Precision Agriculture

M&A, Investment, and Start-ups on the Rise

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In this Issue

Precision Agriculture

M&A, Investments, and Start-ups on the Rise

By Eric Oganesoff, Managing Director, and Reid Howard, Investment Banking Research Intern,
FOCUS Investment Banking, LLC

As farmers are increasingly under pressure to squeeze out profits and comply with burdensome regulations, they search relentlessly for operational efficiencies. To satisfy this escalating demand, established agriculture and technology companies and a host of startups are bringing innovative products and services to the agriculture arena, focused on helping farmers close that gap. This emerging industry is called precision agriculture.

Precision Agriculture

Precision agriculture is thought by many to be the biggest technological change in agriculture since the introduction of hydraulics in the 1940's. Precision agriculture technologies provide the information and systems that allow a farmer to optimize and customize the timing, amount, and placement of inputs (seed, fertilizer, pesticides, irrigation, etc.) for any given section of a field. This allows the farmer to produce the maximum yield from the entire field at the lowest possible cost.

The use of very accurate GPS based equipment can eliminate overruns and reduce wasted seed and fertilizer.

The backbone technology used in precision agriculture is GPS-enhanced guidance and mapping capabilities. GPS location information is often augmented by correctional technologies (Wide Area Augmentation System (WAAS) or Real Time Kinematic technology (RTK), for example); to provide steering and application capabilities down to centimeter precision.

With this extraordinary accuracy, the farmer can avoid overlaps and missed sections, and apply inputs (seed and fertilizer) where they are needed. There are three primary emerging trends driving the increase in growth forecasts, investments, M&A activity, and participants in the precision agriculture market:

Accelerating use of auto steering and variable rate controls for inputs. Guidance and auto steering have provided farmers with significant benefits by reducing costly application overlaps by field equipment. There also is an increasing use of variable rate application equipment that allows farmers to customize inputs to each section of a field based on soil type and historical yield, minimizing costs and increasing profitability by section.

For example, a farmer might have a section of a field where the yield has been lower than average and the soil type is not optimal. The farmer can program the variable rate equipment to change the amount of seed and fertilizer to be applied to that section to lower the overall costs and improve productivity.

Advanced sensors and Big Data. Weather and soil data can be coupled with real time plant health data from aerial imagery (satellites and the emergence of drones) and on-the-ground sensors for in-depth analysis. This analysis supports real time predictive decision-making to drive lower costs and improved yields. Real time sensors, mounted on fertilizer application equipment, allow farmers to vary the application of fertilizer as the equipment passes over the crops.

Return on investment realization. Increased functionality and expanded offerings of precision agriculture devices, integrated software, analytics, and cloud services

have improved potential ROI's to farmers. Anecdotal success stories are spreading through the agriculture market.

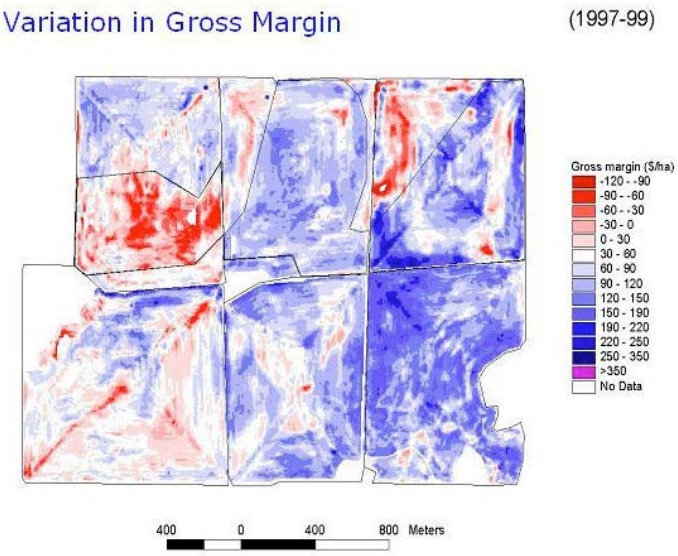
This growing awareness, coupled with the demographic shift to younger, technologically-savvy farmers, has many pundits predicting a dramatic increase in the rate of growth of precision agriculture.

Current estimates show the size of the precision agriculture market in the U.S. is between $1.5 and $2.0 billion[1]. It is estimated to grow in the U.S. over the next 5 years at a 13% percent growth rate to reach $3.0 to $3.5 billion[1]. Outside the U.S., including developing countries where the need to improve productivity is even greater, the growth rate is expected to be over 25 percent per year[1].

There are a growing number of companies offering precision agriculture products and services. They are coming from all parts of the marketplace and range from large public companies—i.e., Monsanto (biotech, seeds, chemicals), John Deere (equipment), etc.—that provide a suite of products and are moving into software and data analysis, to small privately owned or venture backed companies who provide specialty farm management software, cloud services, sensors, data analytics, and even drone imaging services.

Many of these smaller companies will be bought as they gain momentum and provide unique products and services that larger companies can leverage into their current customer base or provide entry into a new line of business or customer base. The entire industry is realizing that a key value driver in the development of precision agriculture is data—collecting it, analyzing it, and using it.

[1] AgWired. (2013). *Projected Growth in Precision Ag Market*. Available: http://agwired.com/2013/09/13/projected-growth-in-precision-ag-market/. (accessed 5th Nov 2013)



With the input and yield data from each section of a field, farmers can determine the profitability for each specific section.

