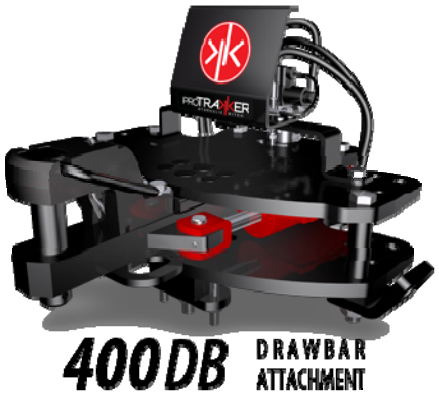
Entry Point Precision Agriculture Technology: Benefits and Costs for Decision Making

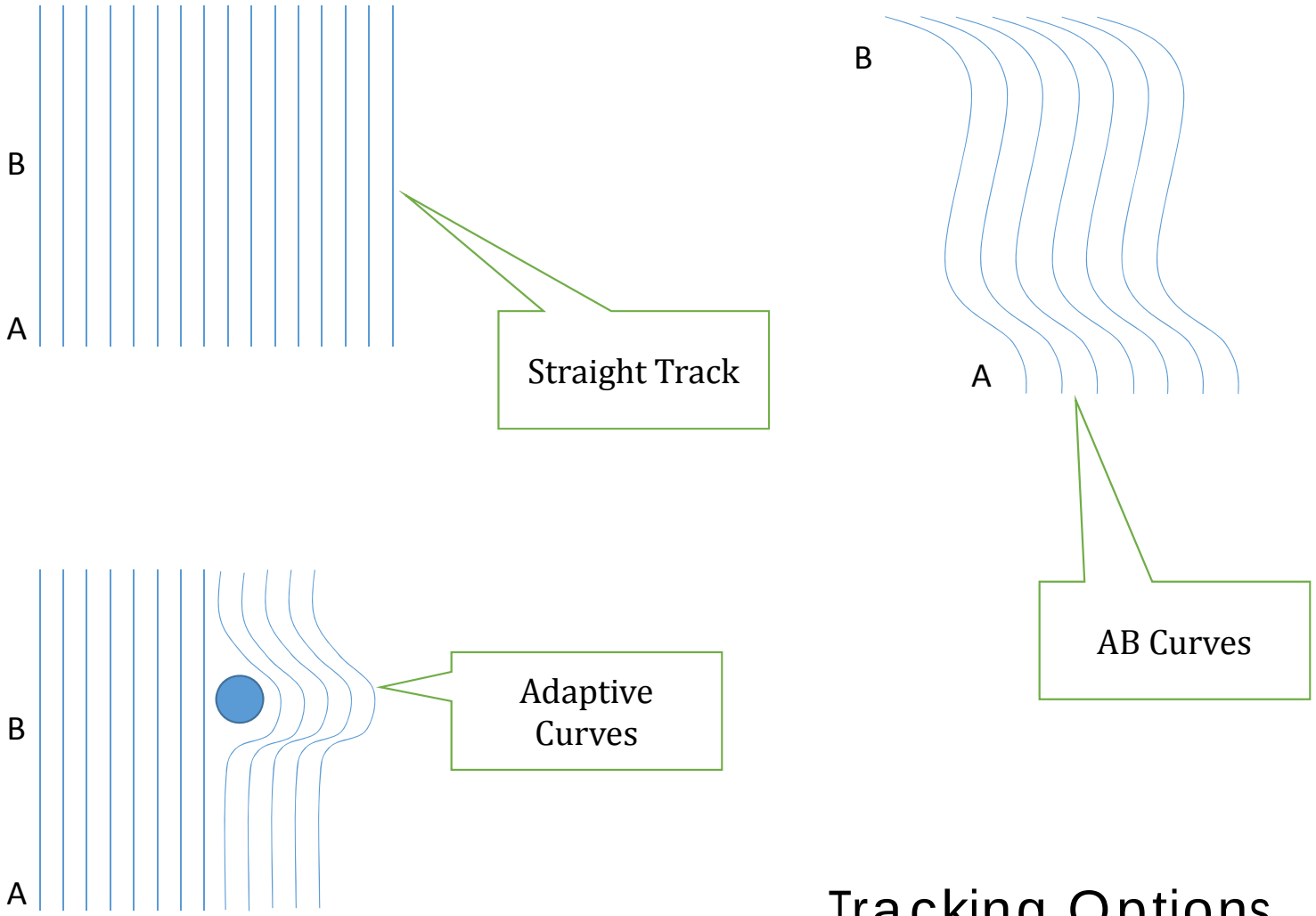
Erick Haas, and John Hanchar
Cazenovia Equipment Company, and Cornell University, respectively
Precision Agriculture – Decision Making for a Profitable Future
February 25, 2016
2016 NY FARM Show, Syracuse, NY

