BENEFITS AND COSTS OF ENTRY LEVEL PRECISION AGRICULTURE TECHNOLOGIES

2017 OPERATION MANAGERS CONFERENCE

Erick Haas
Integrated Solutions Specialist
Cazenovia Equipment Company
ehaas@cazequip.com

John Hanchar
Northwest NY Dairy, Livestock & Field Crops Team
Cornell University
jjh6@cornell.edu

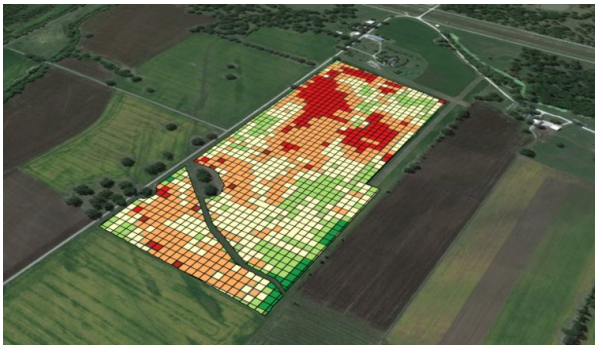
TODAY'S AGENDA

- Benefits of Precision Agriculture for your Operation
- Features of Auto Steer & Section Control
- Financial Impacts
- Questions/Discussion

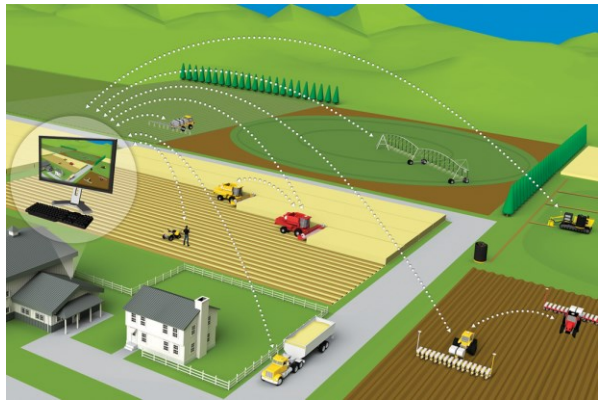
GOALS OF TECHNOLOGY

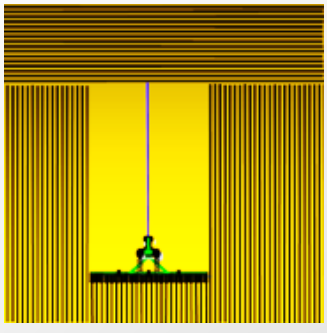
- Technology allows a new level of efficiency, without which would be unachievable
- Minimizing our inputs, wastes
- Maximizing our yields, information
- **Precision Ag is Decision Ag**

VARIABLE RATE



WIRELESS
TELEMATICS





AUTO STEER

YEAR ROUND APPLICATIONS






INITIAL BENEFITS

- Overlap control
  - Immediate cost savings
- Yield accuracy
  - Accurate vs inaccurate data
- Machine wear
- Labor saver
  - Less qualified operators
  - Let the machine do the thinking
- Transferable

REQUIRED HARDWARE

- Display Interface
  - Add-On
  - Integrated
- GPS Receiver
  - Location, direction, height, heading
  - Activations/subscriptions
- Mechanical steering
  - Add-On
  - Integrated
- Activation(s)
  - Auto-Steer Activation

TILLAGE

- Overlap reduction
  - Time
  - Fuel
  - Wear
- Consistency across field
- Operator fatigue

PLANTING/SEEDING

- Eliminate your guess rows
- Operator fatigue*
- Focus on planter functions
- Ease at harvest

CROP CARE

- Protect emerged crops
- Ease operator strain
- Reducing overlap

METHODS

- Guidance Lines
  - Match up with planting lines
  - Level of guidance key
- Sensors
  - Mechanical sensors
  - Optical sensors

