LITERATURE

Remorov (7) found that losses in red clover seed harvesting and ricking frequently ran as high as 74.6% of the biologically possible yield. He found the stage of maturity to be very important. The greater the percentage of brown heads the more shattering during harvest. Serbaceva (9) in a similar experiment found that when 50% of the heads of red clover were brown that seed germinated normally and loss through shattering was small. Increasing the percentage of brown heads did not increase the germination, or reduce the number of stunted seeds. However increased browning did increase the shattering. When 50 to 60% of the heads were brown the shattering loss during harvesting was 3%. When 80% of the heads were brown, shattering loss was 19%. When 100% of the heads were brown, shattering loss was over 40%.

Dryda (2) found that the time of day when the field was cut influenced the amount of shattering. The shattering was least early in the morning, higher in the evening and greatest at noon. Delay in harvest increased the loss which frequently ran as high as 75% of the potential yield. The more the crop was handled after it was cut, the higher the loss of seed. These workers found loss of seed during loading and carting greatly increased when dried in ricks instead of sheaves.

The possible losses mentioned so far occur in harvesting and handling the cut material. Grandin (3) conducted several experiments checking the seed lost during threshing. Under carefully controlled conditions he cut the loss down to 3%; however he concludes that under ordinary farm practices 10% or more of the seed is lost in threshing. In one instance at Michigan State College (5) a field of ladino clover was threshed twice. The second threshing recovered about half as much seed as the first threshing.

With the development and widespread distribution of the small combine many farmers began using it to harvest small seeded legumes. This gave rise to new problems in harvesting. Cook (1) discovered in checking alfalfa seed yields, from different fertilizer treatments, that he could get a greater difference in yield by turning the combine into the wind and back to the wind than he could get by any change in cultural treatment. In work carried on by Pederson (4) he could in direct combining of alfalfa from the stand that he could increase seed recovery from 52% to 79% by harvesting only in one direction. That is with the wind blowing into the back of the combine instead of harvesting around the field as is the usual practice.

Sheldon and Dexter (9) while conducting an experiment on harvesting ladino clover seed with a vacuum harvester came up with some rather interest-

ing results. When combining from the swath, a recommended method in some areas, the yield was sixty pounds per acre. This is considered a fair yield (6). When a portion of the same field was picked up with the vaccuum harvester the yield was one hundred and sixty pounds per acre.

METHOD OF PROCEDURE

The present experiment was started in the summer of 1947, and the trials were duplicated as nearly as possible in 1948. All fields checked are located in Alcona County, Michigan. The amount of seed actually present on the field was determined by the quadrat system of sampling and converted into pounds of seed per field. Hereafter, the yield determined by this method will be referred to as the "actual yield."

Samples one yard square were taken at random over the field at the rate of six per acre on one acre plots, four per acre on five acre plots, and three per acre on plots of ten acres or more. It would have been desirable to take a greater number of samples per acre, especially in fields where the stand was irregular, but because of the short harvest season, and wishing to check as many fields as possible, this rate was chosen as the most practical.

The samples were collected by hand and immediately placed in individual cloth bags. Samples were taken just prior to the time the farmer planned to harvest. This practice was followed so as to reduce the differences between sampling and harvesting which might be expected by further ripening, wind shattering, etc. In a few cases unfavorable weather, or machinery break down, intervened so there was a considerable lapse of time between the date of sampling and actual harvest date. The samples were stored in a dry place free from rats and mice.

The actual acreage of each field harvested was measured in order to establish the exact yield per acre.

After all the samples were collected the material was brought to East Lansing and carefully threshed and cleaned to determine the actual yield from the field. Each sample was put through the threshing machine four times and the remaining chaff was rubbed out by hand to get any seeds still remaining. Great care was taken that no seed was lost in the sweepings, screenings, or other steps in handling.

The total weight of clean seed from these samples was converted to pounds per acre and compared to the amount of clean seed the farmer actually recovered. The amount of seed left after being cleaned at an elevator was taken as the harvested yield from the field.

The time and method of harvest for each field was decided by the individual farmer. No attempt was made to influence any farmer to harvest in any particular way, inasmuch as the purpose of this experiment was to determine the percentage of seed recovered by farmers when present day harvest procedures were followed.