Considerations for Auto Steer

- Versatility
- Easy of use
- Do your homework
- Integration

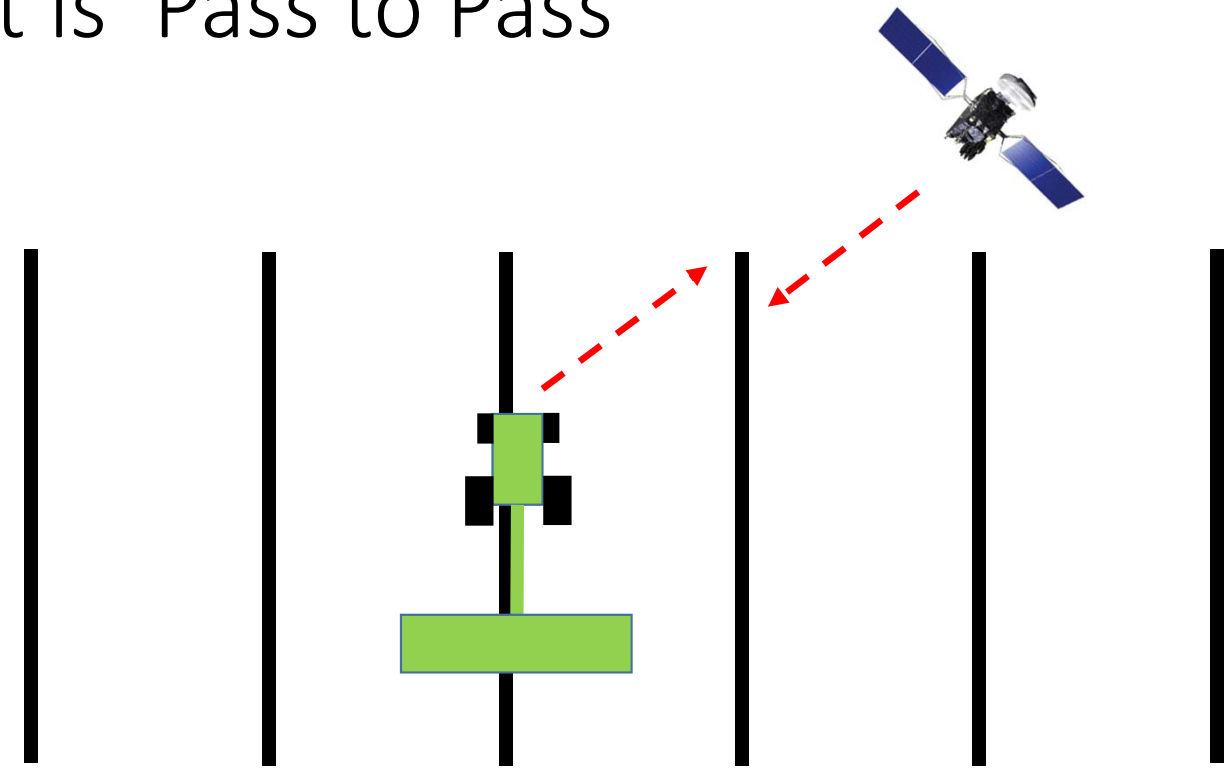
Active Implement Guidance



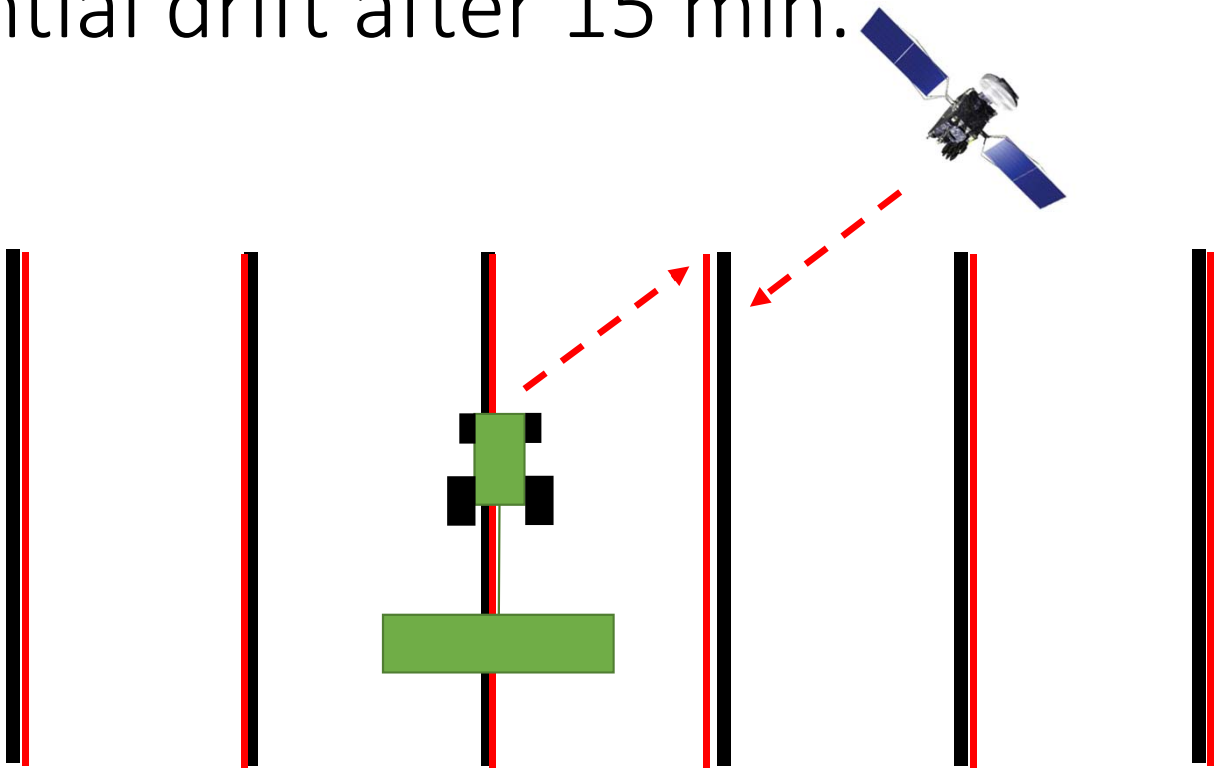


Tracking Options

What is ‘Pass to Pass’



Potential drift after 15 min.



Which correction signal is for me?

Lower

- Not following with second machine
  - Mowing
  - Baling
  - Harvest
  - Tillage
  - *Planting/seeding*
  - Manure/fertilizer

Higher

- Accuracy is critical
  - Post emergent spraying
  - Planting/seeding
    - Section Control
  - Variable rate

Economic Analysis of Auto Steer

- What expected changes in profit can be attributed to auto steer when compared to traditional steer by sight?
- What expected net present values and rates of return can be attributed to auto steer when compared to traditional steer by sight?
- How sensitive are results to changes in key variables – expected acres affected, before and after overlap, etc.?
- What factors, considerations omitted from the analysis need mention?

