WheatCAP UAS Survey Summary

Program	1) Does your program have an Unmanned Aircraft System (UAS) component?	2) If yes, how would you rank your program's UAS experience? 1) Beginner, 2) Intermediate, or 3) Advanced. How many years of UAS experience does your program have?	3) If no, do you plan to have a UAS component during the next two years?	4) From which year of the grant you estimate you will be able to start sending data to TX UAV data analysis center?	5) Does your program have certified pilots?	6) List your program's UAS drones	7) List your program's UAS sensors	8) List your programs flight planning software	9) List your program's UAS data processing software	10) List your program's proreferencing and ground-truthing equipment	11) If your program has UAS component already implemented, how do you address the issue of georeferencing (aligning UAS data products over the ensemble season)?	12) Does your program have experience in raw image collection using sensors mounted on UAS?	13) Does your program have experience in storage and sharing of multiple terabytes of raw images in addition to processed geospatial data products generated from the UAS data?	14) Does your program have experience in analyzing geospatial data products such as orthomosaics, DSM, or 3D Point Cloud generated from the UAS data?	15) Does your program have experience in analyzing geospatial data products such as vegetation indices (NDVI, NDRE, SAVI, etc.), structural phenotypic information (canopy height, canopy volume, canopy cover, etc.), etc.?	16) Does your program have experience in developing multi-temporal analysis using the data products mentioned in the questions 13 and 14?	17) Does your program currently conduct 3k own UAS data collection, data processing, storage, and analysis?	18) Please indicate your program's training needs on UAS/sensor setup, UAS mission planning, UAS data management and sharing, UAS data analysis, custom algorithm/software development for your research program
Texas A&M University	Yes	Advanced	NR	Year 1; *	Yes, 2	DJI M600,DJI M200, DJI M300, Mavic 2 Pro, Phantom 2, Phantom 4, Phantom 4 Pro, Phantom 4 RTK, Phantom 4 Multispect ral, S1000+; Parrot FW; Footech Hover 1; 3DR iRIS/X8; Nimbus 1800; Zeta FX-79	Micasense RedEdge-M, Micasense Altum, DJI Zenmuse X7, LiDAR; Velodine VLP-16, Riegl VUX 1R; Hyperspec	Drone deploy, PixelDcapture, DJI Ground Station, ArduPilot Mission Planner, Map Pilot	PixelD, Agisoft Metashape , Slantview, QGIS, Python, Matlab	DMSD REACH RS+ GNSS GCPs, Leaf Porometer, Infrared Thermometer, Fluorometer (OptiSciences); Chlorophyll Meter (Konika Minolta), Trimble R8S, GCPs, V-snap (PPK), Reach RS/RS2 (PPK & RTK), DJI RTK station	Use Ground Control Points (GCPs) in the field and survey those GCPs using a survey grade GPS, then incorporate this information into the processing steps	Yes	Yes	Yes	Yes	Yes	Yes	Personnel at College Station and Amarillo can benefit from CAP training and data processing and analysis.