The machine used to thresh out the samples was designed similar to a combine cylinder and concave. The threshing was accomplished by rasp bars attached to a cylinder, and concave rasp bars attached to a stationary concave. The chaff and dirt was removed by running the threshed material through a Clipper fanning mill.

A few extra samples had been collected to be used in adjusting the machine. After the machine was set the remaining samples were threshed several times to see how much seed was threshed out each time through the machine, see tables 7 and 8.

Data:

Fields of alfalfa and alsike clover were the only small seeded legumes found in sufficient numbers in the area to get several representatives of each of the various methods of harvest commonly used.

HARVEST METHODS USED

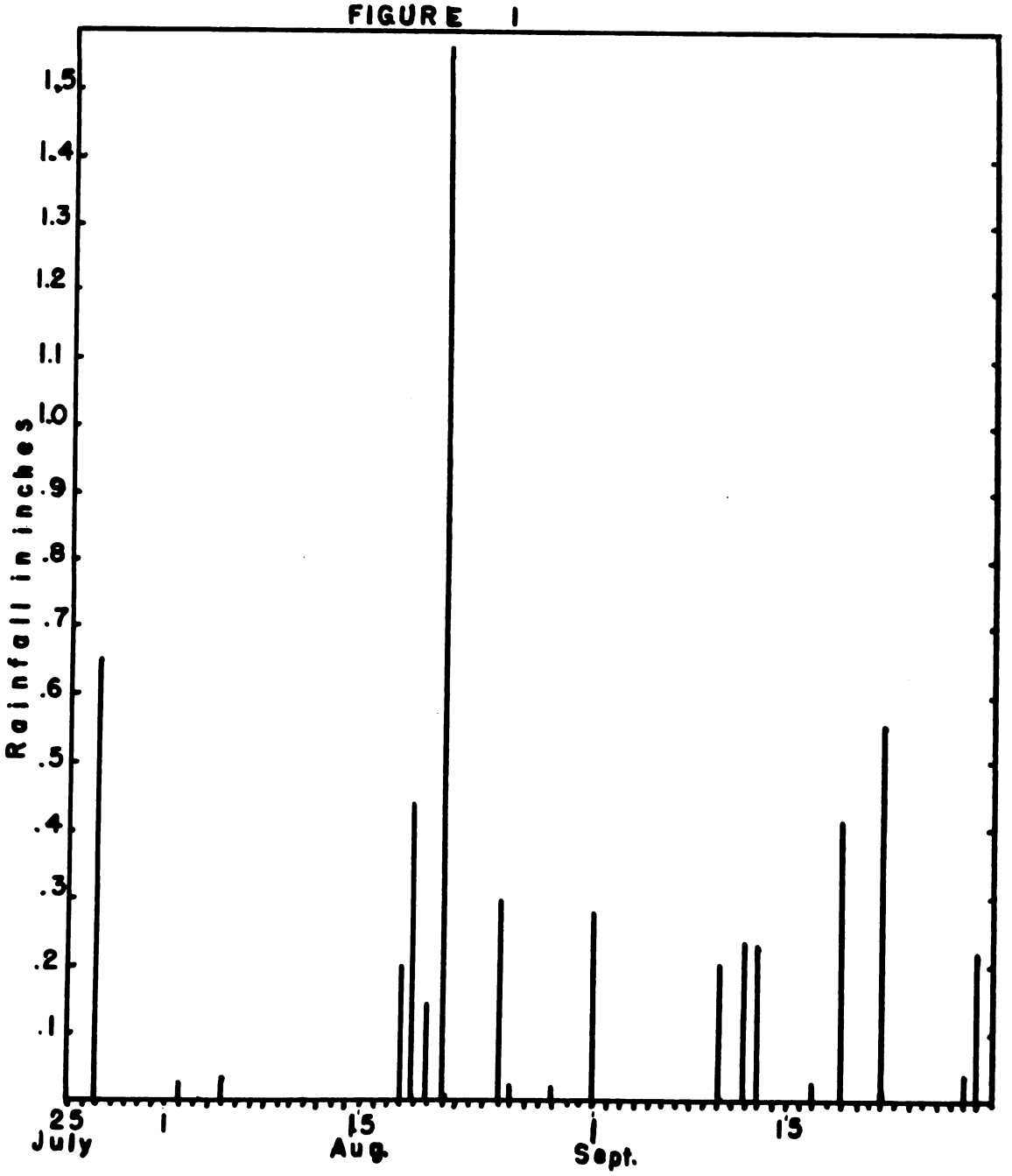
1. Combined from stand
2. Combined from windrow
3. Combined from swath
4. Cured in windrow, picked up with hayloader and stored in barn until threshed.
5. Cured in cocks, threshed or stored in barn when dry.
6. Cut with binder, cured in long shocks, threshed when dry.