MOWING

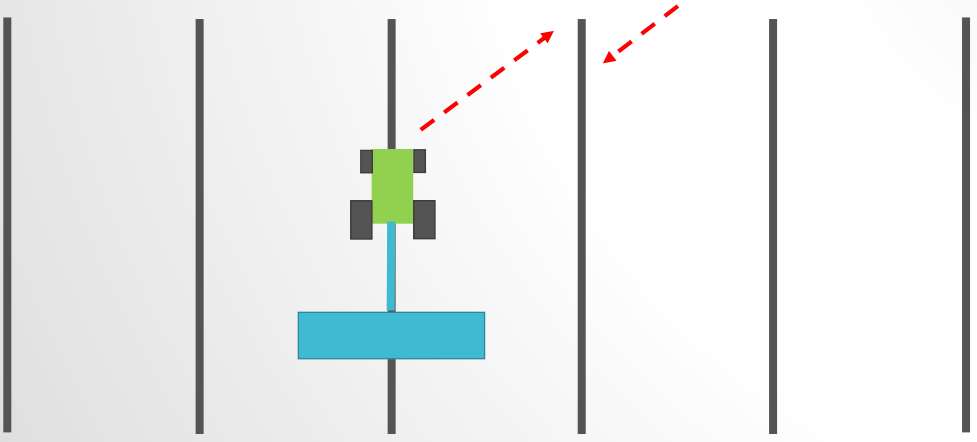
- Overlap control
- Operator fatigue
- Focus on your task
- Efficiency

HARVEST: *COMBINES & SPFH*

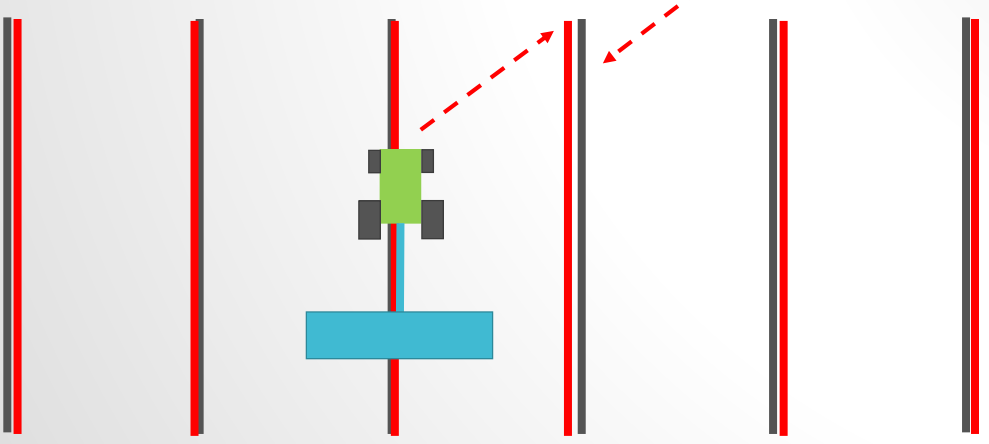
- Manual Row Guidance
- Automatic Row Guidance
- Integrated Technology
- Add-on
- Yield monitor accuracy

Application	<1"	<1.5	~2"	6"-9"
Spraying/Spreading	•	•	•	•
Tillage				•
Mapping			•	•
Mowing			•	•
Harvest			•	•
Seeding	•	•	•	
Strip Tilling	•	•	•	
Section Control	•	•	•	
In-Row Guidance	•	•	•	

WHAT IS 'PASS TO PASS'

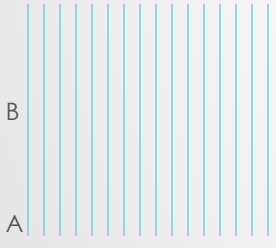


POTENTIAL DRIFT AFTER 15 MIN

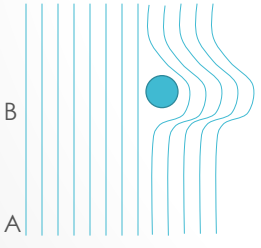


COMPATIBILITY/INTEGRATION

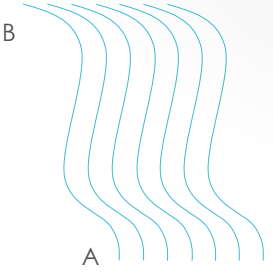
GUIDANCE LINE OPTIONS



Straight Tracking



Adaptive Tracking



Curve Tracking

IMPLEMENT GUIDANCE

Passive

Active

IMPLEMENT GUIDANCE COMPANIES

SUNCO™ Farm Equipment
Turning Design into Quality Products

JOHN DEERE

ORTHMAN

PROTRAKKER GUIDANCE SYSTEMS

Trimble

WHO OFFERS WHAT?