ROI and Payback

The benefits of implementing precision agriculture technology come from lowering costs for seed, fertilizer, fuel, and labor and increasing the yield (bushels per acre) from a field. Often, payback periods can be one to five years depending on what technology the farmer uses. Additionally, less driver fatigue and allowing the farmer more time to address other management tasks are also cited as benefits. There is an adoption and learning path that is important to follow in order to maximize the level of return.

For example, Brian Watkins, a farmer in Kenton, Ohio who grows corn and soybeans on his 7,000 acre farm, estimated a whopping 145% return on his investment. He invested in auto steer and GPS guidance equipment that reduced overlap and missed sections and variable rate application equipment so his inputs were matched precisely to his particular fields.

Market Participants—Public Companies

The public companies providing products and services in the precision agriculture industry are shown in Figure 1 along with their specific precision agriculture offerings.

They are categorized as "pure-play" agriculture or "diversified" (i.e. they serve multiple markets beyond agriculture). It is interesting to note that the three-year stock performance of the entire group is on par with the performance of the S&P 500 (Figure 2).

However, when comparing the diversified companies with the pure play companies, the diversified companies have performed much better over the same time period (Figures 3 and 4).

Figure 1: Precision Agriculture Public Market Participants ($ millions)

Company	Agriculture only or Diversified	Symbol	Precision Ag Products	Total Ent. Value (TEV)	TTM Rev.	TTM EBITDA	TEV/ Rev.	TEV/ EBITDA	TTM Date
AGCO Corp.	Agriculture	NYSE: AGCO	Challenger, Fendt, Massey Ferguson, & Valtra Series—Product lines of tractors, harvesters, tillage, and application equipment	$6,299	$10,631	$1,102	0.6	5.7	9/30/13
AgJunction Inc. (1)	Agriculture	TSX: AJX	Outback Guidance, Satloc, AJ Cloud Services	$65	$55	$9	1.2	7.2	9/30/13
Agrium Inc.	Agriculture	NYSE: AGU	Variety of seeds, herbicides, fungicides, insecticides, and seed care chemical solutions	$16,357	$16,620	$2,425	1.0	6.7	9/30/13
Buhler Industries Inc. (2)	Agriculture	TSX: BUI	Versatile & Farm King—Tractors and other agricultural machinery	$183	$340	$31	0.5	5.9	6/30/13
Deere & Company	Agriculture	NYSE: DE	Comprehensive tractors, harvesters, and sprayers with section control and variable rate application. Displays (Greenstar), guidance control solutions, and software solutions (APEX Farm Management)	$62,701	$37,795	$6,624	1.7	9.5	7/31/13
Dupont Inc.	Diversified	NYSE: DD	Pioneer—Development of an agronomy software solution to assist in field management	$65,288	$35,547	$5,580	1.8	11.7	9/30/13
Exel Industries Société Anonyme (3)	Agriculture	ENXTPA: EXE	Specialty sprayers and tractors. Leader in niche markets like high clearance tractors	$488	$795	$57	0.6	8.6	6/25/13
Lindsay Corporation	Agriculture	NYSE: LNN	Zimmatic Irrigation Line—Variable Rate Irrigation system with software for remote irrigation mgmt	$839	$691	$120	1.2	7.0	8/31/13
Monsanto Company	Agriculture	NYSE: MON	FieldScripts Software—Variable Rate Planting Prescription Software	$58,371	$14,861	$4,186	3.9	13.9	8/31/13
MTS Systems Corp.	Diversified	Nasdaq: MTSC	Specialized GPS guidance sensors and hardware for Precision Agriculture	$1,028	$569	$93	1.8	11.1	6/29/13
Raven Industries Inc.	Diversified	Nasdaq: RAVN	Viper4, Viper Pro, Envizio Pro Series, & Raven VT—Field Computers, CruzerII Series, SmartTrax Series & Phoenix GPS—Autosteer hardwares & application, boom, planter/ seeder, & harvest control hardwares	$1,358	$392	$81	3.5	16.8	7/31/13
Topcon Corporation (4)	Diversified	OTC: TOPCF	Guidance systems, application control systems, field data collectors, GPS receivers, and field management software	$2,025	$1,028	$131	2.0	15.5	9/30/13
Trimble Navigation Ltd.	Diversified	Nasdaq: TRMB	GreenSeeker—Crop health assessment sensor, Connected Farm—Field Management software solution & data management, application control, yield monitoring, and water control systems	$8,966	$2,204	$423	4.1	21.2	9/27/13
Yara International ASA	Diversified	OTC: YAR	ZIM Series—Water sensor technologies for precision irrigation systems	$12,576	$14,074	$2,194	0.9	5.7	9/30/13
			High	$65,288	$37,795	$6,624	4.1	21.2	
			Low	$65	$55	$9	0.5	5.7	
			Average	$16,896	$9,686	$1,647	1.8	10.5	
			Median	$4,162	$1,616	$277	1.4	9.0	

Source: Capital IQ (except as noted)

(1) EBITDA value includes TTM cost of restructuring of ~$6mm, in addition to the Capital IQ EBITDA value
(2) Calculated EBITDA based on previous for quarterly reports
(3, 4) EBITDA from Yahoo Finance

