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Medical Center

The Farm Labor Dashboard:
Wearable Technology Solutions for Health, Wellness and Safety in Agricultural Work

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This material is supported by the National Institute of Food and Agriculture, USDA, under awards 2014-69006-21873 and 2018-69006-28096.

Goals for today ...

Identify health and safety hazards that can be reduced with wearable technology.

Discover what data can be collected with wearable technology.

Learn how to select apps and technology.

Share smartphone applications and/or wearable technology with with attendees.

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Noise Injury

- Noise Injury affects the hearing of up to two-thirds of the farming community.
- Noise injury occurs when tiny hairs in the inner ear (cochlea) are damaged by excessive noise.
- Once destroyed cochlear hair cells are not replaced.
- Hearing loss is painless, progressive and permanent.
- Hearing loss is preventable.

Machinery or Activity	Average Noise levels dB(A) at operators ear	Time period before hearing damage (no hearing protection)	Min. protection level needed (ear muffs or ear plugs)
Firearms	140+	No Safe Exposure	26dB+
Pig Handling—suckers	109	1-2 minutes	26dB+
Chainsaws	106	3 minutes	26dB+
Irrigation Pumps (diesel)	100	15 minutes	22-25dB
Circular Saws	99	18 minutes	18-21dB
Augers	93	1 hour	14-17dB
Tractors without cabs	92	1.5 hours	14-17dB
Ride on lawn mowers	92	1.5 hours	14-17dB

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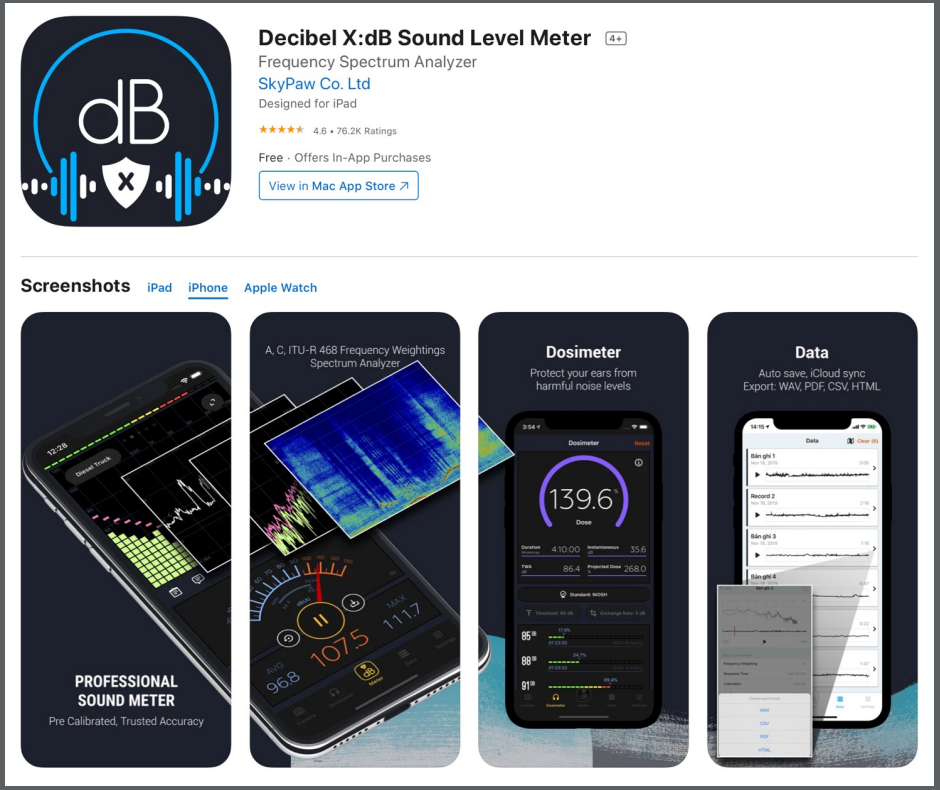
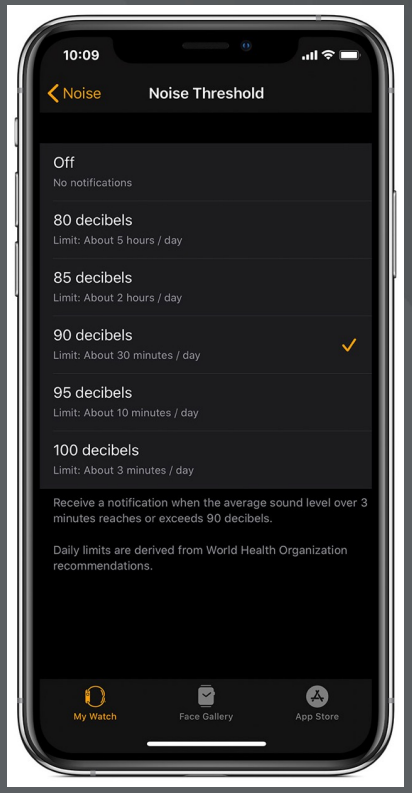
Sound Level Meters