In 1947 the alsike harvest was started on July 28 and completed on August 14. It rained on two occasions during this period, .02 inches on August 2 and .03 inches on August 5, see figure 1. The rest of the time the weather was clear and conditions ideal for harvesting seed. Any difference between actual recovered yield at harvest and potential yield calculated from samples was attributed to losses during harvesting, threshing and cleaning. See table 1.

The 1948 alsike harvest was started on July 30 and completed on August 16. It rained on twelve occasions during this period, see figure 2. Table 2 shows a marked decrease in the percentage of seed recovered in 1948 as compared to 1947. This decrease was probably due to the unfavorable weather conditions encountered in 1948.

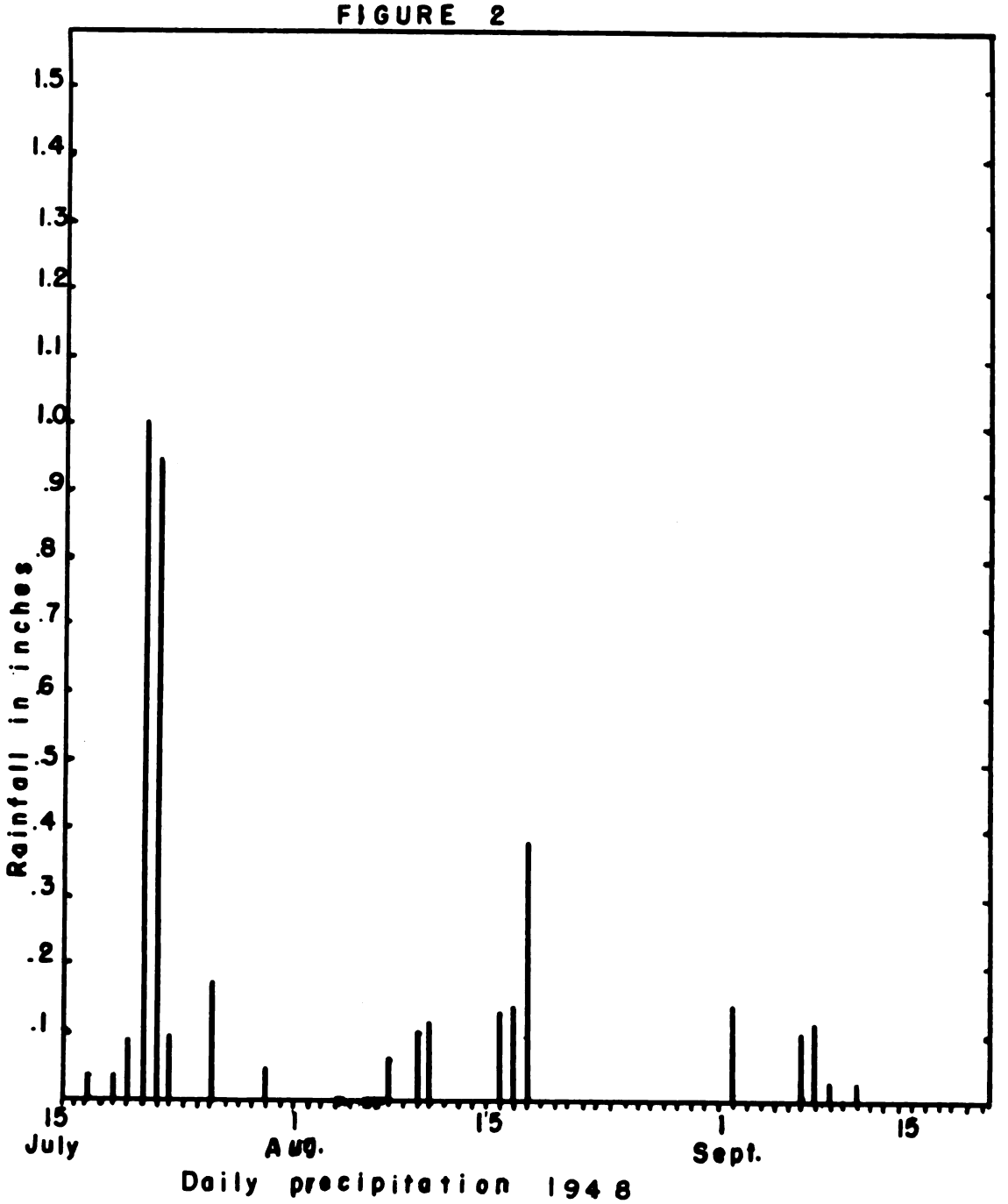
The 1947 alfalfa harvest was started on August 28 and completed on September 30. See Table 3. The 1948 harvest was started on August 19 and