Figure 2: Public Companies with Precision Agriculture Offerings vs. S&P 500 Index

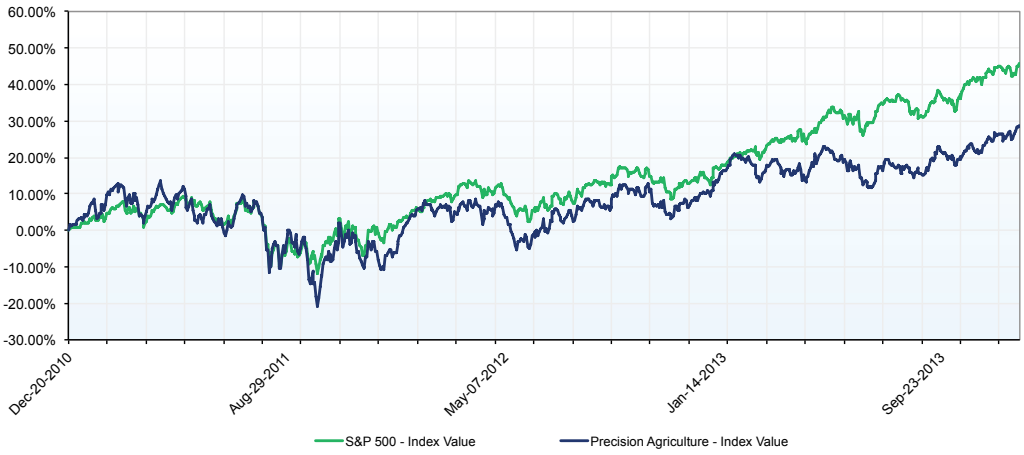
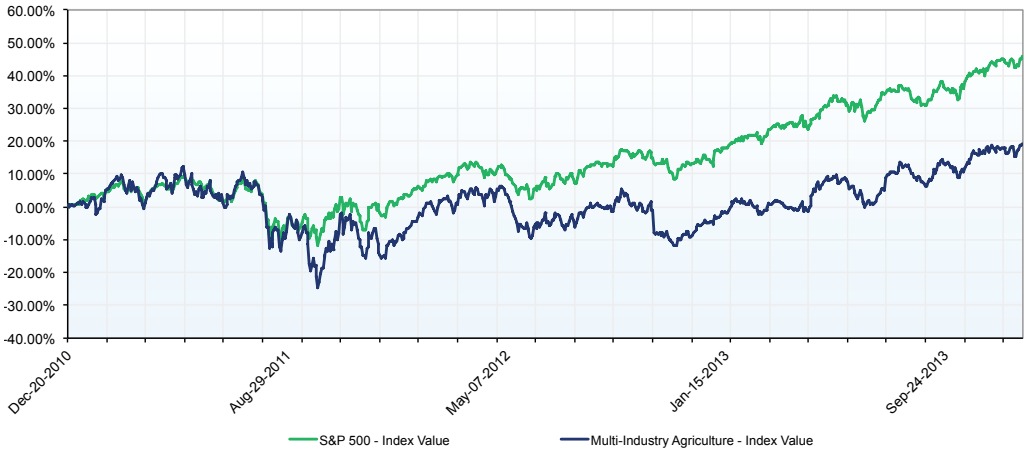


Figure 3: Diversified Agriculture Companies vs. S&P 500 Index



Diversified Company List: Dupont Inc.; MTS Systems Corp.; Raven Industries Inc.; Topcon Corporation; Trimble Navigation Ltd.; and Yara International ASA.

Figure 4: Pure Play Agriculture Companies vs. S&P 500 Index

Pure Play Company List: AGCO Corp.; AgJunction Inc.; Agrium Inc.; Buhler Industries Inc.; Deere & Co.; Exel Industries Société Anonyme; Lindsay Corp.; and Monsanto Co.

M&A and Investment Activity

The increasing buzz in the market regarding the opportunities in Precision Agriculture has spurred M&A activity and investment. Much of the activity has focused on software, data analytics, advanced sensors, and sensor platforms (e.g. drones).

Based on discussions with numerous participants in the market, acquisitions and investments are expected to increase as current participants' position themselves for future growth by offering a broader set of complimentary products and new companies bring new innovative solutions to market.

Recent M&A and investment activity focused on precision agriculture is shown in Figures 5 and 6.

