

ASSESSMENT OF POD CEAL DC™ EFFECT ON GRAIN YIELD IN BEANS USING MULTI-SPECTRAL SATELLITE IMAGERY AND YIELD DATA

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ABSTRACT

Pod Ceal DC™ from BrettYoung creates an elastic membrane, which results in controlling shatter before combining. To carry out this on-farm experiment, an irrigated field was divided in two parts according to the yielding potential and topographical characteristics to ensure equal conditions in both parts of the field. Grain beans were grown in the field using conventional technology. Pod Ceal DC™ was applied three weeks before harvesting in 50% of the total field area (27 ha). The other part of the field did not receive the treatment. An NDVI map based on a Landsat 5™ image collected at the peak of the growing season was created for the whole field. During harvesting, yield data were collected for the whole field. Since the NDVI image indicated the relative amount of green biomass in the field, yield data from the part with Pod Ceal DC were used to estimate potential grain yield in both parts of the field. To calculate the effect of Pod Ceal DC on the yield of grain, the actual yield recorded by yield monitor in the area with no Pod Ceal DC treatment was subtracted from the expected yield calculated from the NDVI imagery. The difference was found to be 123.1 kg/ha⁻¹. Based on current price of grain beans and the cost of application, the average net profit was \$68.8 ha⁻¹.

Keywords: precision agriculture, Pod Ceal, beans, NDVI, yield data, satellite imagery.

INTRODUCTION

Loosing yield during combining is a typical problem for many crops, such as canola, beans etc. Pod Ceal DC™ from BrettYoung is a product applied by air or ground to canola once the majority of the pods have lost their intense green colour. At this time, although yellow, the pod is still pliable and may be bent without splitting open to release the seed. Pod Ceal DC™ creates an elastic membrane which keeps rain and dew from the pod, and lets internal moisture out. This results in controlling shatter before combining. The aim of this experiment was to assess the efficiency of Pod Ceal DC applied on beans.

MATERIALS AND METHODS

The experiment was carried out in an irrigation pivot near Rolling Hills, AB. The field was split up into two parts (NE and SW), according to the field topography and fertility characteristics to make sure that the both parts had very similar yielding potential. Pod Ceal DC was applied over the NE part of the field in the end of August, three weeks before the field was harvested. To assess the efficiency of Pod Ceal DC, an NDVI map was created for the field at the peak of the growing season. There were several images collected for the test field in 2009, and for the best accuracy, we selected the image with the shapes of NDVI contours closest to the shape of yield contours. NDVI map created from the image collected on August 22, 2009 was used for the recreation of a map of potential yield.

The field was harvested on September 16, 2009, and yield data were recorded. The average yield from the NE part, where the Pod Ceal DC was applied, was used to calibrate the image, i.e. to relate the information about the yield to NDVI values, and recreate the yield map.

At the next step, the re-created yield map based on the satellite imagery and NDVI map were compared with the actual yield map for both variants of the experiment. Yield loss, bu/acre, lbs/acre, and \$/acre were calculated for the SW part of the field, where no Pod Ceal DC was applied.