FIGURE 1



Daily precipitation 1947

FIGURE 2



Daily precipitation 1948

Table 1 - A comparison between seed produced and that actually harvested by various harvesting methods from alsike seed fields in 1947.

Field No.	Acres	Dates			Yield in lbs. from field		Percentage Harvested
		Sampled	Harvested	Threshed*	Actual	Actually Harvested	
1	5.38	7/28	7/28	8/1 (e)	879	490	55.76
2	4.42	7/29	7/29	8/1 (b)	1160	624	53.78
3	10.33	7/30	8/1	8/14 (e)	1157	284	24.37
4	7.05	7/31	8/1	8/5 (b)	935	240	25.94
5	8.01	8/1	8/1	8/8 (b)	1701	1188	69.85
6	6.52	8/1	8/1	8/9 (b)	2180	1277	58.57
7	6.10	8/4	8/4	8/7 (b)	527	201	38.13
8	11.50	8/5	8/5	8/11	2589	679	26.23
							Ave. 44.08

* The letters in parenthesis refer to methods of harvest which are listed following table 4 on pg. 10.

Table 2 - A comparison between seed produced and that actually harvested by various harvesting methods from alsike seed fields in 1948.

Field No.	Acres	Dates			Yield in lbs. from field		Percentage Harvested
		Sampled	Harvested	Threshed *	Actual	Actually Harvested	
1	15.10	7/20	7/20	8/5 (b)	1665	548	32.92
2	2.25	7/20	7/20	8/4 (b)	282	44	15.60
3	7.52	7/20	7/22	8/2 (b)	2144	580	27.06
4	2.24	7/23	7/24	7/30 (e)	208	146	70.19
5	5.40	7/23	7/23	7/30 (b)	1069	355	33.19
6	7.72	7/23	7/23	8/6 (e)	1441	692	48.06
7	2.72	7/24	8/2	8/15 (e)	235	143	61.11
8	6.62	7/26	7/26	8/16 (e)	1076	447	41.16
9	8.39	7/24	7/24	7/29 (b)	2199	1470	66.85
10	9.47	7/27	7/28	7/30 (b)	1517	302	19.92
11	3.69	7/28	7/31	8/4 (b)	782	325	41.56
12	3.51	7/28	7/31	8/4 (b)	127	44	34.65
13	2.94	7/29	7/31	8/5 (b)	280	118	42.14
						Ave.	41.11

* The letters in parenthesis refer to methods of harvest which are listed following table 4 on page 10.

Table 3 - A comparison between seed produced and that actually harvested by various harvesting methods from alfalfa seed fields in 1947.

Field No.	Acres	Dates			Yield in lbs. from field		Percentage Harvested
		Sampled	Harvested	Threshed *	Actual	Actually Harvested	
1	5.63	8/27	8/28	9/5(f)	1989	696	34.98
2	7.90	8/28	8/28	9/10(f)	2552	944	36.99
3	4.21	8/30	8/30	9/17(e)	1363	349	25.60
4	9.91	8/30	9/1	9/5 (d)	3565	1530	42.90
5	3.13	9/1	9/14	9/14(a)	806	207	24.43
6	5.96	9/2	9/15	9/15(a)	1332	407	30.55
7	6.64	9/16	9/17	9/17(a)	1489	692	46.48
8	3.51	9/2	9/9	9/15 b	1202	940	77.64
9	10.40	9/3	9/3	9/17 b	2953	825	27.89
10	2.39	9/4	9/4	9/17(c)	1033	439	42.48
11	7.21	9.4	9/5	9/15 b	2146	521	47.39
12	2.96	9/5	9/6	9/30(e)	1099	540	49.19
13	2.46	9/16	9/17	9/17(e)	437	252	57.61
							Ave. 41.86

* The letters in parenthesis refer to methods of harvest which are listed following table 4 on page 10.