Figure 5: M&A Activity within the Precision Agriculture Market

Acquirer	Target	Target Description	Date Announced	Transaction Price
Land O'Lakes	Geosys	Imagery processing technologies and softwares	12/4/13	N/A
Yara International ASA	ZIM Plant Technology	ZIM Series—Water sensor technologies for precision irrigation systems	11/18/13	N/A
Monsanto Company	Climate Corp.	Hyper-local weather monitoring, data modeling solution, & insurance	10/2/13	$1.1B
Trimble Navigation Ltd.	RainWave LLC	Precipitation monitoring for the agribusiness, construction, and engineering	8/27/13	N/A
Trimble Navigation Ltd.	IQ Irrigation	GPS-controlled system controls individual nozzles on most irrigator makes and models	8/27/13	N/A
Trimble Navigation Ltd.	Hydro-Engineering Solutions LLC	Civil engineering company that specializes in hydrology and hydraulics	8/27/13	N/A
Nozzleworks Inc.	Spratronics	Variable O-Nozzle—Patented VRA nozzle widely used for application equipment	6/12/13	N/A
Digi-Star LLC	RDS Technologies	Sprayer rate controls, yield monitors, and drill control systems	11/12/12	N/A
ublox	Fastrax	Fastrax Software—GNSS solution for ag	10/30/12	13M
Frontier Ag Ltd	Farm Image Ag. Serv. Ltd	Sampling services, soil and field mgmt. serv.	7/6/12	N/A
Monsanto Company	Precision Planting Inc.	Monitoring systems, germination tools, and sensors for seeding	5/23/12	$210M Cash plus $40M Earn Out
Hemisphere GPS	AgJunction Inc.	AJ Cloud—Cloud-based data mgmt. SW platform and wireless HW for PA	1/18/12	$10M ($2.5M Cash and $7.5M in stock)
Topcon	AGCO Corp. (SGIS Agronomic SW Business)	SGIS Agronomic Software—Field mgmt. SW	8/4/11	N/A
Buhler Industries Inc.	Ezee-On	Precision seeding and tillage eqmt.	2/7/11	N/A
Agrium	Miles Farm Supply	Operates retail locations for ag. HW	11/16/10	N/A
CF Industries Holdings	Terra Industries Inc.	Produce and distribute fertilizers, globally	3/12/10	$4,700M
Buhler Industries Inc.	Feteri Manufacturing Corp.	Operates manuf. facilities for heavy machinery	2/11/10	N/A
Raven Industries Inc.	Ranchview Inc.	RTK and guidance hardware solutions	10/27/09	N/A
Trimble Navigation Ltd.	Farm Works Software	Farm Works—Field management software	7/17/09	N/A
Trimble Navigation Ltd.	Ntech Solutions Inc.	GreenSeeker & WeedSeeker	6/5/09	N/A
Monsanto Company	EarthMap Solutions Inc.	Specialty maps from imaging for vegetation levels, soil mgmt., yield, and VRA	3/24/08	N/A

Figure 6: Investments within the Precision Agriculture Market

Investor	Target	Target Description	Date Announced	Announced Investment Size
Draper Fisher Jurvetson	DroneDeploy	UAV Guidance software solutions	10/30/13	N/A
Foundry Group, True Ventures, & Others	3D Robotics	3DR Series—UAV imagery acquisition and analysis for ag as a key market focus	9/26/13	$30M - Series B
Horizons Ventures	Meteo-Logic	Power & weather forecasting solution	9/8/13	$3M - First Round
Bob Young & Innovate Indiana Fund of Ind. Univ.	Precision Hawk	Lancaster Platform—UAV imagery acquisition solution and analysis	8/14/13	N/A - Angel Round
Andreessen Horowitz, Google Ventures, & First Round	Airwave	UAV Customizable Autopilot solutions	5/15/13	$13.3M - First Round
Hyde Park Ventures & Huron River Ventures	Farm Logs	FarmLogs—Field management software	1/28/13	$1M - First Round
Marc Andreessen & Andreessen Horowitz	Solum Inc.	Solum—Soil and field mgmt. SW solutions	6/27/12	$17.1M - Series B
NextView Ventures, SoftTech Venture Capital, & Others	Farmeron	Dairy farm mgmt. and analysis SW solution	5/10/12	$1.4M - First Round
Not Disclosed	Solum Inc.	Solum—Soil and field mgmt. SW solutions	2/1/10	$2.05M - Series A
Raven Industries Inc.	SST Development Group	SST Summit Professional, Sirrus, FarmRite, & agX—Agricultural mgmt. SW suites	11/19/09	N/A

On the Horizon—Big Data and "Here Come the Drones"

Huge amounts of data are now being collected by farmers who are utilizing precision agriculture technology. These include current and historical yields by field sections; local weather; soil analysis; seed types, fertilizer and pesticide application by sections; market prices; profitability; various types of imagery; irrigation; and event timing (planting, fertilizing, harvesting, etc.). This wealth of data (Big Data) needs to be filtered, fused, and analyzed to provide useful and actionable information for increasing yields and reducing costs.

Several companies are emerging with data analytics. A few examples include include Climate.com, SST Software, and Land O'Lakes:

The Climate.com platform collects weather measurements from 2.5 million locations and forecasts from major climate models, and processes this data along with 150 billion soil observations to generate 10 trillion weather simulation data points[2]. Climate.com offers up-to-the-minute information on field-specific conditions, yield forecasting, crop insights and production decision support (timing to plant and harvest, for example). Climate.com was recently acquired by Monsanto.

SST Software's products (both web-based and desktop) allow growers and retailers (depending on the product) to process and store raw farm data and provide a number of value added features based on analytics including management of soil sampling, creation of variable rate fertility plans, zone maps, export of application plans into field equipment, comparisons of the cost and profitability of various plans and numerous advanced reports.

Land O'Lakes offers their Winfield R7 tool which is a comprehensive precision farming solution that gives variable-rate prescriptions for seed, crop production, and crop nutrient applications. It combines satellite imagery with local seed and crop protection data to generate field performance information for each acre and matches crop inputs and decisions to the potential of each field and each zone.

Fixed wing drones can be used as a platform for high resolution images to provide the farmer with detailed pictures of the field to check on plant health.