CASE IH/AFS

- EGNOS
  - 8" (SAT)
- RTX Range Point*
  - 6" (SAT)
- RTX Center Point*
  - 1.5 (SAT)
- RTK
  - 1"

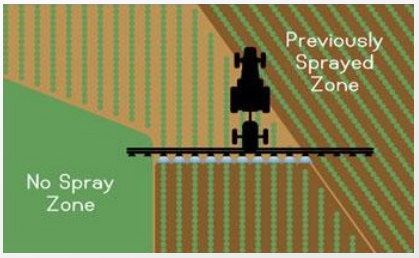
JOHN DEERE

- SF1
  - 9" (SAT)
- SF2*
  - 2" (SAT)
- SF3*
  - 1.2" (SAT)
- RTK/Mobile RTK*
  - <1"

WHO OFFERS WHAT?

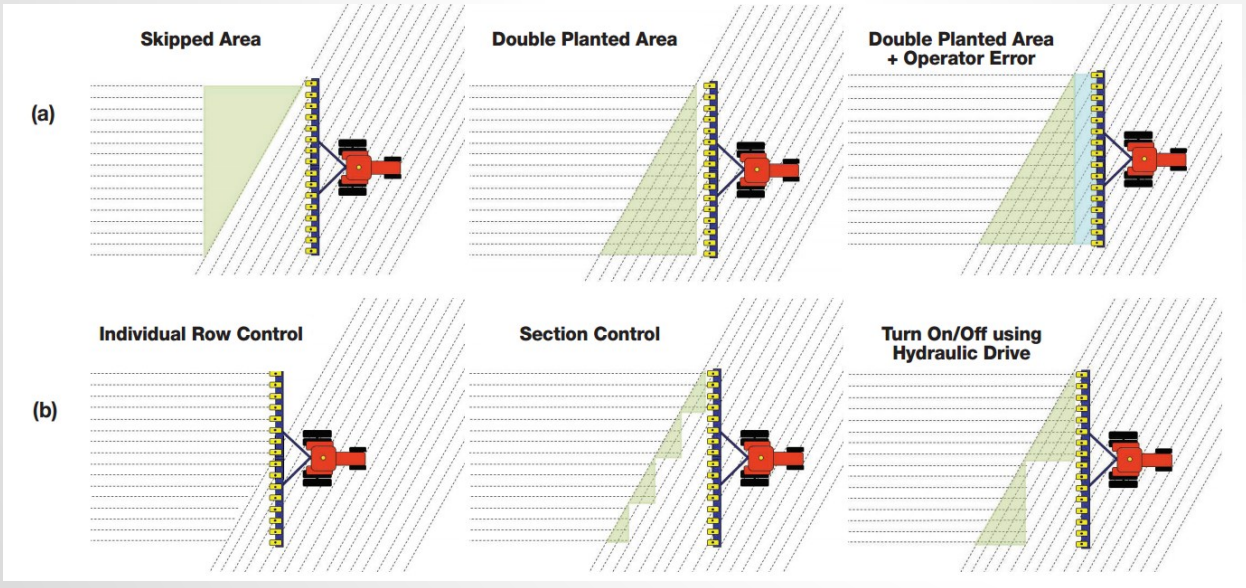
TRIMBLE/NEW HOLLAND

- OmniSTAR VBS
  - <39"
- RangePoint RTX*
  - <6"
- OminSTAR G2/XP*
  - 3"-4"
- CenterPoint RTX*
  - <1.5"



SECTION CONTROL

- Seeders
  - Corn Planters
  - Drills
- Sprayers
  - Dry & Liquid



SINGLE PASS

DOUBLE-PLANTED
30˚

AVAILABLE ON VARIETY MODELS

- You don't need a 2017 planter with all the bells & whistles to take advantage of section control
- Many planters have retrofit kits allowing you to upgrade your current planter w/o having to purchase an entirely new machine.

HARDWARE/SOFTWARE REQUIREMENTS

- Display interface
- GPS Receiver
- Section Control Activation *(software)*
- Machine Hardware
  - Clutches
  - Harnesses
  - Controller

IS THIS FOR ME?

Start measuring & do some simple math!

- Overlap for each practice
  - Tillage
  - Application
  - Seeding
  - Harvest
- Time spent
- Operator Fatigue
- Contact your dealer to demo this technology!

THINK DOWN THE ROAD

COMPATIBILITY!

SUPPORT IS KEY!