Table 4 - A comparison between seed produced and that actually harvested by various harvesting methods from alfalfa seed fields in 1948.

Field No.	Acres	Dates			Yield in lbs. from field		Percentage Harvested
		Sampled	Harvested	Threshed *	Actual	Actually Harvested	
1	3.00	8/17	8/19	8/21(b)	723	121	16.67
2	4.21	8/25	8/30	9/3 (b) (a)	1187	217	18.30
3	14.03	8/24	9/8-15	8/8-15	3781	1138	30.09
4	1.65	8/25	8/25	9/6(f)	728	300	41.21
5	2.02	8/25	8/26	9/11(f)	392	156	39.03
6	3.44	8/25	8/26	9/11(f)	1385	528	38.12
7	3.50	8/30	8/31	9/11(f)	1159	450	38.82
8	1.63	8/30	8/30	12/9(g)	412	194	47.09
9	7.51	8/31	8/31	9/4(b	1878	888	47.24
10	9.50	8/31	8/31	9/16(e)	1495	585	39.16
11	2.93	9/8	9/9	9/14(c)	310	143	46.28
12	3.44	9/8	9/9	9/14(c)	304	101	49.51
13	6.01	9/10	9/10	9/10(a)	1209	512	42.34
14	9.44	9/10	9/13	9/13(a)	1132	250	22.09
15	5.42	9/14	9/14	9/14(a)	402	101	25.07
16	8.16	9/13	9/13	9/20(f)	385	144	37.58
17	3.68	9/14	9/14	9/19 b	407	229	56.13
						Ave.	37.34

* The letters in parenthesis refer to the method of harvest listed on the following page.

a. Combined from stand.

b. Combined from windrow.

c. Combined from swath

d. Cured in windrow, picked up with hayloader and stored in barn until threshed.

e. Cured in cocks, threshed, or stored in barn when dry.

f. Cut with binder, cured in shocks, threshed when dry.

g. Cut with binder, stored immediately in barn.

Table 5 - A comparison of the average efficiency of the various methods used in harvesting alsike clover seed.

Harvest method used	Percentage Harvested 1947	1948	Ave. for both years
Combined from windrow	45.42	30.88	37.11
Cured in cocks	40.06	57.47	52.50
Average	44.08	41.11	42.24

Table 6 - A comparison of the average efficiency of the various methods used in harvesting alfalfa seed.

Harvest method used	Percentage Harvested		
	1947	1948	Ave. for both years
Combined direct from stand	39.77	29.89	34.83
Combined from windrow	50.94	34.58	41.45
Combined from swath	42.48	47.89	46.09
Cured in windrow, picked up with hayloader and stored in barn until threshed.	42.80	--	--
Cured in cocks	39.39	39.16	34.65
Cut with binder, cured in long shocks	40.39	38.95	39.49
Cut with binder, immediately put in barn	----	47.09	--
Average	41.86	37.34	39.29

Table 7 - Percentage of seed recovered from successive threshings of alsike clover.

Threshing No.	Percentage of seed recovered
1	50.42
2	31.30
3	9.46
4	4.23
5	2.77
6	1.32
	100.00

Table 8 - Percentage of seed recovered from successive threshings of alfalfa.

Threshing	Percent of seed recovered
1	65.79
2	30.69
3	7.29
4	5.59
5	1.43
6	1.08
7	.35
8	.27
9	.21
10	.19
Rubbed out of chaff	.11
	100.00

completed on September 30. See Table 4. It rained frequently during the alfalfa seed harvest season during 1947 and 1948, see figures 1 and 2.

DISCUSSION

A study of the tables 1-4 shows that the losses inherent in the various harvesting methods ranges from 23% to 84%, with an average loss of 60%. These losses are considerable and any possible means of reducing them should be investigated, and used if practical.

The 1947 alsike harvest was carried out under almost ideal conditions. The weather remained clear and dry through out the harvest period, except for the two light rains mentioned previously. Under these conditions any difference between harvested yield and actual yield should be due to losses during the processes of harvesting, threshing and cleaning.

