

# EDIBLE BEAN HARVEST METHODS BY VARIETY

A MSPG ON-FARM NETWORK PROJECT

Brent VanKoughnet of Agri Skills Inc. was contracted to explore the effect of two different harvest methods on a number of pinto and navy bean varieties in a full field scale environment near Carman Manitoba. Varieties and harvest methods for each project are as follows:

## Pinto Bean Project

### Varieties included:

- Windbreaker – most common
- Monterrey – new upright
- LaPaz – most common upright variety

### Harvest methods included:

- Traditional undercutting and windrowing
- Straight cut using a MacDon FD70 FlexDraper

Each pinto variety and harvest method comparison was replicated five times.

### Agronomic Observations

All varieties emerged within 8–10 days with good vigour and survival rates (80–90% of the 80,000 seeds planted). Windbreaker matured and was ready for harvest 2–3 days prior to LaPaz or Monterrey. There was considerably less difference in maturity than was observed between Windbreaker and LaPaz in a similar trial conducted in 2013. When measuring plant height, it was observed that Windbreaker crunched down naturally while 15–20% of Monterrey and 10% of LaPaz tipped over due to wind. The tipped over plants dramatically increased the percentage of pods within two inches of the ground for those affected plants (Table 1).

**Table 1. Architecture of pinto beans at harvest**

Variety	Plant height fully extended (inches)	Plant height – actual (inches)	Estimated % of pods below 2 inches
Windbreaker	22–24	12	15 %
Monterrey	24–26	8–16	5–20%
LaPaz	24–26	10–16	5–15%

## HARVEST

For each variety of pinto and navy beans a 35 foot (14 rows by 30 inches) by 800 to 1250 foot strip was undercut, windrowed and picked up versus direct harvested with a flex header. Cutting took place 1–2 days before harvest with windrowing the day before harvest. The pintos and navies were harvested by a Case 7230 with a Sund pickup compared to the same combine with a 35-foot MacDon FD75-S FlexDraper header.

All three pinto varieties had between 16–17% seed moisture with few splits. Both undercut and flex header samples had very little dirt and foreign material with no significant differences to affect yield comparisons. In terms of harvestability, Windbreaker went through the combine much more easily than Monterrey or LaPaz for both cut and flex methods. Yield was higher for Windbreaker than Monterrey or LaPaz. Harvest losses due to straight cutting were negligible with Monterrey and LaPaz, and slightly higher for Windbreaker (Table 2).

**Table 2. Pinto bean yield summary**

Variety and harvest method	Average yield of five replicates (lbs/ac)	Average difference between harvest methods (lbs/ac)
Windbreaker cut	3359 <sup>a</sup>	101
Windbreaker flex	3258 <sup>b</sup>	
Monterrey cut	2904 <sup>c</sup>	-8
Monterrey flex	2912 <sup>c</sup>	
LaPaz cut	2891 <sup>c</sup>	-33
LaPaz flex	2924 <sup>c</sup>	
C.V. %	7.6	

<sup>a-c</sup> Means followed by same letters are not significantly different at 90% confidence interval

## Navy Bean Project

### Varieties included:

- T9905 – considered the standard in conventional architecture
- Cascade – new upright
- Portage – early season upright
- Lightning – upright variety (Ontario)
- Indi – upright

### Harvest methods included:

- Traditional undercutting and windrowing
- Straight cut using a MacDon FD75-S FlexDraper

Each variety and harvest method comparison was replicated four times.

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Pinto bean variety architecture

**Agronomic Observations**

All varieties emerged within 9–10 days with good vigour and survival rates (76–95% of the 110,000 seeds planted). Portage were mature 4–5 days before Cascade and Indi and 6–7 days before Lightning and T9905. Harvest took place after waiting for T9905 and Lightning to mature and a brief rain shower delay. Lightning and Cascade had 10–15% of plants tipped over due to wind while other varieties were closer to 5%. Indi was extraordinarily upright (Table 3).

**Table 3. Architecture of navy beans at harvest**

Variety	Plant height fully extended (inches)	Plant height – actual (inches)	Estimated % of pods below 2 inches
T9905	24	10–16	5–10%
Cascade	24	8–14	10–15%
Portage	20	16–18	5%
Lightning	22	14–16	10%
Indi	22	18–22	5%

**HARVEST**

Navy harvest used the same protocol as with pinto beans. Cascade and Indi did not cut as clean as other navy varieties. It is believed that the tougher stalks in combination with driving even slightly off centre with the cutter, left a number of plants that looked cut but were still anchored to the ground. Those plants did not move with the windrower or get picked up by the Sund pickup. Flex header yields for Cascade were, on average, higher than cutting and windrowing, likely for this reason. All navy varieties had between 13–15% seed moisture with few splits. Both undercut and flex header samples had very little dirt and foreign material.

**Harvest Losses and Influencing Factors**

All pinto and navy bean varieties thrived in virtually ideal growing conditions throughout the season. Strong winds and rain did push over some of the upright varieties more than expected and some did not return to upright.

