AIM Research Trial Report: **Effect of Fall Hilling on Marketable Yield & Quality**
Working Group: Science & Technology
Crop Year: 2021
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Project Rationale:

Since 2018, the AIM Science and Tech Working Group has been investigating fall hilling as a beneficial management practice. Preliminary research and anecdotal evidence from other regions has pointed toward improvements to marketable yield associated with fall hilling. In addition, by performing tillage in late summer/early fall, followed by establishment of a cover crop, there is the potential for longer-term improvements in soil health.

Project Overview:

Trials were set up in three fields by Bluefield Acres in 2020, and AIM was invited to assist in gathering data from these fields. All three fields were planted with Dakota Russets in a similar geographic area of the province.

Each of the fields had a portion of the field where hilling was performed in September 2020, followed be establishment of a cover crop. The remainder of the field was tilled but not hilled, with establishment of a cover crop. The 2020 cover crop that was used was oats; however, establishment was below average this year. GPS points to mark the division between treatment and control were logged in order to inform harvest sampling in the fall of 2021. In one of the fields, SoilTech wireless moisture and temperature sensors were installed, one each in the treatment and control areas of the field. Harvest sampling was done as close as possible to the division in treatment and control rows in order to control the effect of background field variation.

Results:

This was the first year using SoilTech in-ground sensors to measure soil moisture and soil temperature. Prior to June 2nd, only soil temperature data was logged, as there were issues getting the soil moisture to properly register. From May 15th to June 2nd, average soil temperature in the check region was 11.6 degrees C, while the average soil temperature in the hilled treatment region was 11.9 degrees C.

From the period of June 2nd to June 15th (immediately after planting), the average temperature in the check was 15.9 C, compared with 15.7 C in the hilled treatment. Volumetric moisture percentage was 27.6% in the check, compared with 29.9% in the hilled treatment. After June 15th, there appeared to be less difference between the check and treatment for soil moisture.

Table 1: Yield and quality for Dakota Russets in field BFA1

Treatment	Total Yield cwt/ac	Smalls %	> 10 oz %	Total Defects %	Specific Gravity	M. Yield cwt/ac	Payout $/acre
Control (GSP)	334.4	11.3	11.2	5.9	1.085	279.9	3654
Fall Hilled	298.4	6.4	16.5	1.7	1.085	276.6	3544
Difference	-36.0	-4.9	+5.3	-4.2	0.000	-3.3	-110

Table 2: Yield and quality for Dakota Russets in field BFA2

Treatment	Total Yield cwt/ac	Smalls %	> 10 oz %	Total Defects %	Specific Gravity	M. Yield cwt/ac	Payout $/acre
Control (GSP)	341.3	5.4	26.4	4.0	1.083	316.4	4026
Fall Hilled	349.5	4.4	14.8	1.9	1.084	331.4	4215
Difference	+8.2	-1.0	-11.6	-2.1	+0.001	+15.0	+189

Table 3: Yield and quality for Dakota Russets in field BFA3

Treatment	Total Yield cwt/ac	Smalls %	> 10 oz %	Total Defects %	Specific Gravity	M. Yield cwt/ac	Payout $/acre
Control (GSP)	343.2	6.2	12.3	4.2	1.087	314.3	4043
Fall Hilled	371.4	6.3	14.9	3.9	1.089	342.4	4506
Difference	+28.2	+0.1	+2.6	-0.3	+0.002	+28.1	+463

Table 4: Yield and quality for Dakota Russets for the three trial fields combined.

Treatment	Total Yield cwt/ac	Smalls %	> 10 oz %	Total Defects %	Specific Gravity	M. Yield cwt/ac	Payout $/acre
Control (GSP)	339.5	7.8	15.8	4.8 b	1.085	302.3	3897
Fall Hilled	339.7	5.9	15.5	2.7 a	1.086	315.4	4069
Difference	+0.2	-1.9	-0.3	-2.1	+0.001	+13.1	+172

Across the three trial fields in 2021, there is some variability in response. None of the results were statistically significant at $p < 0.1$ in the individual fields. When combining results from all three fields, the average increase in marketable yield is 13.1 cwt/acre. There was a significant difference in total defects, with the fall hilled treatment showing a reduced level of defects.

Summary:

Table 5: Examining average differences between fall hilling and conventional management across 10 yields over four years:

Variety & Year	Total Yield cwt/ac	Smalls %	> 10 oz %	Total Defects %	Specific Gravity	M. Yield cwt/ac	Payout $/acre
Burbank 2018	-4	-3	0	-2	0.001	15	222
Prospect 2018	-2	-1	-5	-6	0.003	20	203
Ranger 2018	-30	-8	8	-3	0.001	11	77
Burbank 2019	26	-1	5	-2	-0.001	32	438
Burbank 2019	-1	4	-2	1	0.000	-16	-256
Prospect 2019	29	2	0	-9	0.002	45	603
Burbank 2020	21	-1	10	1	0.004	18	334
Dakota 2021	-36	-5	5	-4	0.000	-3	-110
Dakota 2021	8	-1	-12	-2	0.001	15	189
Dakota 2021	28	0	3	0	0.002	28	463
average	**+4**	**-1.5**	**+1.2**	**-2.6**	**0.001**	**16.5**	**$216**

The results from 2021 are very similar to what we have found over 10 site-years in this research. Over this time, we have observed that fall hilling does not have much, if any, impact on total yield. However, there is a trend toward slightly fewer smalls, fewer total defects, and a slightly higher marketable yield and crop value. In only two of ten site-years was marketable yield and crop value lower in the fall hilled treatment than the control.

It should be noted that in only two trials was the difference in marketable yield found to be statistically different ($p < 0.1$). However, there does appear to be a trend toward a small positive for marketable yield and crop value.

Beyond the immediate impact on yield and crop value, adoption of fall hilling may have greater positive impacts on long-term soil health and sustainability. Performing primary tillage in August-September allows the producer to do this work before the busy potato harvest season. This tillage is also more likely to take place under drier soil conditions that are less likely to introduce soil compaction.

In addition, it allows for the early establishment of a cover crop. A well-established cover crop is associated with reduced soil erosion, reduced nitrate leaching, and increasing soil organic matter.

Based on 10 site-years of data, it appears that fall hilling does not have a detrimental impact on marketable yield and crop value in processing varieties. If the observed trend is accurate, there may be a small gain in marketable yield (approx. 5%) through the use of fall hilling. Given that this increase should come with a negligible increase in costs (and potential long-term savings due to improved soil health), there would appear to be few disadvantages of adopting fall hilling.

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