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Hearing Protection

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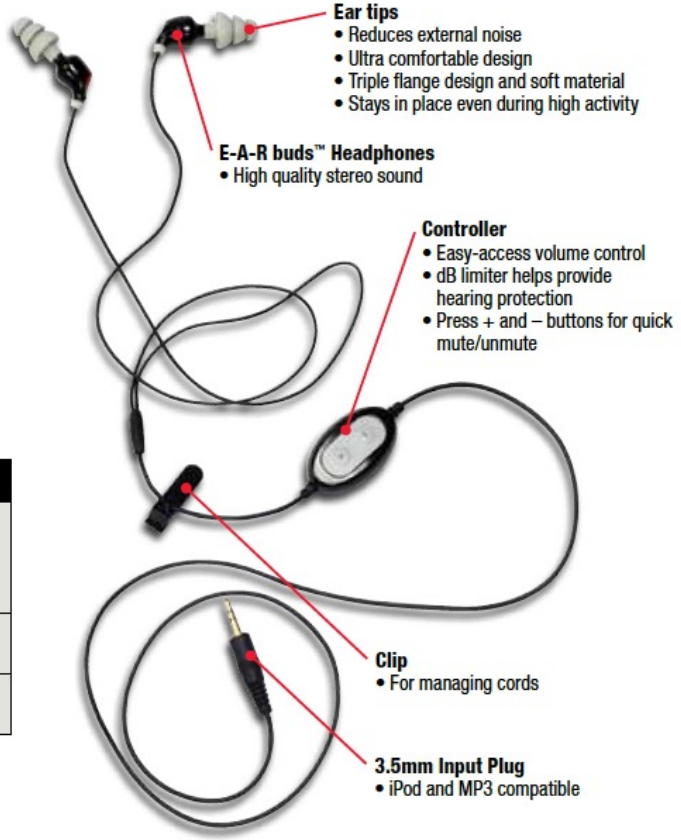
A great way to improve compliance with hearing regulations is to give your workers an incentive to keep their hearing protection in place.

With 3M™ Peltor™ E-A-R buds™ Headphones, your team members can listen to their favorite audio entertainment while wearing their hearing protection. An easy-to-use volume control with audio limiting technology keeps the sound at or below 82 dB. E-A-R buds headphones are comfortable to wear, long-lasting and include two noise isolating ear tip options. Connect to iPod® mobile digital devices, smartphones, MP3 players or any other device with a 3.5mm stereo audio jack.

Skull Screws™ ear tips also included.

Product Highlights:

- Compatible with any device with a 3.5mm stereo audio jack (e.g. smartphone, MP3, iPod).
- Includes two noise isolating ear tip options for greater comfort:
  1) 3M™ Peltor™ UltraFit™ Replacement Tips, Gray, NRR 20 dB,
  2) 3M™ Peltor™ Skull Screws™ Replacement Tips, Gray, NRR 29 dB.
- Convenient, easy-access volume control allows you to adjust internal sounds on the move.
- Audio muting option lets you shut off the sound at a touch.
- Durable lasting cable assemblies ensure long life for your investment.
- Output audio limited to a maximum sound pressure level (SPL) of 82 dB.



3M Stock Number	Product Number	Description
E-A-R buds		
70-0716-1473-2	EARbud2600N	3M Peltor E-A-R buds Noise Isolating Headphones, 1/Ea Included with product are 1 pair of UltraFit ear tips and 1 pair of Skull Screws ear tips
70-0716-1218-1	420-2096-25A	3M Peltor E-A-R buds Replacement Tips, UltraFit, Gray, NRR 20 dB, 25 pair/case
70-0716-1527-5	370-1019-10	3M Peltor E-A-R buds Replacement Tips, Skull Screws, Gray, NRR 29 dB, 10 pair/case

For more information in the United States, contact:
Technical Assistance: 1-800-665-2942 3M.com/PPESafety
Customer Care Center: 1-800-328-1667

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Situational Awareness

Distractions can be deadly.

Bone Conduction Headphones are among the newest innovations in the audio wearables market. Because of how innovative they are compared to regular headphones or earbuds, they are gaining in popularity. Most people don't know bone conduction headphones work with earplugs or the benefits.

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https://www.techevaluate.com/do-bone-conduction-headphones-work-with-earplugs/

Heat Illness

Ag workers are at particular risk for heat illness because of exertional heat stress.

Like athletes, during hard work, heat is built-up in the body.

This, plus the external (environmental) sources can cause heat-related illnesses.

Heat illness occur when the body can no longer cope, and the body's physical and mental functions break down.

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HEAT INDEX											
ENVIRONMENTAL TEMPERATURE (°F)											
	70°	75°	80°	85°	90°	95°	100°	105°	110°	115°	120°
Relative Humidity	**Apparent Temperature ***										
0%	64°	69°	73°	78°	83°	87°	91°	95°	99°	103°	107°
10%	65°	70°	75°	80°	85°	90°	95°	100°	105°	111°	116°
20%	66°	72°	77°	82°	87°	93°	99°	105°	112°	120°	
30%	67°	73°	78°	84°	90°	96°	104°	113°	123°		
40%	68°	74°	79°	86°	93°	101°	110°	123°			
50%	69°	75°	81°	88°	96°	107°	120°				
60%	70°	76°	82°	90°	100°	114°					
70%	70°	77°	85°	93°	106°	124°					
80%	71°	78°	86°	97°	113°						
90%	71°	79°	88°	102°	122°						
100%	72°	80°	91°	108°							

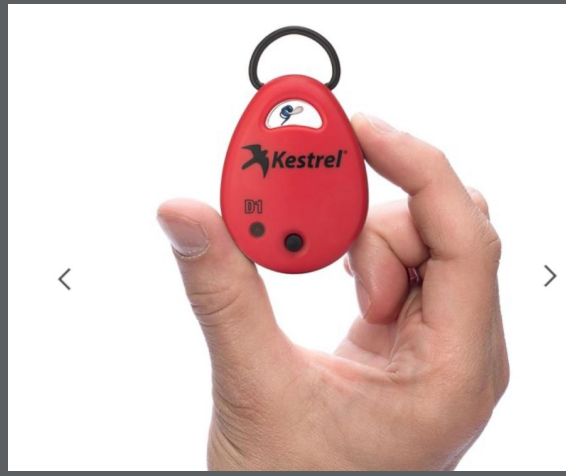
*Combined index of heat and humidity...what it "feels like" to the body. Source: National Oceanic and Atmospheric Administration