Drones

Another exciting technology affecting agriculture is UAS (Unmanned Aerial Systems) or drones. Drone companies offering or planning to offer products and services to the agriculture market are numerous, and investments in these companies are on the rise. During the first nine months of 2013, approximately $40.9 million has been invested in UAS related startups—double the pace of 2012's UAS investments[3].

The use of drones for agriculture will add real time high definition imagery, collected on-demand, to help a farmer see what is happening in the field without having to walk through the field. Drones can cost a fraction of what an airplane or a satellite costs, and they can provide a superior set of images with a potential resolution equivalent to standing next to the plant.

Continued on page 9

[2] Corn + Soybean Digest. (2011). *WeatherBill Changes Company Name to the Climate Corporation*. Available: http://cornandsoybeandigest.com/weatherbill-changes-company-name-climate-corporation-appoints-former-us-senator-byron-dorgan-board-d. (accessed 5th Nov. 2013)

[3] Olga Kharif. (2013). *Drones Delivering Pizza? Venture Capitalists Wager on It*. Available: http://www.bloomberg.com/news/2013-10-30/drones-delivering-pizza-venture-capitalists-wager-on-it.html. (accessed 8th Nov 2013)

These small, unmanned rotary and fixed wing aircraft can fly at low altitudes and be programmed to fly a certain pattern. They can take high definition images with visual and multi spectral cameras, providing specific plant health information in real time. This new imagery would need to be integrated with all the other data a farmer collects to increase productivity.

Currently, in the U.S., the FAA restricts the use of drones for commercial purposes but has been directed by Congress to allow drones to be used for commercial use by 2015[4]. These rules are expected to allow drones to fly up to 400 feet with a weight of no more than 55 lbs[5].

Drones are, however, being successfully used outside the U.S. For example, in Japan the Yamaha Rmax drone has been used in agriculture since the 1980's and now sprays 90 percent of the crops in Japan[6].

In Chile, IDETEC Corp. has been using the Stardust aircraft platform since 2008 to acquire multispectral, thermal IR (Infra Red), and digital elevation data[7]. IDETEC uses the images to help a farmer determine crop health variability, areas of poor plant stand, presence of pests, and crop development status so corrective action can take place.

Successful entrants in the drone market will be the ones who can integrate the existing data and the science of agronomy into the images through partnering or acquisitions.

Figure 7 lists those drone companies that have announced that they do now or plan to participate in the agriculture market.

Roto wing drones can also be used as a platform for high resolution images.

Yamaha's Rmax drone that has been used in Japan since the 1980's.

[4] Federal Aviation Administration. (2012). FAA Makes Progress with UAS Integration. Available: http://www.faa.gov/news/updates/?newsId=68004. (accessed 4th Nov 2013)

[5] The Washington Post. (2013). *Why Drone markers have declared war on the word drone*. Available: http://www.washingtonpost.com/blogs/the-switch/wp/2013/08/16/why-drone-makers-have-declared-war-on-the-word-drone/. (accessed 5th Nov 2013)

[6] Graham Warwick. (2013). *AUVSI—Precision Agriculture Will lead Civil UAS*. Available: http://www.aviationweek.com /Blogs.aspx?plckBlogId=Blog:7a78f54e-b3dd-4fa6-ae6e-dff2ffd7bdbb&plckPostId=Blog%3A7a78f54e-b3dd-4fa6-ae6e-dff2ffd7bdbbPost%3A6be07d39-38e7-49b5-b4ab-75b723a35b91. (accessed 5th Nov 2013)

[7] Juan Sainz V. (2013). *IDETEC Unmanned Systems*. Presented at the AUVSI Conference in Washington DC.

Figure 7: UAS Companies Participating in Precision Agriculture

Company	City	State	Country	Precision Ag Participation
3D Robotics	San Diego	CA	US	3DR Series—UAV imagery acquisition and analysis for ag as a key market focus
AeroDreams	Buenos Aires		Argentina	UAV imagery acquisition solution
AgEagle	Neodesha	KS	US	AgEagle System—UAV imagery acquisition system
Airwave	New Port Beach	CA	US	os Series AutoPilot—UAV customizable autopilot solutions
Altavian, Inc.	Gainesville	FL	US	Nova Block III—UAV imagery acquisition system
AutoCopter	Charlotte	NC	US	AutoCopter Ag Solution—Multispectral imagery acquisition and perscription application
Boeing Co.	Chicago	IL	US	Currently testing agriculture UAV systems
Bosh Global Services	New Port News	VA	US	UAV imagery acquisition and analysis solution
CropCam	Stony Mountain	MB	Canada	UAV imagery acquisition solution
DroneDeploy	San Fransisco	CA	US	UAV Guidance software solution
Hawkeye UAV	Manawatu		NZ	UAV imagery acquisition solution
HoneyComb Corp.	Portland	OR	US	UAV imagery acquisition solution
IDETEC			Chile	StarDust—UAV imagery acquisition solution
ISIS geomatics	Lethbridge	AB	Canada	UAV and Satellite imagery and remote sensing acquisition systems
Microdrones GmbH	Siegen		Germany	UAV imagery acquisition solution
MosaicMill Ltd.	Vantaa		Finland	Software & Hardware for UAV platforms
n-Link Corp.	Bend	OR	US	Paradigm—Specialization in UAV data collection systems
Precision Hawk			Canada	Lancaster Platform—UAV imagery acquisition solution and analysis
senseFly SA	Ch. De La Venoge 11		Switzerland	eBee & swinglet CAM—UAV imagery acquisition solution and analysis
Sky Hawk	Penns Park	PA	US	UAV imagery acquisition solution
Trigger Composites	Grodzisko Dolne		Poland	UAV imagery acquisition solution
Volt Aerial Robotics	Chesterfield	MO	US	UAV imagery acquisition solution

Private Company Participants

In addition to the public companies, merger and acquisition activity, and other finance activity in the precision agriculture marketplace mentioned above, there are at least an additional 87 private companies that offer precision agriculture products and services.