Kansas State University - Manhatasan	Yes	Advanced	NR	Year 1; *	Yes	DJI M100, DJI M600, DJI Inspire	RGB: XSR, DJI X3; Multispect ral: DJI X3, Micasense RedEdge/ Altum; Hyperspec tral: Headwall Nano; Thermal: Flir Vue Pro R, Flir A6205	Mission Planner and Litchi Mission Hub	Agisoft, QGIS	PhotoSignS, Trimble Handheld GreenSeeker	Not provided	Yes	Yes	Yes	Yes	Yes	Yes	Well set up through internal collaboration
University of Nebraska - Lincoln	Yes	Advanced	NR	Year 1; *	Yes	DJI Phantom 4 Pro, RTK, Matrice 210, Matrice 600 pro	RGB, MicaSense RedEdge, SlantRang e 3p multispect ral, LiDAR, hyperspec tral, DJI/FLIR thermal	DJI proprietary flight control and planning software and headwall's proprietary mission planner	PixelD, ArcGIS, Python, R, MATLAB	IR thermometer, GreenSeeker, Ocean Optics sensors: LAI, stomatal conductance for gas exchange, leaf chlorophyll meter.	1) Use ground Control Points (GCPs) in the field and survey those GCPs using a survey grade GPS, then incorporate this information into the processing steps 2) Use RTK (Real Time Kinematic) GPS enabled UAS for data collection	Yes	Yes	Yes	Yes	Yes	Yes	Have access to significant training through collaborators at UNL
Kansas State University - Hays	Yes	Advanced	NR	Year 1; *	Yes	DJI S900	RGB and Multispect ral: Mat/Max modified RGB (G/R/NIR), Micasense RedEdge	ArduCopter Mission Planner	Agisoft Metashape	Ground control points, grey-scale panels for reflectance calibration, SPAD meter for chlorophyll, LiCor LI-2000 for leaf area index	Use Ground Control Points (GCPs) in the field and survey those GCPs using a survey grade GPS, then incorporate this information into the processing steps	Yes	Yes	Yes	Yes	Yes	Yes	Coordination of effort to maintain consistent output.
University of Illinois	Yes	Beginner	NR	Year 1	No	Not sure	Not sure	Not sure	Not sure	Not sure	Not sure	Not sure; collaborator does	No	No	Yes	Yes	No	Trainine in all those asaects
Michigan State University	Yes	Beginner	NR	Year 1	No, use service	DJI M600 Pro	Headwall Photonics Co-Aligned VNIR-SWIR Sensor with LiDAR	Not sure	Not sure	Greenseeker. PhotosynQ	Use Ground Control Points (GCPs) in the field and survey those GCPs using a survey grade GPS, then incorporate this information into the processing steps	Yes	No	Yes	Yes	No: collaborator does	No	UAS data management, specifically extracting plot-level data quickly and efficiently
University of Minnesota	Yes	Beginner	NR	Year 1	No	DJI Phantom 2 4k	RGB; Thermal: Flir Vue Pro	PixelDcapture	PixelD mapper, QGIS, R	Big Ruler, Thermocouples and Handheld thermal camera. Licor Li-6400	Use Ground Control Points (GCPs) in the field and survey those GCPs using a survey grade GPS, then incorporate this information into the processing steps	Yes	Yes	Yes	Yes	Yes	No. through collaborators	a) Spatial data analysis using python, b) RTK technology, c) Development of analysis pipeline that automatically recognize ground control points, d) Increasing the speed and reducing the labor
University of Wisconsin - Madison	No	Beginner	Yes	Year 2	No	No drones	No sensors	No software	No software	Does not have	Not provided	No	No	No	No	No	No	Full trainine
NCSU-ARS	Yes	Beginner	NR	Year 2	No	DJI M100	Multispect ral: MicaSence RedEdge M	Atlas-FlaNit	PixelD	Do not know	Not sure	No	No	No	No	No	No	do not have experience
Colorado State University	Yes	Beginner	NR	Year 1	No, use service	DJI M600, Phantom 4 Pro V2, Mavic 2 Pro, Mavic 2 Zoom, Mavic Pro, Tello, Applied Aeronautic s Albatross, Precision Hawk Lancaster 4, E-Flite Timber S 1.5m, E-Flite Apprentice S 15e, Parkzone Cessanda	RGB: DJI X3; Multispect ral: Micasense RedEdge M; Thermal: Flir Duo, Flir Duo Pro R 640x512 - 13MM	Not provided	ArcGIS No software	Ground NDVI data	Use Ground Control Points (GCPs) in the field and survey those GCPs using a survey grade GPS, then incorporate this information into the processing steps	Yes	Yes	No	No	No	Use a service for collection and process in house	Interested in a coordinated effort to process imagery/data
University of Idaho	No	Beginner	Yes	Year 2	No	No drones	No sensors	No software	None	Not provided	No	No	No	No	No	No	No	All of described needs.