Two methods of harvest were practiced by the farmers when harvesting alsike clover seed. The method most frequently used was to mow the crop with a windrowing attachment on the mower. The material was cured in the windrow for several days; or until dry. When the material was dry, and the weather clear, the seed was combined directly from the windrow. One of the greatest hazards frequently encountered in this method is unfavorable weather. When the weather is cloudy, or partly cloudy, the material may never get dry enough to thresh out well. Frequently a farmer will combine his field during such weather. His reason being that he has time to do it now and may not later; or he is afraid the weather in the near future may be worse. Combining under such conditions results in very poor seed recovery. However, the material that is too tough to combine may be dry enough to be stacked or placed in a barn to continue drying until fit to thresh.

The second harvest method used was to mow with a windrowing attachment and immediately put up in cocks. The material is cured in these cocks and threshed, or put in barns when dry. These cocks will stand light showers without much loss of seed due to shattering and discoloring. The most important point in this procedure is to put up the cocks immediately after cutting. If one man is working alone he should mow one or two rounds at a time and stop to cock this much up. Even a one or two hour delay between cutting and cocking on a good drying day will result in considerable loss due to shattering when the cocks are being made. Two farmers cocked the seed crop during 1947, one putting up the cocks immediately on cutting, the other waiting until the next day to finish cocking. Only 24.37% of the potential yield was recovered when the entire field was mowed one afternoon and put up in cocks the next day, whereas 55.76% was recovered where two men followed immediately after the mower putting up the cocks, table 1. When the man operating the mower got more than two windrows ahead he stopped mowing and helped the other two catch up.

During the ideal weather of the 1947 harvest season the recovery when combining from the windrow was higher than when cured in cocks. However, this is not significant. The range within each method was far greater than any difference between methods.

In 1948 the same two methods of harvest were employed. It rained on twelve occasions during the harvest season. Under these conditions combining from the windrow resulted in a marked decrease in seed recovery. This was undoubtedly due to the fact that the material in the windrows never got throughly dry. The difference for this year was quite significant; 30.88% recovery when cured in the windrow and 57.47% when cured in cocks; see

table 2.

The average for both years slightly favors curing in cocks, 52.50 to 37.47% recovery, however the variability is so great for the number of samples taken that these results can not be considered as conclusive evidence.

One field sampled in 1948, table 2 number 5, was first checked on July 21. It rained heavily during the afternoon so the field was resampled on July 28. The second set of samples were taken adjacent to the spots the first samples were collected from. The second sampling contained 43.79% less seed than the samples collected before the rain. This is a very good illustration of the amount of shattering caused by a rain storm when alsike clover is ripe. The farmer recovered 70% of the remaining seed. Alsike shatters badly when dead ripe and for this reason it should be cut before all of the heads become brown. Field No. 10, table 2, was left until it became dead ripe, shattering resulted and only 19.9% of the seed was recovered.

The alfalfa seed harvest season, in Alcona County, comes in late August and September. The fall rains start during this period, figure 1, so the curing of alfalfa seed presents more hazards than are encountered in harvesting alsike seed. It may be impossible to get the material throughly dry in the field. A portion of the alfalfa seed requires no after ripening period so if the weather is warm and humid considerable sprouting may occur in the windrow or cock. Also the fall rains may cause new growth from the crowns which complicates the curing process and taking more time.

The methods of harvesting alfalfa seed are more diversified than for alsike clover. Methods commonly used were; combining from the stand, combining from the windrow, combining from the swath, curing in cocks, and harvesting with a binder, curing in shocks and threshing. Here again no one method is definitely superior to the others. The variation between fields within a method is greater than between methods.

Curing in cocks stands at the bottom of the list with an average recovery of 34.65. This is probably due to the fact that the material is handled more after it is cut than in any other method. Combining from the stand follows next with 34.83% recovery. If the field ripens evenly, and the weather is clear on the day of harvest, combining from the stand can be expected to recover about 50% of the potential yield. Unfortunately this is the exception rather than the rule. Generally alfalfa ripens unevenly and quite frequently the second growth gets so high that this green material goes thru the combine causing the mixture to be quite tough. At best quite a few of the pods are too tough to thresh, even though they contain mature seed. Extra care must be taken in storing the seed when it has been harvested direct from the stand. The moisture content is frequently high enough to result in heating and molding in the bag or bin.