ECONOMIC ANALYSIS OF AUTO STEER AND AUTO SECTION CONTROL

- What changes in profit can be expected?
- What net present values and rates of return can be expected?
- How sensitive are results to changes in key variables?
  - expected acres affected
  - before and after overlap
  - percent double planted acres
- 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 manual steering**

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

EXPECTED CHANGE IN PROFIT ATTRIBUTED TO AUTO STEER BY ACRES OF CORN BY OVERLAP WITHOUT AUTO STEER

	Overlap Without Auto Steer (%)		
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) initial capital cost = $12,000, expected useful life = 10 years; 3) expected overlap with auto steer = 0%

NET PRESENT VALUE (NPV), AUTO STEER, BY ACRES OF CORN BY OVERLAP WITHOUT AUTO STEER

	Overlap Without Auto Steer (%)		
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) 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.

INTERNAL RATE OF RETURN (IRR), AUTO STEER, BY ACRES OF CORN BY OVERLAP WITHOUT AUTO STEER

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

Notes: 1) Expected change in value of production = $0; 2) 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 = 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.

EXPECTED CHANGE IN PROFIT ATTRIBUTED TO AUTO SECTION CONTROL (ASC) BY ACRES OF CORN BY DOUBLE PLANTED ACRES DISTRIBUTION WITHOUT ASC

	Double Planted Acres Distribution without ASC		
Acres of Corn Affected	% of Fields, Low, Moderate, High: 15, 50, 35	% of Fields, Low, Moderate, High: 20, 50, 30	% of Fields, Low, Moderate, High: 25, 50, 25
	--- Annual change in profit (dollars) ---		
250	-871	-946	-1,021
500	855	677	499
1,000	3,845	3,489	3,133

Notes: 1) Expected change in value of production = $0; 2) initial capital cost = $15,000, expected useful life = 10 years; 3) expected double planted acres with ASC = 0; 4) A field is classified as Low when less than 2 percent of the field is double planted, Moderate when the double planted area is at least 2 percent but not more than 5 percent, High when more than 5 percent of a field is double planted.

NET PRESENT VALUE (NPV), AUTO SECTION CONTROL (ASC), BY ACRES OF CORN BY DOUBLE PLANTED ACRES DISTRIBUTION WITHOUT ASC

	Double Planted Acres Distribution without ASC		
Acres of Corn Affected	% of Fields, Low, Moderate, High: 15, 50, 35	% of Fields, Low, Moderate, High: 20, 50, 30	% of Fields, Low, Moderate, High: 25, 50, 25
	--- Net Present Value (today's dollars) ---		
250	-7,465	-8,073	-8,682
500	6,534	5,091	3,647
1,000	30,786	27,899	25,011

Notes: 1) Expected change in value of production = $0; 2) initial capital cost = $15,000; 3) expected double planted area with ASC = 0; 4) 10 year planning horizon; 5) A field is classified as Low when less than 2 percent of the field is double planted, Moderate when the double planted area is at least 2 percent but not more than 5 percent, High when more than 5 percent of a field is double planted; 6) discount rate in real terms = 4%; 7) if NPV > or = 0, then investment is attractive, appealing.

INTERNAL RATE OF RETURN (IRR), AUTO SECTION CONTROL (ASC) BY ACRES OF CORN BY DOUBLE PLANTED ACRES DISTRIBUTION WITHOUT ASC

	Double Planted Acres Distribution without ASC		
Acres of Corn Affected	% of Fields, Low, Med, High: 15, 50, 35	% of Fields, Low, Med, High: 20, 50, 30	% of Fields, Low, Med, High: 25, 50, 25
	--- Internal Rate of Return (%) ---		
250	-7.9	-9.1	-10.4
500	12.0	10.3	8.6
1,000	35.9	33.3	30.6

Notes: 1) Expected change in value of production = $0; 2) initial capital cost = $15,000; 3) expected double planted area with ASC = 0; 4) 10 year planning horizon; 5) A field is classified as Low when less than 2 percent of the field is double planted, Moderate when the double planted area is at least 2 percent but not more than 5 percent, High when more than 5 percent of a field is double planted; 6) IRR is the discount rate (%) that generates a NPV = 0 ; 7) 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 entry level precision agriculture technologies exceed 0 over a range of expected values for key factors
  - overlap without and with auto steer
  - acres affected
  - percent double planted without auto section control
- 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

QUESTIONS

Erick Haas
Integrated Solutions Specialist
Cazenovia Equipment Company
ehaas@cazequip.com

John Hanchar
Northwest NY Dairy, Livestock & Field Crops Team
Cornell University
jjh6@cornell.edu