South Dakota State University	No	Beginner	Yes	Year 2	No	DJI Phantom 4 Pro V2	RGB; Multispect ral: Sentera Quad	Drone deploy, PixelDcapture	PixelD, ArcGIS	FLIR Infrared thermometer, SPAD502	No implementation	No	No	No	No	No	No	All of aspects
Cornell University	Yes	Intermediate	NR	Year 1; *	Yes, 2	DJI M100	Multispect ral: MicaSence RedEdge M	Mission	PixelD	Trimble GreenSeeker	Use Ground Control Points (GCPs) in the field and	Yes	Yes	Yes	Yes	Yes	Yes	UAS data management and sharing. UAS data analysis.
University of California - Davis	Yes	Intermediate	NR	Year 2; *	No	DJI M100	Multispect ral: MicaSence RedEdge M	PixelDcapture	PixelD	Greenseeker NDVI, Chlorophyll meter	Use RTK (Real Time Kinematic) GPS enabled UAS for data collection	Yes	Yes	No	Yes	Yes	Yes	minimal. But may change if current person leaves
Washington State University	Yes	Intermediate	NR	Year 1 *	Yes	DJI Inspire 1	RGB; Multispect ral: Sentera Quad	PixelDcapture	PixelD and some programs developed in-house	SVC HR-1024i High-Resolution Spectroradiometer, Insend thermometer, Chlorophyll meter, Photosync, CropScan	Use Ground Control Points (GCPs) in the field and survey those GCPs using a survey grade GPS, then incorporate this information into the processing steps	Yes	No, only storage	Yes	Yes	Yes	Yes	Training on data sharing, some data analysis components, and algorithm/software development
Oklahoma State University	Yes	Intermediate	NR	Year 1; *	Yes	DJI M600 Pro, Phantom 4 Pro, Phantom 4, Flaircraft 800	Hyperspec tral: Headwall CoAligned sensor; Thermal: Flir LiDAR Ioendirat	UgCS; Mission Planner	Headwall Hyperspec tral software; ArcGIS	Flir infrared handheld camera; Chlorophyll meter; Licor photosynthesis system; Licor leaf area meter; Green Seeker	Use RTK (Real Time Kinematic) GPS enabled UAS for data collection	Yes	Yes. OneNet	Yes	Yes	Yes	Yes	WIT is in the process of developing a data processing pipeline for UAS data starting Spring 2021. We will also be evaluating the AAFPA-E TERRA ornaram data pipelines
Montana State University	Yes	Intermediate	NR	Year 1; *	Yes	DJI M100	RGB; Multispect ral: Micasense RedEdge	PixelDcapture, WebODM	QGIS	On foot visual counts of plant emergence, stay-green trait	Use RTK (Real Time Kinematic) GPS enabled UAS for data collection	Yes	Yes	Yes	Yes	Yes	Yes	Custom algorithm/software development for detecting early emergence of cereals
Indiana Tech	Yes	Intermediate	NR	Year 1; *	Yes	DJI M600 Pro, M300 RTK	Multispect ral: Micasense RedEdge-M, LiDAR	Mission Planner	PixelD	Excel	Use Ground Control Points (GCPs) in the field and survey those GCPs using a survey grade GPS, then incorporate this information into the processing steps	Yes	Yes	Yes	Yes	Yes	Yes	Have all the pieces we need, but most of the expertise is from the IT side, so expertise transfer is necessary.
North Dakota State University	No	No Program	No	None	No	No drones	No sensors	No software	No software	?	No	No	No	No	No	No	No	Not likely to have a UAV component. More likely to deploy ground-based sensing first due to the logistics of flying UAV and the likelihood that ground-based sensor satisfy their primary objectives (breeding, disease characterizing, lodging, green leaf area).