Many farmers favor harvesting with a binder and curing in long shocks, contending that in case of rain the pods do not get as wet or take as long to dry out when the weather clears. This is because the air can pass through the top of the sheaves and dry out the pods quickly, cutting down on loss due to sprouting. In a windrow a large portion of the pods are inside the roll and will remain damp considerably longer than the outside and top of the windrow. This is particularly true if the ground is quite

moist. The same is true for material in cocks, however a well made cock will stand a shower of short duration without soaking through. A rain of several days duration will soak into even a well made cock however, and then it is necessary to tear the cock apart so the air can get through to dry it out. Combining from the windrow appears to be slightly more efficient than cutting with a binder; 41.45% for the combine compared to 39.49% for the binder, table 6; in spite of the theoretical advantage of having a better method of drying. Here again it is probably due to more handling. The sheaves are dry when taken from the field, and it has been observed that the seed shattered badly in handling the bundles. A tight bottom rack on the wagon and careful handling of the bundles will save a lot of seed that otherwise sifts down through the load and on to the ground.

Combining from the swath rather than from the windrow has some advantage. When cured in the swath the bushy nature of the alfalfa stems will hold the pods up off the ground so the air can pass readily through the entire layer. This has a distinct advantage over a windrow in case of a rain. However, if rainy humid weather should continue for a week or more, then the second growth will push up through the swath and make it difficult to pick up the swath with a combine. It may be necessary to rake the swaths up into windrows if this occurs. That was the case with one field sampled in 1947; table 3, field number 10. Even so 43.48% of the seed was recovered, which is above average. In 1948, table 6, combining from the swath recovered 47.89% of the seed as compared to 34.58% recovery when combined from the windrow. When planning to combine from the swath the crop should be cut with a mower which cuts a swath of the same width as the combine to be used. A tractor with wide spaced front wheels should be used in mowing so that the

swath is not matted down by the wheel running over it.

Two other methods of harvest were checked, but only one representative of each method was sampled so these methods were not included in the analysis. These two methods were; cured in windrow and picked up with a hay-loader, table 3, 49.90% recovery; and reaped with binder and immediately stored in a barn, table 4, 47.09% recovery.

Loss due to rain on a ripe stand is not as severe in alfalfa as in alsike clover. On one of the farms checked in 1947; table 3, fields 5, 6, and 7, two of the fields were sampled before the rain and one just prior to combining direct from the stand. The recovery from the fields which were rained on was 24.4% and 30.5% while the field sampled just before it was combined returned 46.5%. In other words it appears that 53.5% of the seed was lost during the combining operation and 22.1% was lost due to the rain.

The results obtained in threshing samples of alsike several times are shown in table 7. When threshed only once, approximately 50% of the seed would have been lost, as is the case with a combine; or 18% of the seed lost if threshed with a clover huller, which has a double cylinder. It appears that most threshing equipment is no more efficient than a rain storm in which 50% of the seed was lost as a result of the storm. However, several samples were run and the results were the same in all cases.

The same procedure was followed with several samples of alfalfa. The results were similar, table 8, except that the first threshing recovered 65.79% of the seed as compared to 50% of the alsike.

These results help to explain why less seed is recovered from a field than the farmer expects. These samples were dry and the machine was adjusted to do the best possible job of threshing. Under field conditons the

moisture content of the material is variable and in the case of the combine the wind is variable. With these conditions existing it is understandable why the average efficiency is around 40%.

SUMMARY

During the summers of 1947 and 1948 various methods of harvesting alsike clover and alfalfa seed were checked. The fields were sampled by the quadrat method of sampling. The actual yield was established from the quadrat samples and compared with the harvested yield secured by the farmer. The efficiency of each method is based on the average percentage of seed recovered in trials for both years.

Each method studied had strong supporters among the farmers. In fact, some farmers would use only one method and in case the weather, or some other factor, made their procedure impractical for that season they will lose the entire crop rather than resort to a different practice.

In spite of various personal preferences it is difficult to obtain actual experimental proof of the superior harvesting efficiency of any given method.

The methods of harvesting alfalfa seed, ranking from best to least efficient, fall in the following order.