RESULTS AND DISCUSSION

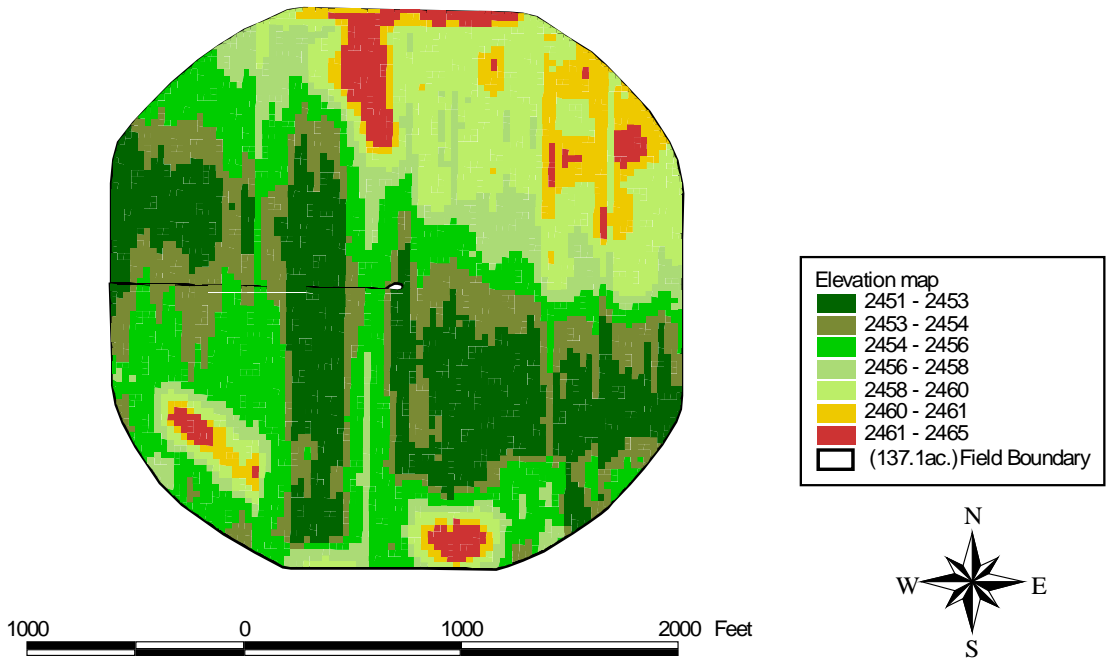
Visual analysis indicated that the average yield in the NE part, where the pod seal was applied, was higher than in the SW part with no Pod Ceal DC (Fig. 1). Quantitative analysis of the actual yield data showed that the average yield in the part with the Pod Ceal DC applied was 49.1 bu/acre, whereas in the other part it was only 45.7 bu/acre. Expected yield for the SW part was calculated to be 47.54 bu/acre, i.e. the difference was 1.84 bu/acre.

Traditionally, yield in beans is measured in pounds with the conversion factor from bushels of 60. Therefore, the average yield loss in the part with no pod seal applied was 110.24 lbs. Using the average cost of beans to be \$ 0.35 per lb, the average loss per acre was \$ 38.58. The results of calculations are shown in the table.

Table. Influence of pod seal on yield of beans, 2009.

Characteristic	Pod Ceal	No Pod Ceal	Whole field, average
NDVI	0.597	0.578	0.587
Yield expected, bu/acre	49.10	47.54	48.3
Yield average, bu/acre	49.10	45.70	47.46
Yield loss, bu/acre	0	1.84	
Yield loss, lbs/acre	0	110.24	
Loss, \$ / acre	0	38.58	
Net profit, \$ / acre	28.58	0	
Net profit, \$ / hectare	68.8	0	

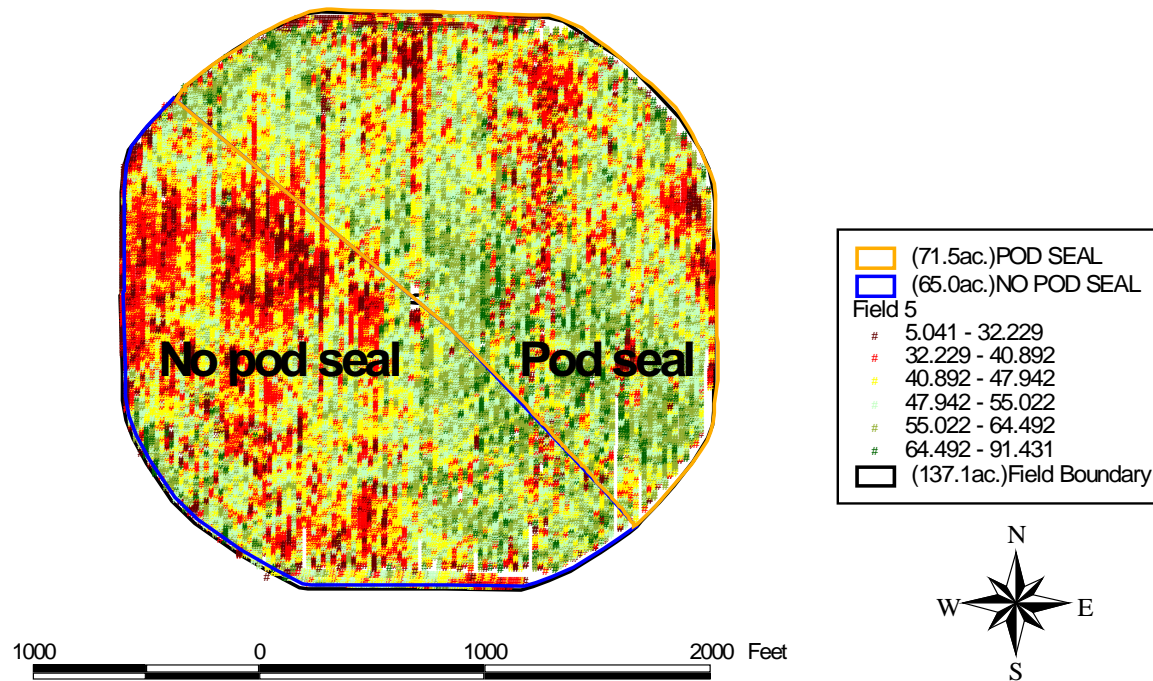
SW 29 14 13 W4; 10 (137.12 ac.)