Many of these have overlapping offerings — 50 offer software products, 44 develop and sell hardware, 36 claim to provide some sort of cloud service, and 24 offer sensors. Many of these companies are very small and very new. These companies are listed in Figure 8.

Figure 8: Private Companies in Precision Agriculture

Company	City	State	Country	Offering Type	Precision Ag Products
Ag Integrated	State College	PA	US	Software / Cloud	Onsite—Cloud-based management solution
Ag Knowledge	Clarksdale	MS	US	Software / Cloud	AgKnowledge Data Storage
Ag Leader	Ames	IA	US	Hardware / Software / Cloud	AgFiniti—Cloud storage solution. Displays, guidance, and yield monitoring solutions. SeedCommand, DirectCommand, Intelliscope—Variable Rate Control systems
AgData	Toowoomba	QLD	Australia	Software / Cloud	Phoenix Production Software—Suite of modules for agribusiness management. Phoenix Live—Cloud storage system
AgNav	Barrie	ON	Canada	Software / Cloud	Aerial imagery and spraying solutions. NavViewW & SprayView—GIS SW solutions. Desktop and cloud based data solutions
AgNition Inc.	Guelph	ON	Canada	Software / Cloud	ScoutDoc—Mobile field scouting application
AgriApps	Cape Town		S. Africa	Software / Cloud	Fleet Manager—Fleet management SW for ag equipment
AgriData Inc.	Grand Forks	ND	US	Software	Ag Applicators Service—Aerial mapping acquisition for applicator management
Agri-Vision	Salisbury	MO	US	Software	AgVision Grain Software—Inventory management SW
AgSense	Huron	SD	US	Software / Cloud	Field Commander, Crop Link, Flow Monitoring, Precision Irrigation, Grain Trac, Weather Trac, Tank Trac, and Aqua Trac—Agricultural mgmt. and control SW
AgSmarts	Martin	TN	US	Software / Cloud	Field mgmt. SW solution—irrigation management, asset tracking, crop data analysis, and remote monitoring
AgSquared LLC	Port Jefferson Station	NY	US	Software / Cloud	AgSquared—Field planning, management and record keeping software
AgSync	Wakarusa	IN	US	Software / Cloud	AgSync Aerial, AgSync Ground, HQ Sync, & AgSync Operator—Mgmt. and storage SW. AgriSite IPM—Site Scouting Application
AgTerra Technologies Inc.	Sheridan	WY	US	Hardware / Software / Cloud	AgTrac, MapItFast, & SprayLogger—Field management softwares, Data Loggers—Acquisition hardware
AgXcel LLC	Kearney	NE	US	Hardware	AgXcel—Precision seed & fertilizer application HW
Ally Precision Industries	Sioux Falls	SD	US	Hardware / Software / Cloud	ISOLynx—Touchscreen controllers, FieldLynx—Field management software
Amazone GmbH	Hasbergen-Gaste		Germany	Hardware	Comprehensive variety of hardware and heavy equipment, including spreaders, tillage, rollers, and seed drills
Arvus	Itacorubi		Brazil	Hardware / Software / Cloud	Autopilot, Variable Rate Application hardware and software systems.
Barron Brothers International	Cornelia	GA	US	Hardware / Software	BBI Spreaders—Spreaders for Variable Rate Application, Task Command System—New Software platform to control Variable Rate Application
Bestway Inc.	Hiawatha	KS	US	Hardware / Software / Sensors	AutoGlide—Auto Boom Height Control System
Blue River Technologies	Mountain View	CA	US	Hardware	Automated weed elimination solution
Bullseye Precision Farming	Bundaberg	QLD	Australia	Hardware / Sensors	Bullseye's Fertilizer Applicator—Precision air operated six row folding applicator
Claas	Harsewinkel		Germany	Hardware / Sensors	Combines, Balers, Tractors, machine automation and guidance systems
Crop Ventures Inc.	Omaha	NE	US	Software / Cloud	Farm Command—Field management SW
Cropio		NY	US	Software / Cloud	Field management and vegetation control software solution
CropMetrics	North Bend	NE	US	Software	Virtual Agronomist—Field management solution SW
CropTrak	Tucson	AZ	US	Software / Cloud	CropTrak—Mobile field management application solution
Decisive Farming	Irricana	AB	Canada	Software / Cloud	My Farm Manager—Field mgmt. SW. Optimize RX—Prescription mapping SW
DICKEY-john Corporation	Auburn	AL	US	Hardware / Sensors	Autosteer, autosection control, ground speed adapters and sensors hardware add-on solutions
Digi-Star LLC	Fort Atkinson	WI	US	Hardware / Sensors	Grain Tracker—Grain cart weighing systems
DN2K, LLC	Greenwood Village	CO	US	Software / Cloud	DN2K—Cloud storage solution. DWorks Solution Suite—Field mgmt. SW
Dycam	Woodland Hills	CA	US	Hardware / Sensors	Dycam Agricultural Digital Camera—Customized agricultural image acquisition sensor
E4 Crop Intelligence	Woodbine	IA	US	Software	Sampling & Testing, Fertilizer & Seed prescription, & yield analytics solutions

