

Unmanned Aerial Vehicles (UAVs),
the Next Technology in Ag?

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Figure 1

Problem Statement:

Unmanned Aerial Vehicles (UAVs) are starting to spark an interest within the United States. One of the largest economy sectors taking notice of these machines' capabilities is the agriculture industry. This is because of their ability to capture real time data/imagery that can be used as viable input into a grower's decision making process (Figure 1). What kind of data? Well, that depends on the camera, which type of UAV, and which light filters (visual, infrared, NDVI). This information can then be interpreted to show plant growth, nutrient distribution, drainage, etc. (Figure 2). Data from these images can be used to estimate yield and make decisions to increase yield.

The problem that hobbyists, growers, farmers, and business entities have with UAV technology is that there seems to be some absence of potential market knowledge on such a new and sometimes controversial product. Consumers are unsure about where to begin on purchasing, the act of flying a UAV, acquiring aerial pictures, filter use, cost of equipment, and what the person does with the images once he/she collects them. Another problem is current Federal Aviation Administration (FAA) regulations in regard to UAVs. These regulations limit the use of the unmanned aircraft to hobby flight only. Commercial flights are prohibited.

Since the technology is new to most of Indiana agriculture producers, the students of this project created and conducted a survey to help narrow down the market. This survey shows what consumers see as the best fit for UAV technology, and establishes groundwork for improving basic consumer knowledge of UAVs. In this project, the students addressed and helped to narrow down the potential buying market for UAVs. This poster will illustrate consumer knowledge of this technology and where the consumers' concerns lie within this new era of agriculture.

Product Development and Results:

The students constructed a survey that was distributed across Indiana to farmers and producers. Indiana was chosen to be the test state, because of the close ties between county extension offices and Purdue. Both students also have many agricultural contacts in Indiana that were able to distribute/promote the survey and/or take the survey themselves. The estimated budget for this project was minimal to none, due to the use of the Internet, email, and social media sites for delivering the survey to candidates.

The survey questions were designed to retrieve what knowledge, expectations, and uses the respondents have concerning UAVs. The questions included in the survey were directed towards crop production. The study had a total of sixty-six completed surveys.

The survey included questions asking the respondents what their age, farm size, and their use of precision agriculture tools. The questions were used to filter the data into smaller groups to see if there was a relationship between different age groups and farm acres (Table 1.). This could distinguish any major or minor modes in the data.

Table 1. Characteristics related to farm size

		Size of Farms (acres)				
		All	0-500	501-1500	1501-3000	Over 3000
Source of UAV images	Hire	51%	44%	63%	45%	60%
	Both	27%	22%	19%	32%	40%
	Own	22%	33%	19%	23%	0%
Precision agriculture technologies that had a high UAV interest	GPS	42%	50%	38%	48%	50%
	VRT	40%	45%	33%	52%	50%
	GIS	55%	55%	43%	60%	75%
	RTK	54%	25%	100%	50%	67%
	Yield Monitor	41%	42%	38%	48%	50%
Adopt within the next four years		83%	67%	100%	77%	100%
Number of responses		66	21	16	23	7

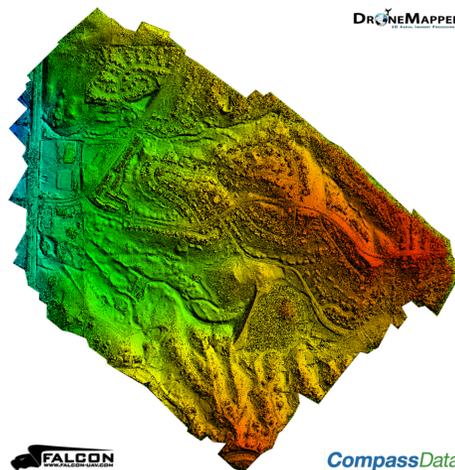


Figure 2

Results from the survey found that 93% of farmers are highly interested in learning more about how UAVs can be used in agriculture. Currently 23% of farmers know someone using a UAV for agricultural purposes. Approximately 87% of the respondents want the raw images and final analysis products. About 81% of these farmers are comfortable with a neighbor having a UAV. The most common concern of those who were not comfortable with a neighbor having a UAV was the invasion of privacy. Overall, 97% felt that UAV gathered data/images should be worthwhile. More data gathered from the survey can be seen below.

Alternative UAV Solutions:

One part of the project was to construct a UAV buyers guide (as seen in the handout below). This guide would compare different types of craft from different companies. Two Indiana companies were selected each providing either a 1) Fixed Wing UAV or 2) Rotary type UAV.



Figure 3

Economical Impact:

"Saving farmers 1% on inputs like nitrogen & herbicides and increase yields by 1%, that alone is a multi-billion dollar industry." These Unmanned Aerial System are just that. Just the agriculture economic benefit alone is \$2.2B to our economy according to the Association for Unmanned Vehicles & Systems International report in March of 2013. -AgTechTalk

Societal Impact:

With the use of UAVs to gather aerial photographs of crops (Figure 3), farmers have the opportunity to monitor their growth and make real time decisions with concern to nutrients, diseases, pests, weeds, and yield potential. Utilizing what UAVs have to offer in cooperation with other precision agriculture technologies, not only do farmers have the ability to increase productivity but the cropping industry as a whole will increase its ability to feed this ever growing world.