OSHA Heat Index Guidelines

HEAT INDEX	RISK LEVEL	PROTECTIVE MEASURES
Less than 91°F	Lower(Caution)	Basic heat safety and planning
91 to 103 °F	Moderate	Drink ~4 cups of water/hour Take breaks as needed
103 to 115 °F	High	Drink water every 15-20 minutes Take frequent breaks Schedule heavy work tasks when the heat index is lower
Greater than 115 °F	Very hight to extreme	Drink water frequently Reschedule non-essential heavy work if possible Alert workers to heat index for the day and identify precations in place including who to call for medical help

This guidance is available online at www.osha.gov/SLTC/heatillness/heat_index

Preventing Heat Illness



Kestrel DROP D1 and D2

$69 USD - $99 USD

32 Reviews

Kestrel D1 Blue -

Kestrel DROP *2015 Backpacker Magazine Editor's Choice Award*

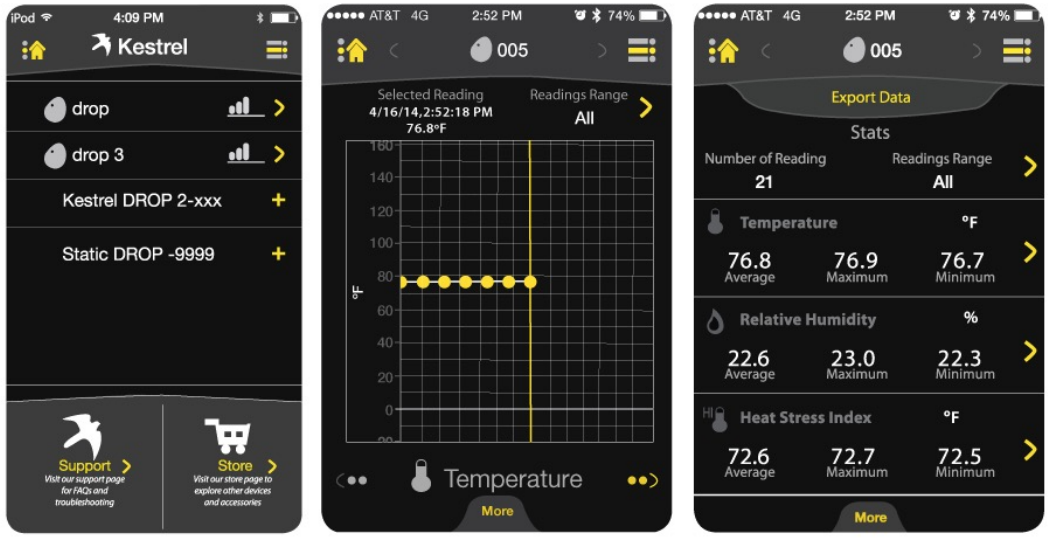
Log it. View it. Share it. Know Your Conditions.

Kestrel DROPs are small, rugged, and accurate environmental data loggers. The Kestrel Drop D1 targets many markets, Transportation, Agriculture, Firefighting, Facilities Management, Medical, Pharmaceutical, Consumer and others.
Made in the USA quality standards and durability from NK, manufacturer of Kestrel Meters, the applications are endless. From measuring...

DOWNLOAD THE FREE KESTREL CONNECT APP

Available on the iPhone App Store

- Requires iOS 6 installed iPhone 4s, iPAD 3rd Generation or iPOD Touch 5th generation - or any later iOS or hardware configuration.
- Will NOT work on iPhone 4, 3GS on 3G or any earlier iPAD or iPOD generation.
- Android App expected in early 2016



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Detecting Heat Illness

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Ergonomics

Fitting the tasks, tools and work environment to the workers.

Heart Rate Monitors

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Green Heron Tools

Women in Agriculture

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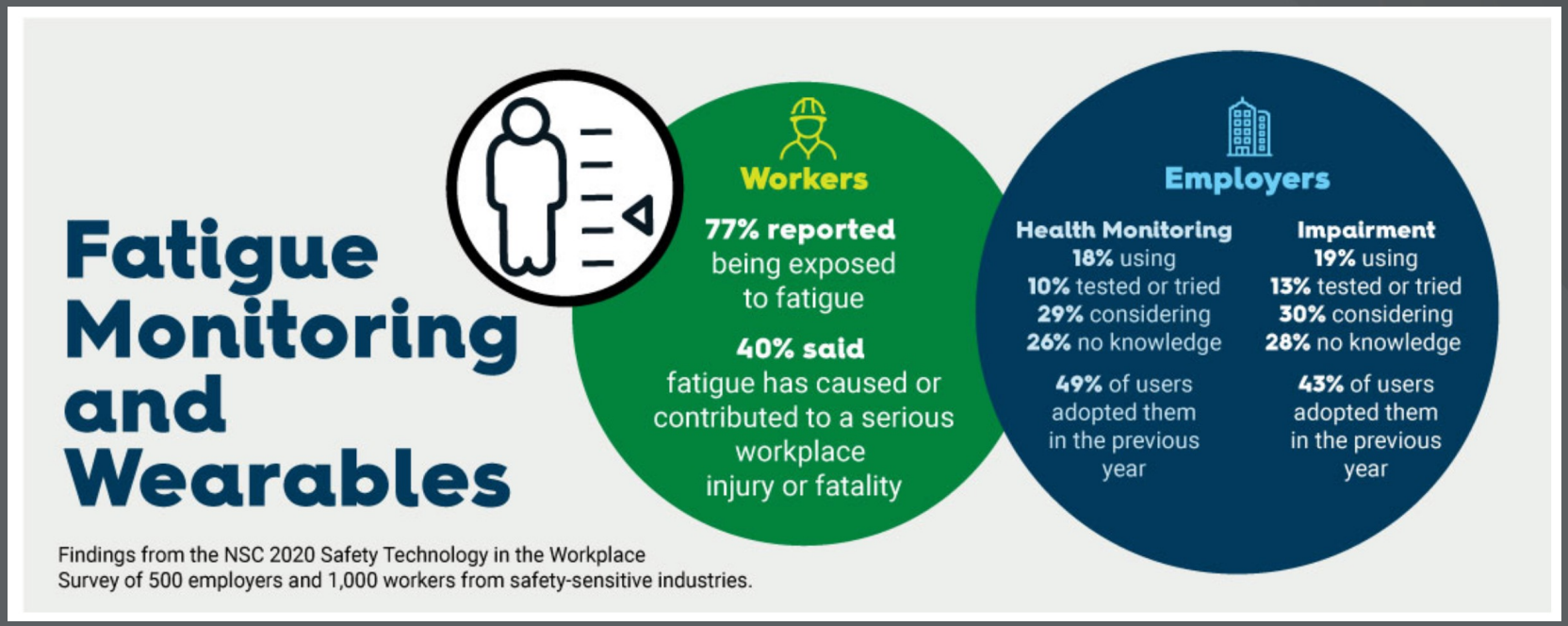
Fatigue