Figure 8: Private Companies in Precision Agriculture (continued)

Company	City	State	Country	Offering Type	Precision Ag Products
Echelon	Weyburn	SK	Canada	Software	EchelonConnect, LevelONE, & PrecisionVRT—Field mgmt. & planning SW
eLEAF	Wageningen		Netherlands	Software	PiMapping—Vegetation remote sensing and analysis system
Fairmade Mgmt. Systems Ltd.	East Sussex		UK	Software	GateKeeper—Agronomy & crop mgmt. SW
Fairport Farm Software	Spearwood		Australia	Software	PocketPAM2, Pasture Watch, MAX, & PDP—Asset and field mgmt. SW suites
Farm Works	Hamilton	IN	US	Software / Cloud	Field management software solutions (Desktop & mobile), Connected Farm—Cloud based data storage system
Farmeron	Mountain View	CA	US	Software / Cloud	Dairy farm mgmt. and analysis SW
FarmLogs	Ann Arbor	MI	US	Software / Cloud	FarmLogs—Field mgmt. SW
Farmscan	Toowoomba	QLD	Australia	Hardware / Sensors	Variety of HW including, spray and variable rate controllers, camera and sensory equipment, and LevelGuide—Laser sensor
Hardi North America	Davenport	IA	US	Hardware / Sensors	Sprayers and Hardi—Variable rate controllers
Headsight Inc.	Bremen	IN	US	Hardware / Sensors	Headsight Crop Control—Height and row control systems
Hiniker Co.	Mankato	MN	US	Hardware	Cultivators, Sprayers, Controllers, Shredders, & Hiniker VOD—Variable orifice distributor
Holland Scientific	Lincoln	NE	US	Hardware / Sensors	RapidSCAN CS-45, Crop Circle ACS-470, Raptor ACS-225LR, GeoSCOUT Series—Geographical data loggers and sensors
Hortau Inc.	St. Romuald	QC	Canada	Hardware / Sensors / Cloud	TX3—Wireless field monitoring station, Irrolis Product Line—Communication and weather station
iCropTrak	Tucson	AZ	US	Software / Cloud	Comprehensive mobile based field mgmt. SW
iLinc	Atlanta	GA	US	Software / Cloud	FarmLinc—Data acquisition, analysis, and storage SW
Intelligent Agricultural Solutions	Fargo	ND	US	Hardware	Wireless blockage monitor and active depth controllers
Juniper Systems Inc.	Logan	UT	US	Hardware / Sensors	Agriculture Field Data Collection—Handheld mobile data collection unit
Kinze	Williamsburg	IA	US	Hardware	Kinze Variable Rate Planters
Land O'Lakes Inc.	Arden Hills	MN	US	Software / Cloud	WinField R7 Tool—Predictive variable rate prescription SW solution
Libera Systems	Grand Forks	ND	US	Software / Cloud	ZoneMap—Variable Rate Map SW tool
Loup Electronics	Lincoln	NE	US	Hardware / Sensors	Loup III, 8000i, Envisio Pro, Loup II, & Cruizer—Yield & drill monitors
MapShots, Inc.	Cumming	GA	US	Software	AgStudio & AgStudio Select—Precision soil fertility, variable rate irrigation & seeding mgmt. SW
MDA Information Systems LLC	Gaithersburg	MD	US	Software / Cloud	Weather forecasting systems and databases for predictive modeling
Meteo-Logic			Israel	Software / Cloud	Power & Weather forecasting solution
Micro Trak Systems	Eagle Lake	MN	US	Hardware / Sensors	DrillMaster—Automatic Rate Controller, Calc-An-Acre II—Speed and area monitor, Flow-Trak II & FlowMate—Flow monitors, hydraulic control valves and motors, and speed sensors
Mueller Electronics Inc.	Burr Ridge	IL	US	Hardware / Sensors	Field-Nav—Agricultural displays, sprayers, tractors, trailers, & drilling machinery
MyAgCentral			US	Software / Cloud	MyAgCentral—SW platform to collect data, manage information, and communicate with trusted advisors
MyWay RTK	Effingham	IL	US	Hardware	Agriculture customized RTK system to assist in autosteer and field mgmt.
Netafim USA	Fresno	CA	US	Hardware	IrriWise—Wireless Radio Crop Monitoring System
Norac	Saskatoon	SK	Canada	Hardware / Sensors	UC4+ & UC5+—Spray height control systems
Novariant, Inc.	Fremont	CA	US	Hardware / Software	SimpleSteer, GeoSteer, ParaDyme, OnTrac2+—Autosteer Guidance Solutions, Central Business System—Farm Management Software
Nozzleworks, Inc.	Bothell	WA	US	Hardware	Variable rate nozzle control systems
OmniStar	Houston	TX	US	Hardware	OmniSTAR HP, OmniSTAR G2, OmniSTAR XP, OmniSTAR VBS—Satellite guidance networks and solutions
OnFarm	Fresno	CA	US	Software	OnFARM—Fixed asset and farm decision mgmt. SW solution
Optima Concept	Ruitz		France	Hardware	Genius Series—Electronic regulators, Commando & Gemini Series—Controls
Reichhardt Electronic Innovations Inc.	West Fargo	ND	US	Hardware / Sensors	PSR Steering Systems & RTK Clue—Guidance systems
SBG Precision Farming	Midenmeer		Netherlands	Hardware	SBGuidance Series—RTK GPS Guidance system solutions