1

2 Fig. 1. Elevation Map

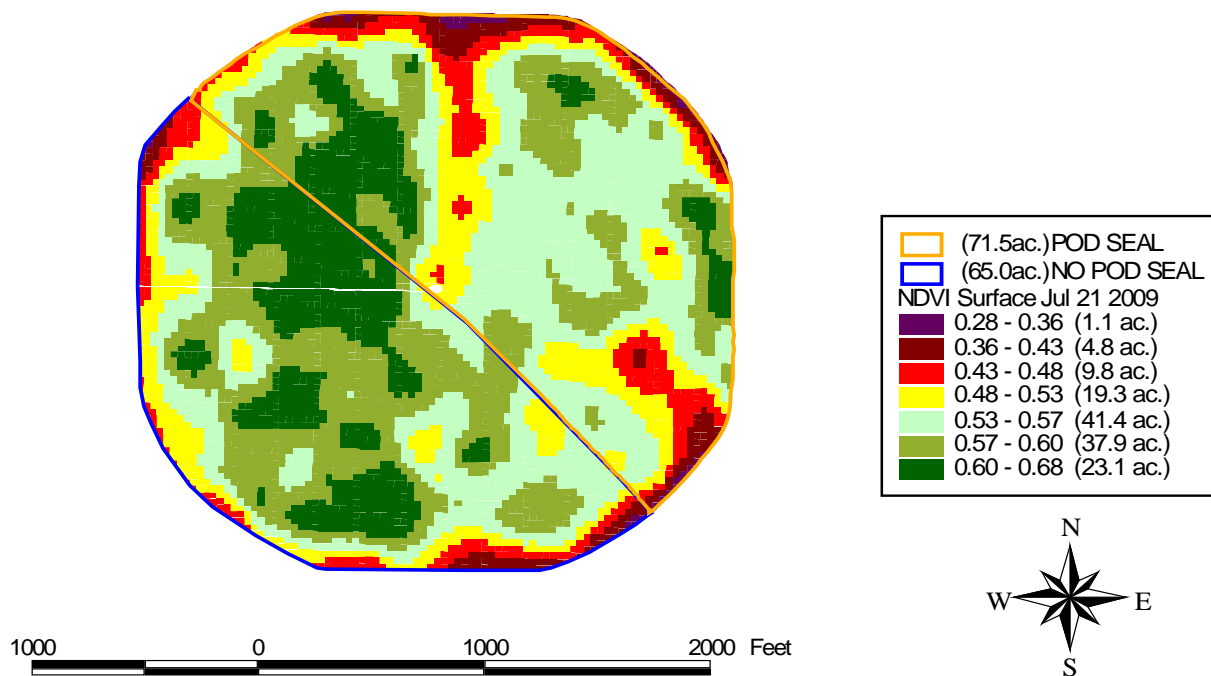
SW 29 14 13 W4; 10 (137.12 ac.)



