

Development of a New Precision Agriculture Competition for the NACTA Judging Conference

KANSAS STATE
UNIVERSITY

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Introduction

The NACTA Judging Conference is held at a different host college each April. The conference guidelines specify six required contests, but the host school typically sponsors 6-8 additional events. In the past, an agricultural mechanization contest has often been part of the contest offerings. However, when Kansas State University hosted the 2017 conference, it was not feasible to sponsor this event since facilities and support for traditional agricultural mechanical skills were not available. Participation in the ag mechanics event has also been limited in recent years. Thus, a new competition focused on precision agriculture was developed. The objective was to provide an event relevant to the increasing interest in both the study and application of precision agriculture.

Justification

- Many colleges have instituted precision agriculture programs and associated curricula
- Career opportunities in precision agriculture are rapidly increasing
- There is an opportunity for industry support both financially and for helping conduct the contest

Development and Operation

- Cooperative effort among faculty and students in the Department of Agronomy and the Department of Biological and Agricultural Engineering at Kansas State University, John Deere equipment company, and Crop Quest consulting company
- Contest rules and problems were developed in advance through teleconferences and email
- John Deere provided an ExactApply™ spray table and an ExactEmerge™ row unit used for training



- John Deere professional staff were on site to set up stations, supervise the events, and help score
- Crop Quest provided precision maps and data from a producers field for an interpretation problem
- Kansas State faculty developed problem sets and produced contest forms and information packets
- Kansas State faculty and students assisted with monitoring, scoring and tabulation of results



Contest Components

- Three one-hour stations focused on activities and demonstrations of precision agriculture concepts using planting, spraying, and harvesting equipment
- Three activities were completed at each station:
 - component identification on the newest equipment available
 - mathematical calculations related to equipment performance and efficiencies
 - a situational analysis involving troubleshooting problems, adjusting to optimize performance, and/or using apps to evaluate scenarios
- Station four involved analysis and interpretation of precision maps and data from two farmer's fields

Contest Action



Planting. An ExactEmerge™ functioning row unit and a planter with four MaxEmerge5 row units were utilized for the assessment. Questions focused on identifying key components of precision planters, calculating seeding rates and singulation, and analyzing meter runoff screens to troubleshoot problems and recommend adjustments.



Spraying. A selection of spray nozzles was provided for identification using iPads loaded with the Nozzle Select app. Calculations covered sprayer calibrations and pulse-width modulation. The ExactApply™ spray table was used for demonstrations in the situational analysis section.