Figure 8: Private Companies in Precision Agriculture (continued)

Company	City	State	Country	Offering Type	Precision Ag Products
ScoutPro Inc.	Ames	IA	US	Software / Cloud	ScoutPro—Corn and Soy mgmt. application solutions
Siga Farm Software	Drummondville	QC	Canada	Software / Cloud	SigaFinance, SigaField, SigaPig, & SigaRation—Agricultural management SW Suites
Simplot AgriBusiness	Boise	ID	US	Software / Sensors	SmartSoil, SmartImage, SmartZone, SmartWater, SmartVigor, SmartHarvest, SmartPlanting, & SmartRx—Field mgmt. solutions
SiteWinder	Edmonton	AB	Canada	Hardware	SiteWinder—Agricultural GPS guidance systems
Smart! Fertilizer Management	Hod Hasharon		Israel	Software	Smart! Software—Fertilizer management SW
SoilIQ	San Francisco	CA	US	Hardware / Software / Cloud / Sensors	SoilIQ—Smartphone mgmt. app and wireless soil mgmt. device focused for small farmers and consumers
Sol-Chip	Haifa		Israel	Hardware / Sensors	Precision agriculture wireless sensors to collect and monitor data on multiple soil and plant indexes.
Solum	San Francisco	CA	US	Software / Sensors	Solum—Soil and field mgmt. SW solutions
Spraytest Controls Inc.	Beechy	SK	Canada	Hardware	ST8, ST12, & ST16—Remote boom control systems
SST Development Group	Stillwater	OK	US	Software / Cloud	SST Summit Professional, Sirrus, FarmRite, & agX—Agricultural mgmt. SW suites
TeeJet Technologies	Wheaton	IL	US	Hardware	RealView & Matrix Pro Guidance—Guidance solutions and displays, FieldPilot & UniPilot—Auto steer systems
Tenacious Systems LLC	New York	NY	US	Software	FarmSoft—Farm mgmt. SW
The Daugherty Companies, Inc.	Warren	IN	US	Hardware	Agri Motive Products—Custom electronic monitors, controls, and wiring systems for agricultural equipment
T-L Irrigation Co.	Hastings	NE	US	Hardware	Precision Mobile Drip Irrigation & Precision Linear Control Panel
Tru Count	Ames	IA	US	Hardware	Tru Count Air & Electronic Clutches—Variable application control clutches
Veris Technologies, Inc.	Salina	KS	US	Hardware / Sensors	Soil EC, OpticMapper, Soil pH, MSP3, pH Detector, & Vis-Nir—Soil analysis HW
Weather Trends International	Bethlehem	PA	US	Software / Cloud	Weather forecasting systems and databases for predictive modeling
ZedX, Inc	Bellefonte	PA	US	Software / Cloud	GRAIN, AgFleet, AF Trace, Irrigation Scheduler, & Application Order Tracker—Mgmt. SW, skybit.com, Vogen, & WxEngine—Weather data systems

For more information about Precision Agriculture:

Eric M. Oganesoff
Managing Director, Washington, DC
eric.oganesoff@focusbankers.com
202-470-1969

Eric Oganesoff has served as the CEO or President of six companies. His industry experience ranges from wireless solutions, big data, software, and RFID services to manufacturing, industrial products, energy, and environmental products.

He is a member of the FOCUS Telecom and Technology Group and is the leading wireless, RFID technology, M2M, and Big Data banker for the firm. Current and past engagements include companies involved in advanced implantable RFID sensors, advanced bio-threat sensors, medical sensors, RFID middleware, as well as satellite imaging processing and sensor development.

He received a White House appointment to NASA as Special Assistant to the Associate Administrator, Office of Space Flight, where he headed the NASA task force that developed NASA's first strategic marketing plan for Space Shuttle launch services. He received a Presidential Commendation for his work at NASA.

Reid Howard
Investment Banking Research Intern, Washington, DC
reid.howard@mba.mbs.ac.uk
703-915-9621

Reid is currently a MBA student at the University of Manchester in the UK where he will graduate in early 2014.

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FOCUS
Investment Banking

MID-ATLANTIC REGION
FOCUS Investment Banking LLC
Headquarters
1133 20th Street, NW
Suite 200
Washington, DC 20036
202.785.9404
202.785.9413 (fax)

SOUTHEAST REGION
FOCUS Investment Banking LLC
Atlanta Office
3353 Peachtree Road, NE
Suite 1160
Atlanta, GA 30326
404.504.8620
404.814.9141 (fax)

WESTERN REGION
FOCUS Investment Banking LLC
Los Angeles Office
355 South Grand Avenue
Suite 2450
Los Angeles, CA 90071
213.943.1395
213.943.1397 (fax)

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