3

4 Fig. 2. Yield map of the field.

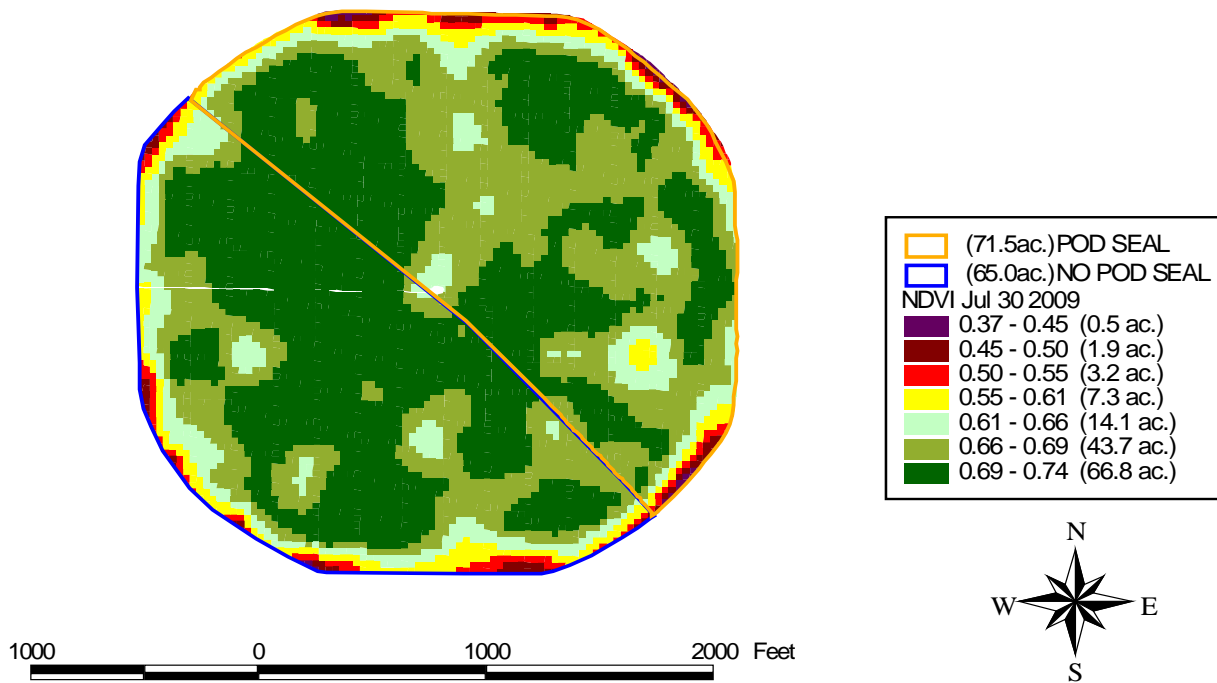
SW 29 14 13 W4; 10 (137.12 ac.)



5

6 Fig. 3. NDVI, Jul 21, 2009

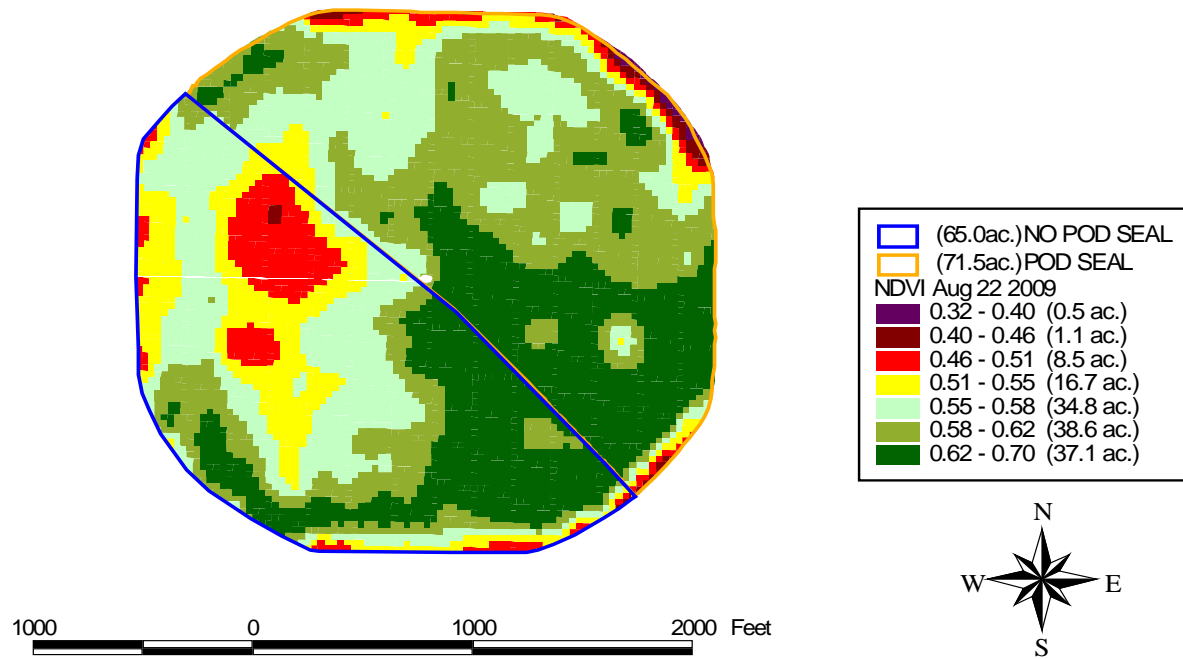
SW 29 14 13 W4; 10 (137.12 ac.)