Contest Action



Name _____ Contestant No. _____ School _____

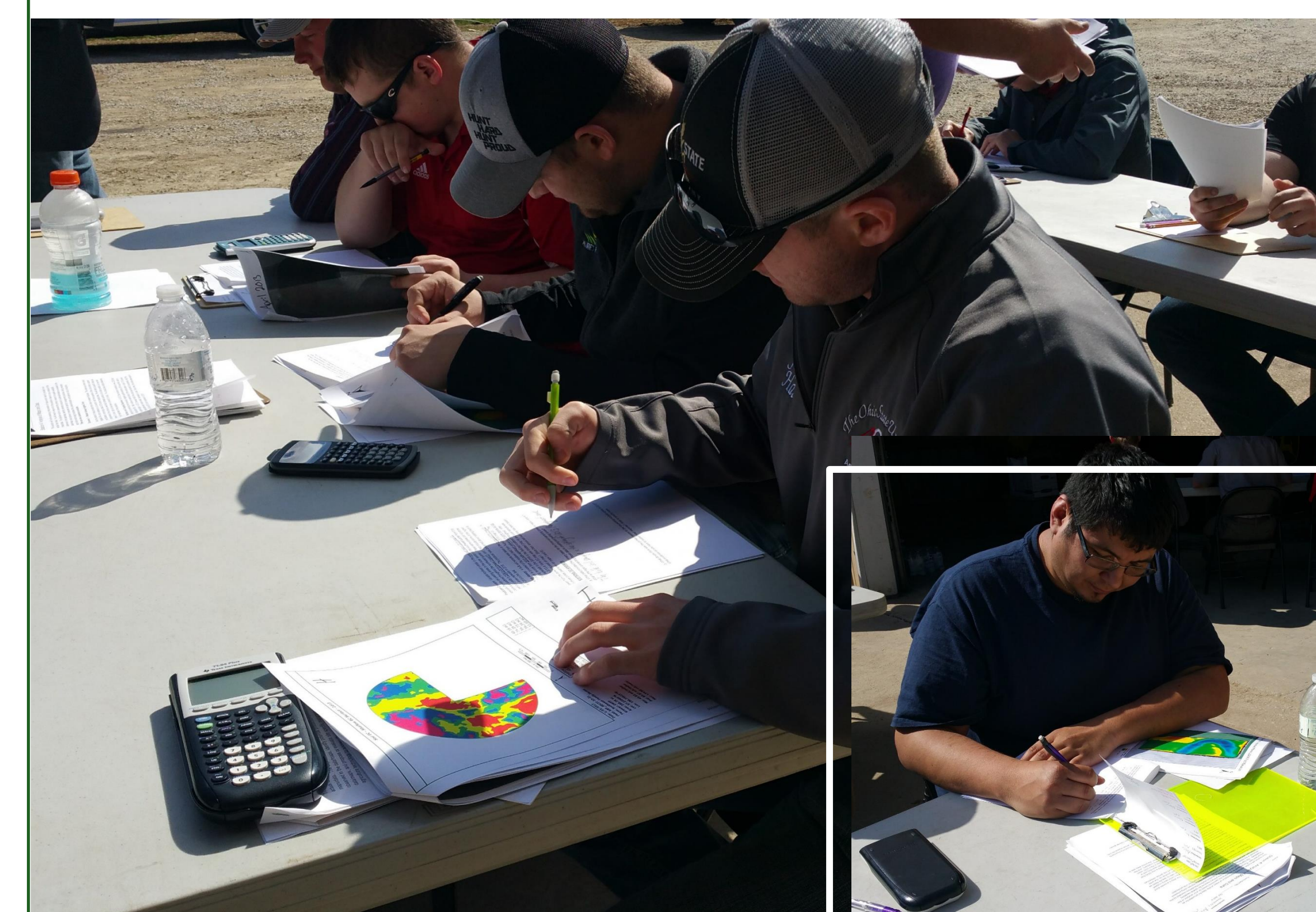
Station 3: Harvest

A: Component Identification – S Series Combine

Find the numbers 1-7 on attached diagram. Find numbers 8-23 in the cab or on the exterior of the combine. Match to the letters with the terms listed below.

Letter	Term	Number
A.	AutoTouch™ Presume	1.
B.	Clean Grain Elevator	2.
C.	CommandTouch™ Armrest Console	3.
D.	CommandTouch™ Cab Cornerpost	4.
E.	CommandCenter™ Display	5.
F.	Concave	6.
G.	Crop Director	7.
H.	Feeder House	8.
I.	Feeder House Conveyor Chain	9.
J.	Grain Bin	10.
K.	Grain Moisture Sensor	11.
L.	Header Height Sensor	12.
M.	Header Raise/Lower Switch	13.
N.	Knife Bank Engagement	14.
O.	Machine Sync Buttons	15.
P.	Multi-Function Lever	16.
Q.	Quick Stop Switch	17.
R.	Reel Raise/Lower Switch	18.
S.	StarFire™ Receiver	19.
T.	Steering Column	20.
U.	Tailboard	21.
V.	Tailings System Concave Position	22.
W.	Tailings Return Elevator	23.
X.	Unloading Auger	24.
Y.	Unloading Auger Drive Engage Switch	25.
Z.	Unloading Auger Swing Switch	26.

Harvesting. A new S680 combine was on site and used for identification of key components including guidance and controls in the cab. Calculation problems covered harvest loss and harvest efficiency. The GoHarvest app was used to answer optimization questions and identify machine setup and adjustments for different scenarios.



Analysis of Maps and Data. Contestants analyzed two different field information packets to assess the reasons for field variability, identify the most likely production problem, and propose a management plan to address the problem using a precision agriculture approach.

Analysis

- Well supported with 44 contestants, second largest of the seven elective events hosted by K-State
- Students from 12 different institutions, seven four-year and five two-year colleges
- Participation exceeded recent traditional ag mechanics events (36 in 2015 and 21 in 2016)

Conclusions

- The event was relevant to expanding programs and curricula in precision agriculture
- Facilitated bringing students from ag engineering and agronomy together in the same way that will likely be expected of them as they enter careers
- Participants and coaches rated the event positively and strongly suggested it continue in the future

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