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https://www.nsc.org/workplace/safety-topics/work-to-zero/safety-technologies/fatigue-monitoring-and-wearables

Air Quality

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Enviro-Trackers Are a New Gadget Trend. What Do We Do With Them?

BY MARGARET RHODES 12.12.14 | 11:20 AM | PERMALINK

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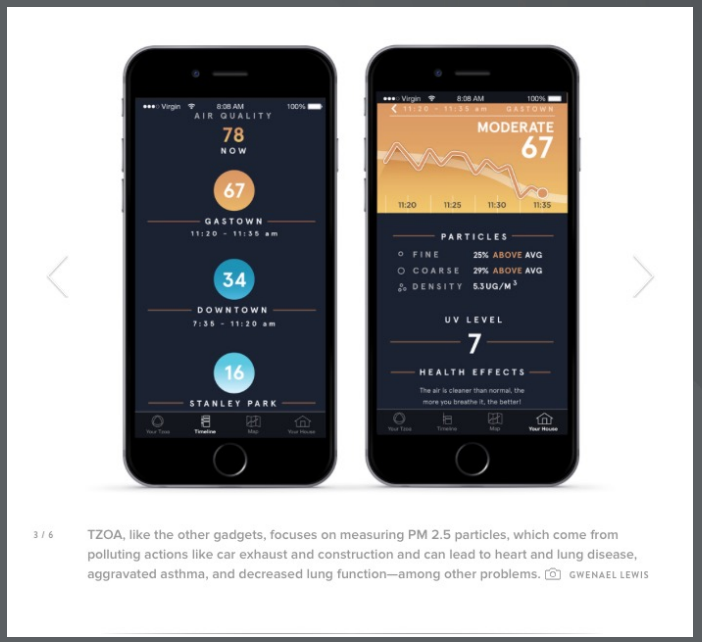
2 / 6 It's one in a new trend of gadgets that leverages the power of cheap sensors to collect data on the environment. GWENAEL LEWIS



3 / 6 TZOA, like the other gadgets, focuses on measuring PM 2.5 particles, which come from polluting actions like car exhaust and construction and can lead to heart and lung disease, aggravated asthma, and decreased lung function—among other problems. GWENAEL LEWIS

4 / 6 This problem is particularly important in China, where poor air pollution levels have led to a reported 1.2 million deaths. The Clarity, seen here, was designed with a Chinese user base in mind. CLARITY