7

8 Fig. 4. NDVI, Jul 30, 2009

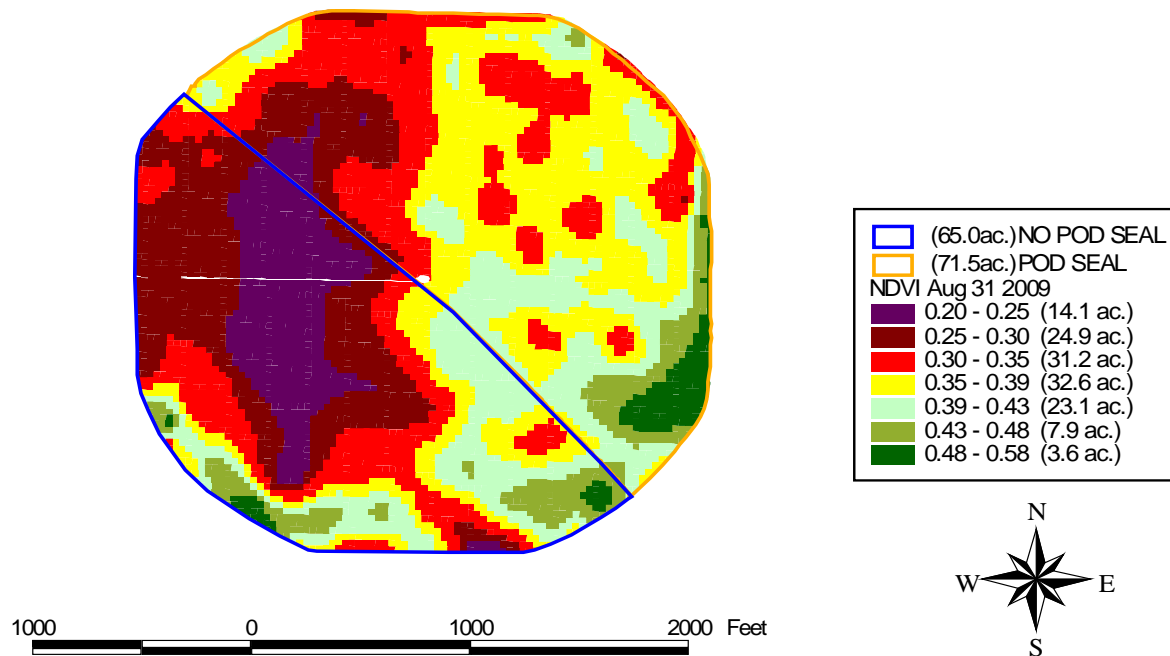
SW 29 14 13 W4; 10 (137.12 ac.)



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10 Fig. 5. NDVI, Aug 22, 2009

SW 29 14 13 W4; 10 (137.12 ac.)



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12 Fig. 6. NDVI, Aug 31, 2009

CONCLUSION

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15 Provided that the average cost of Pod Ceal DC application for the grower in
16 this particular case was \$10 per acre, the average profit related to this product was
17 \$28.58 per acre.