**Table 4. Navy bean yield summary**

Variety and harvest method	Average yield of four replicates (lbs/ac)	Average difference between harvest methods (lbs/ac)
T9905 <i>cut</i>	2652 <sup>a</sup>	-11
T9905 <i>flex</i>	2664 <sup>a</sup>	
Cascade <i>cut</i>	1987 <sup>d</sup>	-175
Cascade <i>flex</i>	2157 <sup>c</sup>	
Portage <i>cut</i>	2495 <sup>b</sup>	20
Portage <i>flex</i>	2475 <sup>b</sup>	
Lightning <i>cut</i>	2484 <sup>b</sup>	9
Lightning <i>flex</i>	2475 <sup>b</sup>	
Indi <i>cut</i>	2473 <sup>b</sup>	-73
Indi <i>flex</i>	2545 <sup>b</sup>	
C.V. %	8.2	

<sup>a-d</sup> Means followed by same letters are not significantly different at 90% confidence interval

Maturity likely did not influence harvest for pinto varieties as harvest timing was close to ideal for all three varieties. As for navy beans, only Portage was mature significantly ahead of other varieties; however, it did not appear to shell any more than other varieties at harvest. In previous years’ experiments the difference in maturity (over mature) may have affected harvest loss potential of the early maturing varieties.

Undercutting conditions were almost ideal: light soil with not too much or too little moisture. Some varieties that are designed to be direct harvested may have tougher stocks that are more difficult to cut. It is unknown whether waiting longer would have made cutting easier; however, the trade-off of waiting longer may be increased potential to shatter. Field conditions were also ideal for the flex header – dry and level. Rolling the field likely made the most significant difference from last years results. In addition to leveling the field, rolling also minimizes the risk of picking up rocks when running the flex header knife so close to the ground.

As another measure of harvest losses, beans on the ground left behind after

**FIELD PREPARATION**

Edge was incorporated with light duty cultivation and heavy harrows May 26.

All treatments were sown into an ideal seedbed 1.5 inches deep into moisture on May 29.

Pinto varieties were sown at 75,000 plants/acre and navy varieties at 110,000 plants/acre with a Case IH vacuum planter.

Field was rolled prior to emergence and considered very level.

**OPERATIONS**

**Fertility** (lbs/ac): 50 N-40 P<sub>2</sub>O<sub>5</sub>-15 K<sub>2</sub>O-15 S-1 Z

**Herbicide:** Viper applied June 24

**Fungicide:** applied July 17 and July 29 (considering the challenge of multiple crop staging/timing and expected high disease pressures, two applications were made)

**Pre-harvest:** Glyphosate and Heat applied September 5

harvest was assessed. Although it is typical to have large variability in losses from one spot to another for each of treatments, Table 5 is a summary of losses from six representative sites for each treatment.

On the ground seed loss estimates generally reflect the yield differences measured using the weigh wagon, with the exception of Indi and Cascade. It is suspected that Cascade and Indi had more areas with higher losses in cutting that were not captured by the chosen representative sample areas. Harvest losses in those few isolated areas could be as high as 1000 lbs. This supports the need to do actual harvested weight differences to accurately measure differences – estimating harvest losses by counting beans left on the ground in random areas does not always tell the whole story.

**CONCLUSIONS**

Varieties respond differently to direct harvesting. For pinto beans, there was no statistical difference in yield using undercutting or direct harvest methods for varieties with plant architecture designed for direct harvesting; however, the reduction in harvest losses was not enough to make up for the difference in yield potential. Although there was 100 lbs of additional harvest losses

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Table 5. Ground harvest losses of pinto and navy beans

Variety and harvest method	Estimated losses (lbs/ac)			Average difference between harvest methods (lbs/ac)
	High	Low	Average	
Windbreaker <i>cut</i>	335	36	147	223
Windbreaker <i>flex</i>	454	239	370	
Monterrey <i>cut</i>	430	36	147	4
Monterrey <i>flex</i>	239	96	151	
LaPaz <i>cut</i>	329	49	144	-22
LaPaz <i>flex</i>	185	42	123	
T9905 <i>cut</i>	138	23	74	83
T9905 <i>flex</i>	277	78	157	
Cascade <i>cut</i>	259	23	80	43
Cascade <i>flex</i>	380	23	122	
Portage <i>cut</i>	426	26	161	-38
Portage <i>flex</i>	187	75	123	
Lightning <i>cut</i>	308	17	140	-5
Lightning <i>flex</i>	210	72	135	
Indi <i>cut</i>	177	14	82	9
Indi <i>flex</i>	147	38	91	

with Windbreaker when straight cutting, Windbreaker still yielded approximately 350 lbs more than the upright varieties.

Flex header harvest loss differences were significantly less than what was observed last year. In 2014, loss differences between cutting and direct harvesting were 500 lbs for Windbreaker and 200 lbs for LaPaz, compared to 100 lbs for Windbreaker and no loss for direct harvesting for LaPaz in 2015. This result can be explained for two reasons: plants were taller with more plant material to feed into the header, and likely more importantly, rolling the field allowed the flex header knife to cut virtually at ground level.

It is important to note that the MacDon FlexDraper is not the same as a standard flex header. This header allows for adjustment that can literally put the knife at ground level. You could not capture the true benefit of these equipment features without rolling the field. The canvas delivery also allows for the seeds that are threshed from the pod by harvesting to stay in the header.

In the case of navy beans, direct harvest using the flex header resulted in similar or, in the case of Cascade, unexpectedly higher yields. This can be partially explained by the cutting difficulties due to the toughness of the stocks and the occasional cutting misses on those treatments. T9905 yielded significantly higher than all other navy varieties by about 150 lbs; however, the other varieties could offer earlier maturity. ■

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**MPSG On-Farm Network**

The overall goal of MPSG's on-farm network is to test new products and practices for pulse and soybean production, while empowering farmers to conduct simple, reliable research on their farms.



Navy bean variety architecture