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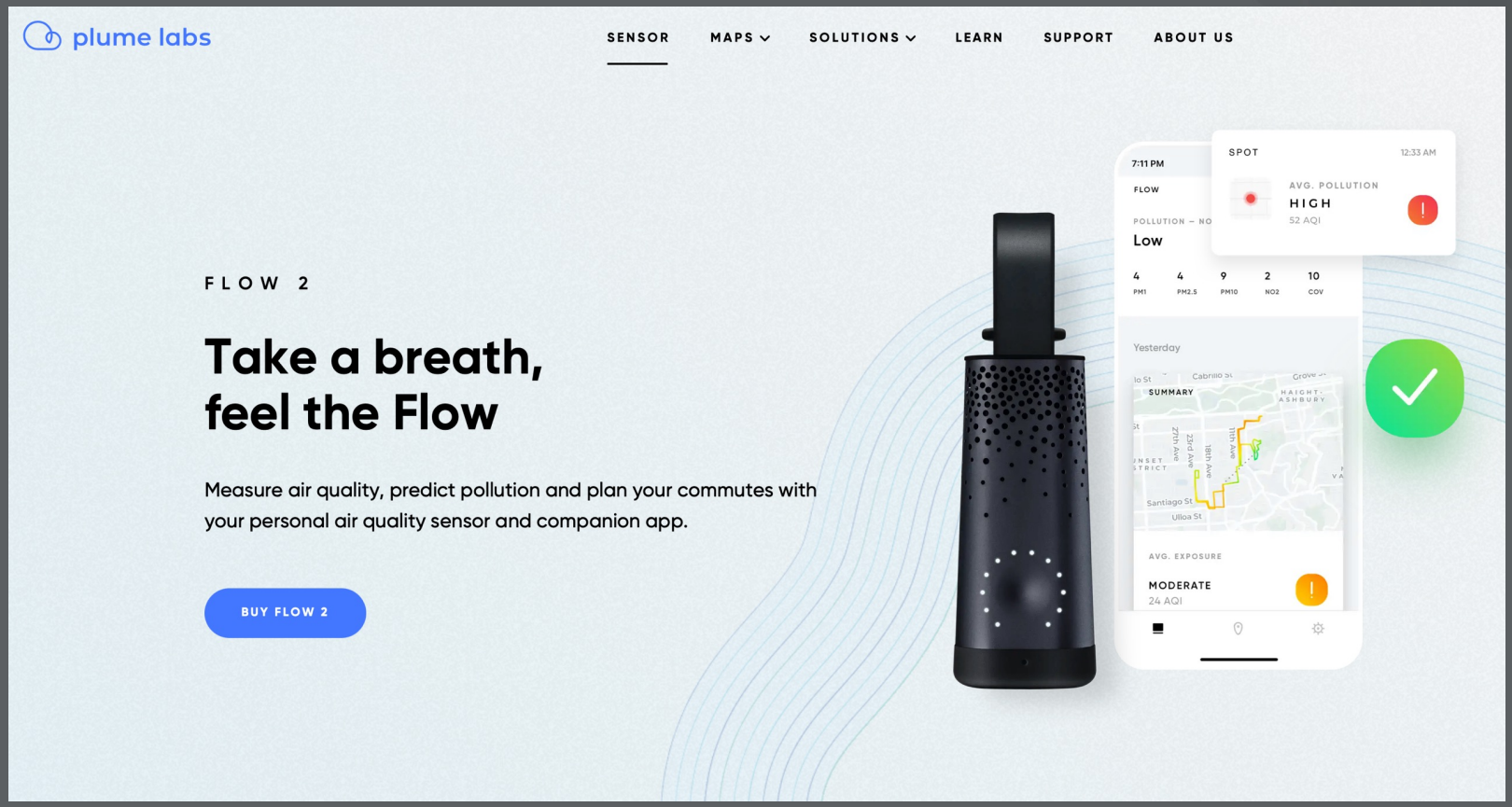
http://www.wired.com/2014/12/enviro-trackers-new-gadget-micro-trend

Air Quality



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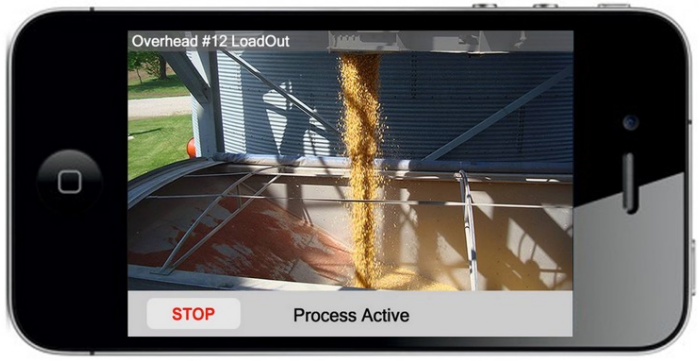
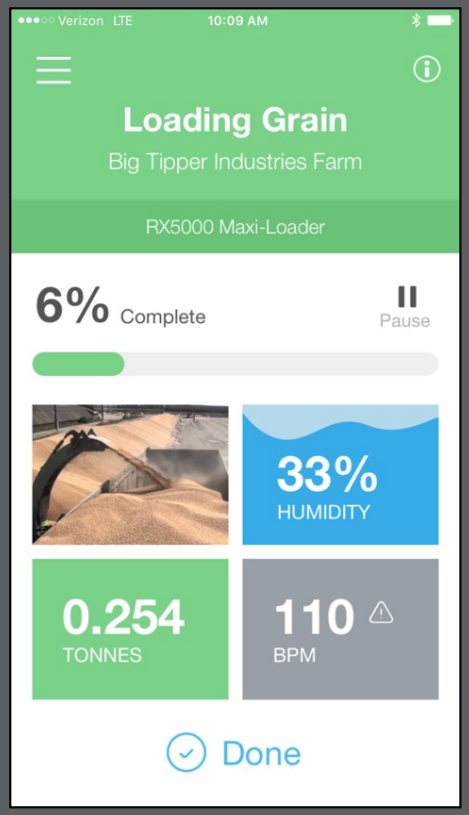
https://plumelabs.com/en/flow/

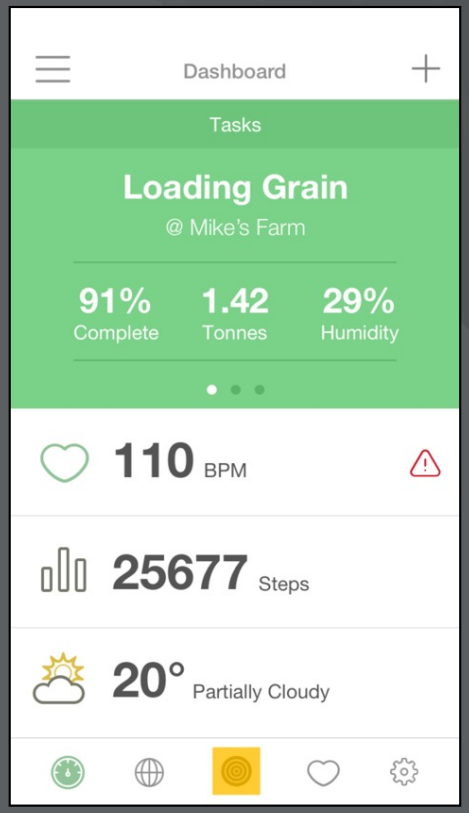
Automated Systems

Yellowbox – Loadout Technologies

Yellowbox







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Selecting Wearables and Apps