1. Combined from the swath.
2. Combined from the windrow.
3. Reaped with binder; cured in long shocks.
4. Combined from the stand.
5. Cured in cocks.

The variability within the method checked is so great that these results can not be considered significant.

The average efficiency in harvesting alsike clover seed is 42.24%. The average for harvesting alfalfa seed is 39.29%. In other words, Michigan farmers are losing 60% of their seed in harvesting small seeded legumes.

Losses run as high as 84.4% in some cases.

General recommendations for the harvest methods checked.

1. Combining direct from stand. If the field is ripening uniformily all the pods or heads can be allowed to get ripe and then combine direct from the stand. This is the cheapest method; however, seeds in any tough pods or heads will be lost. Examination of these tough pods, or heads, often revealed that the seed was mature; so good seed was being thrown away. In case of a rainy spell the second growth may grow tall enough to interfere with combine operations. This causes the seed to be very damp and special care in drying must be observed.

If the plants are not maturing evenly, which is generally the case, then the crop must be cut and cured before it is dry enough to be threshed by either a combine or threshing machine. In this case one of the following methods may be used.

a. Mowing with windrowing attachment and combine from the windrow when dry. This may take two days to a week or more depending on the weather and the amount of green matter present.

b. Mowing and curing in the swath, and combining from the swath when dry.

c. Mowing with windrowing attachment and cocking immediately. When cured, the seed crop may be threshed or stored in the barn.

d. Cutting with a grain, or corn binder, and set up immediately in long shocks. When cured the material may be threshed or stored in a dry place. This method is confined to upright stands.

In all of the above methods, the observance of a few simple rules can mean the difference between recovering most of the actual yield, or loss of

most of the seed.

1. Cut crop while it is tough, in early morning, late evening, or on humid days.

2. Handle materials as little and as carefully as possible after it has started curing.

3. Do not try to thresh or combine while material is tough.

4. Check adjustment of machine frequently; to be sure that it is operating at top efficiency.

5. If the combine or threshing machine is not on hand when the material is dry then store it in a stack, barn, or shed.

With 60% of the seed being lost the question is not whether one method is better than another, but rather one of how can any or all of the methods be improved.

CONCLUSIONS

1. The various methods and techniques now used by farmers in harvesting alsike and alfalfa seed fields were studied under field conditions to determine seed losses occurring during harvest.
2. There is a large loss of alsike and alfalfa seed during harvest by the various methods of seed harvest now in use. These losses ranged from 23% to 84%, with an average loss of 60%.
3. None of the methods of seed harvest resulted in significantly higher recovery of seed from seed fields.
4. The wide range in percent of seed lost indicates a need for further study to determine the causes of these losses.

LITERATURE CITED

1. Cook, R.L. Unpublished data on the production of alfalfa seed in Michigan. East Lansing, Michigan, Michigan State College Soils Department, 1947.

2. Dyrda, V.I. Loss in Red clover seed at harvesting and thresning in the Kungur district, Sverdlov region. Selek Lemenovod, No. 3, pp 45-47, 1936, Herbage Abstracts Vol. 7, pp 63, 1937.

3. Grandin, H. Losses during thresning of small seeded legumes. Lantmannen Svenskt Land. 27 982 1943, Herbage Abstracts, Vol. 14, 1944.

4. Pederson, C.E. Insecticides Increase Legume Seed. Mich. Agr. Exp. Sta. Bul. Vol. 30, No. 3 pp 298-308, Feb. 1948.

5. Pettigrove, H.R. Unpublished data on harvesting Ladino clover seed. East Lansing, Michigan, Michigan State College Farm Crops Dept., 1946.

6. Production of Herbage and Forage Crop Seed in U.S.A. Herbage Reviews, Vol. 7, pp 151-169, 1939.

7. Remorov, A.I. Mechanization of cultivating clover for seed. Selek. Semenovod, No. 3, pp 28-39, 1936, Herbage Abstracts, Vol. 7, pp 63, 1937.

8. Serbaceva, V.D. Determination of harvest ripeness of seed clover. Herbage Reviews, Vol. 8, pp 101, 1940.

9. Sheldon, W.H., and Dexter, S.T. Harvesting Ladino clover seed with a vacuum harvester, Michigan Agr. Exp. Sta. Quar. Bul., Vol. 31, No. 2, pp 215-218, November, 1948.