Expected Change in Profit, Auto Steer, an Example of Partial Budgeting

- Screen shots of MS Office Excel Workbook, partial budget analysis follow

Partial Budget, Expected Change in Profit Attributed to the Proposed Change in the Farm Business

Proposed: Corn production using auto steer equipped tractors vs. **Current: Corn production using traditional steer by sight**

Selected Assumptions

1) Average future year, before tax, marginal analysis measuring the expected change in profit

2) 2015 price levels

3) acres affected: 500 corn

4) herbicide application by custom operator

5) no effects on harvest operations

6) overlap current, 5 to 13 pct.: 10

7) overlap proposed, %: 0

8) tasks, operations affected: a) spring chisel plow; b) spring field cultivator; c) corn planting; d) fall residue management, chisel plow

9) initially no cover crop planted

10) machinery complement size, performance, costs per Lazarus, 2015

11) expected change in total value of production: 0

12) initial, additional capital investment required for auto steer equipment: 12,000 dollars

Items that Increase Profit (A)		
		Dollars
Increased Value of Production		
		0
	Total	0
Decreased Costs		
Labor		
spring chisel plow pass		77
spring field cultivator pass		77
corn planting		143
fall residue management pass		77
Machinery repairs & maintenance		
spring chisel plow pass		69
spring field cultivator pass		43
corn planting		73
fall residue management pass		69
Fuel & lube		
spring chisel plow pass		93
spring field cultivator pass		49
corn planting		52
fall residue management pass		93
Fertilizer & lime		
Seeds & plants		
corn seed		5500
Sprays & other crop expenses		
	Total	6,414
	Total (A)	$6,414

Items that Decrease Profit (B)		
		Dollars
Decreased Value of Production		
	Total	0
Increased Costs		
Fixed, ownership costs		
Auto steer equipment, DIRTI Five:		
depreciation, interest, repairs, taxes, insurance		1748
	Total	1,748
	Total (B)	$1,748
	Expected Change in Profit (A minus B)	$4,666

Table 1. Expected Change in Profit by Expected Acres of Corn by Overlap Without Auto Steer

	Overlap Without Auto Steer (%)		
Expected Acres of Corn Affected	5	10	13
	--- Annual change in profit (dollars) ---		
250	-145	1,459	2,421
500	1,459	4,666	6,590

Notes: 1) Expected change in value of production = $0; 2) expected initial capital cost = $12,000; 3) expected overlap with auto steer = 0%

Table 2. Net Present Value by Expected Acres of Corn by Overlap Without Auto Steer

	Overlap Without Auto Steer (%)		
Expected Acres of Corn Affected	5	10	13
	--- Net Present Value (today's dollars) ---		
250	-1,496	11,513	19,316
500	11,513	37,525	53,130

Notes: 1) Expected change in value of production = $0; 2) expected initial capital cost = $12,000; 3) expected overlap with auto steer = 0%; 4) 10 year planning horizon; 5) discount rate in real terms = 4%; 6) if NPV > or = 0, then investment is attractive, appealing.

Table 3. Internal Rate of Return by Expected Acres of Corn by Overlap Without Auto Steer

	Overlap Without Auto Steer (%)		
Expected Acres of Corn Affected	5	10	13
	--- Internal Rate of Return (IRR) (%) ---		
250	1.4	20.4	29.8
500	20.4	50.0	66.5

Notes: 1) Expected change in value of production = $0; 2) expected initial capital cost = $12,000; 3) expected overlap with auto steer = 0%; 4) 10 year planning horizon; 5) IRR is the discount rate (%) that generates a NPV > or = 0 ; 6) if IRR for the investment is > or = the discount rate in real terms used by the business for capital investment decisions, then investment is attractive, appealing.

Summary

- Expected changes in profit attributed to auto steer exceed 0 over a range of expected values for key factors
  - overlap without and with auto steer, acres affected, and others
- Net present value analysis yields similar favorable results
- Some benefits to the operator difficult to quantify, but valuable -- reduced stress, reduced fatigue
- Producers encouraged to take advantage of analysis provided by equipment professionals, advisors etc. when making decisions
  - auto steer analysis
  - expected changes in profit per acre attributed to Adapt N recommendations, van Es and others

Questions?

- Please Contact

John Hanchar
Cornell University
jjh6@cornell.edu
(585) 233-9249