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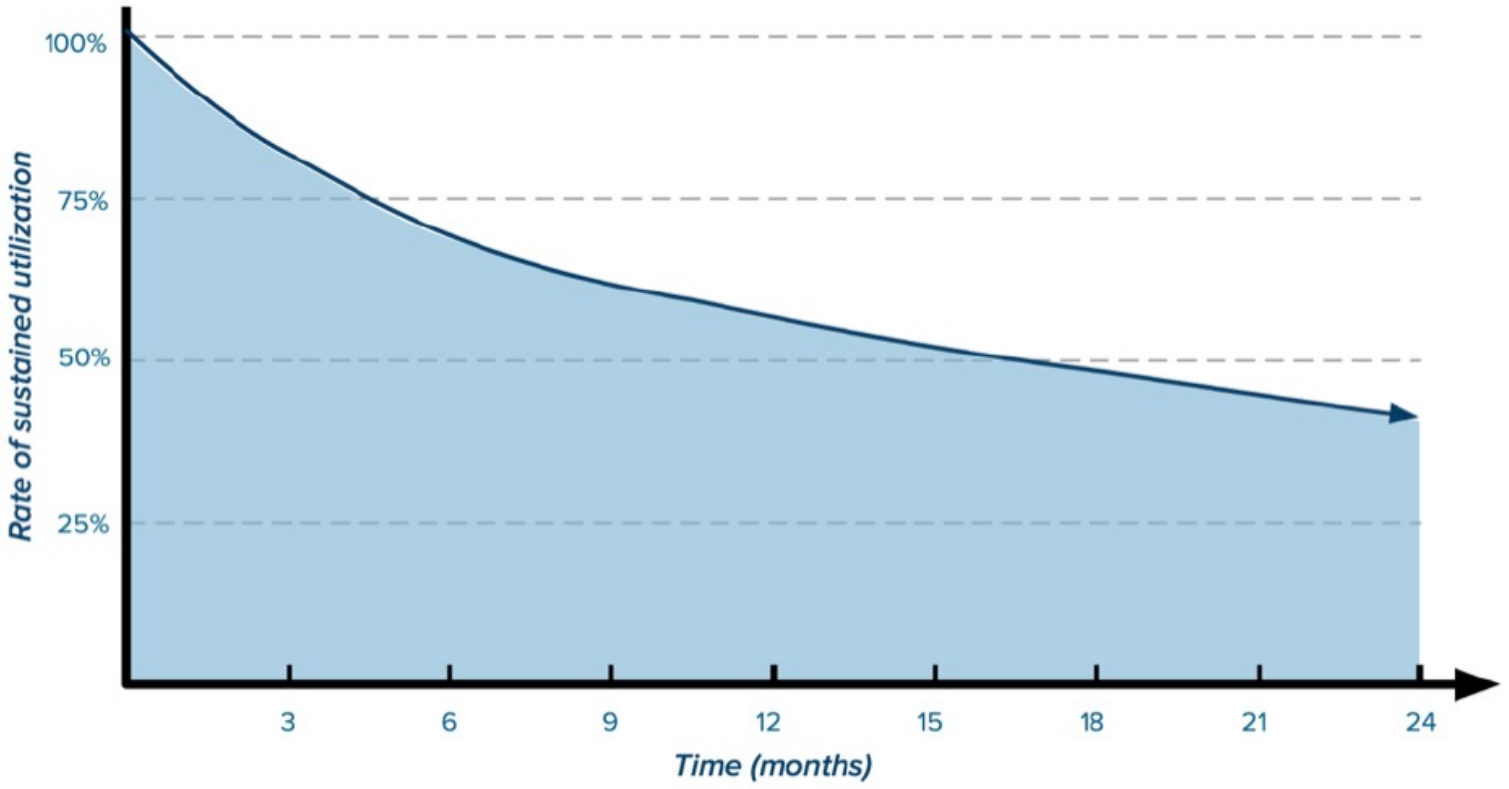
Wearables



Declining Rate of Sustained Activity Tracker Use Over Ownership

(Endeavour Partners, September 2013)

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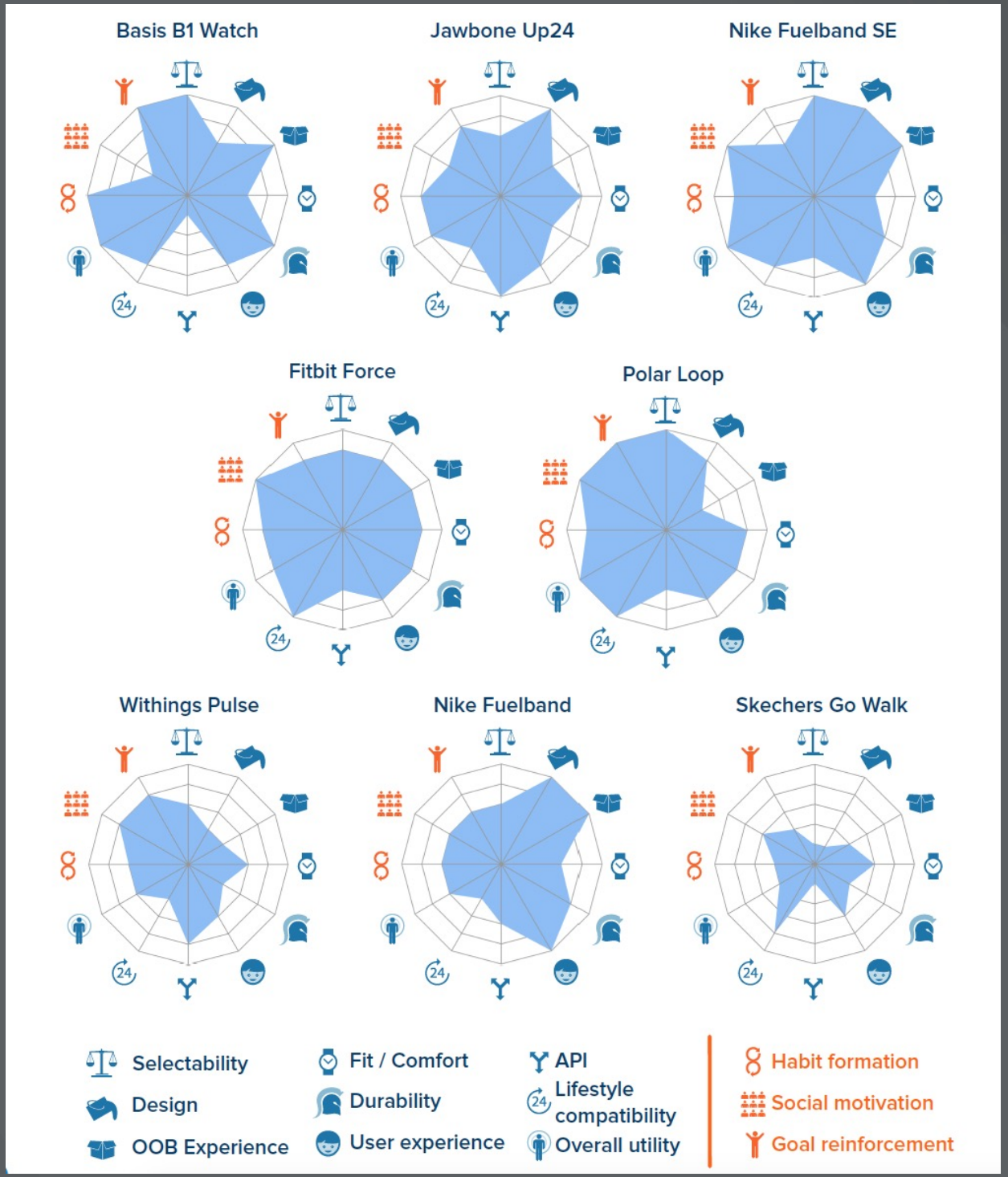

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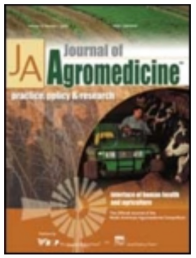

Journal of Agromedicine

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An Evaluation Tool for Agricultural Health and Safety Mobile Applications

Iris Reyes, Tammy Ellis, Aaron Yoder & Matthew C. Keifer

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Criteria	Category	Description
RELEVANCE	**Content**	Relates to the consistency, clarity and reliability of the data.
	Advances agricultural health and safety	Ability to be used for reference, prevention, education, calculations or entertainment to reduce agricultural workplace incidents, injuries or illnesses.
FUNCTION	**Technical performance**	Relates to the app functionality and its ability to be customized and calibrated.
	Usability	App effectiveness, efficiency, ease of navigation and learning its functions and cognitive burden.[9]
	Information delivery	App presentation of data and its ability to report and share information to the user, developer and other parties.
VALUE & PRIVACY	**Value**	The cost of the app to download, upgrade and control ad behavior.
	Advertisement	Delivery and behavior of advertisements such as phone setting modifications and data tracking. Also relates to user control options over ads such as Do Not Track (DNT) mechanisms that prevent or limit access of ad tracking networks.[10]
	Privacy disclosure	Transparency of the app developer in accessing user data such as geolocation, contact lists, calendar, photos, mobile usage, text and media files, unique user identifiers, etc. A privacy policy may include the type and amount of data being collected or shared, how the data will be used and to whom it will be shared.[10]
	Confidentiality	Relates to unique permanent and impermanent user identifiers and its encryption. In general, identifiers should not be used for advertising purposes.[10]

Rubric

	CATEGORY	1 (Poor)	2 (Fair)	3 (Good)	4 (Excellent)
RELEVANCE	**Content**	Content is not reliable, accurate and error-free	Some of the content is reliable, accurate and error-free	Content is generally accurate, reliable and error-free	Content is accurate, reliable and error-free
	Advances Agricultural Health and Safety	The app does not provide information to advance agricultural health and safety	The app provides limited information to advance agricultural health and safety	The app provides good information to advance agricultural health and safety	The app provides great information to advance agricultural health and safety
FUNCTION	**Technical Performance**	Multiple technical issues and does not function as described	Occasional technical issues, functions somewhat as described	Rare technical issues, generally functions as described	No technical issues and functions well as described
	Usability	Difficult to operate, demonstration and instruction are consistently required	Demonstration is required to operate, instruction is sometimes required and may be available	User can launch app, instruction is initially required and available but is not needed thereafter	User can launch and operate the app independently, no demonstration or instruction is needed
	Information Delivery	Cannot save, share or export data	May not save, share or export data	May not save but can share and export data	Can save, share and export data
VALUE & PRIVACY	**Value**	Costs to download, access and upgrade, and ads may be present	Free to download and access, in-app purchases required and ads are present	Free to download and access, no in-app purchases required, ads are present	Free to download and access, no in-app purchases are required and no ads
	Advertisement	Aggressive ads that modify settings without consent, has third-party tracking, no limit/block option	Ads modify settings without consent, third-party tracking, option to limit/block for a fee	Limited ads modify settings with consent, third party tracking, free option to limit/block	Limited or no ads or third party tracking, free option to limit/block
	Privacy Disclosure	No consent or disclosure, accessed data beyond what app needs to function, no privacy policy	No consent or disclosure, accessed data is beyond what app needs to function, privacy policy complex and hard to find	No consent but has disclosure, only accesses data that app needs to function, privacy policy is accessible	Consent and disclosure, only accesses data that app needs to function, privacy policy is easy to read and accessible
	Confidentiality	Permanent and impermanent identifiers are collected for advertising purposes, identifiers are not encrypted	Impermanent identifiers are collected for advertising purposes, identifiers are not encrypted	Impermanent identifiers are collected for advertising purposes, identifiers are encrypted	Identifiers are not collected for advertising purposes

CRITERIA	CATEGORY	Poor 1	Fair 2	Good 3	Excellent 4
RELEVANCE	Content	☐	☐	☐	☐
	Advances Agricultural Health & Safety	☐	☐	☐	☐
FUNCTION	Technical Performance	☐	☐	☐	☐
	Usability	☐	☐	☐	☐
	Information Delivery	☐	☐	☐	☐
VALUE & PRIVACY	Value	☐	☐	☐	☐
	Advertisement	☐	☐	☐	☐
	Privacy Disclosure	☐	☐	☐	☐
	Confidentiality	☐	☐	☐	☐

Calculator

Raw Score	0
Relevance Score	0.0
Function Score	0.0
Value & Privacy Score	0.0
Overall Score	0.0
5-point scale rating	**0**

Testing of Rubric and Calculator

n=13

Varied health and safety occupations

Familiar with apps

Android or iOS

Smartphone or tablet

http://i2.mirror.co.uk/incoming/article6228427.ece/ALTERNATES/s615/Young_child_using_phone.jpg

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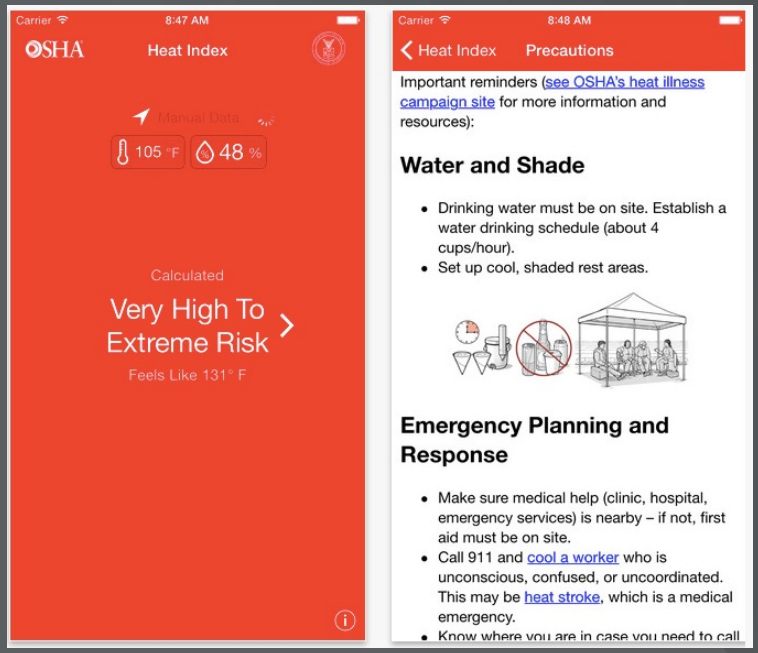
Apps Tested

OSHA Heat Safety Tool
https://www.osha.gov/SLTC/heatillness/heat_index/heat_app.html



NIOSH Ladder Safety
http://www.cdc.gov/niosh/updates/upd-06-17-13.html

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Feedback

Review will vary depending on platform and device type.

Lack of knowledge on data privacy…

"I have no idea how much the app might access information"

"I am not concerned with saving, exporting and sharing data because that is not their function"

"Re: privacy disclosure and confidentiality there should be a field for "n/a" because I could not find this info"

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Conclusions

Identifying apps/tech that truly are of value is key

We need to standardize the evaluation of ASH apps

Will benefit health and safety specialist, managers and workers

Available online at the National Farm Medicine Center website:
www.marshfieldclinic.org/nfmc
http://www.marshfieldresearch.org/nfmc/mobile-app-evaluation

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Apps Listed on eXtension.org

http://articles.extension.org/pages/69286/agricultural-safety-and-health-mobile-apps

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Agricultural Safety and Health Mobile Apps

Ag Safety and Health April 23, 2015 Print

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Mobile apps—computer applications that run on mobile devices such as smartphones—can be educational, fun, and easy-to-use, and they can help users improve agricultural safety and health. The number of safety and health mobile apps continues to grow in number and functionality. Below is a list of mobile apps that may be useful for agricultural safety and health:

Ag Safety Games

- Chicken ROPS Run iOS & Android App: is a fun and challenging arcade-style game with high-quality jet-pack-like game play that emphasizes the value of the tractor Rollover Protective Structure (ROPS) in saving farmers from critical injuries, and even loss of life
- Tractor ROPS Run iOS & Android App: This app reinforces principles of safe tractor operation.
- Fun Safety Games: Learn workplace safety skills through a variety of games.
- Keep Clive Alive: Test your reactions as you keep the little blue farmer out of harm's way.

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Safety Policies for School-based Supervised Agricultural Experiences Programs

Ag Safety & Health Apps

- CSP Quiz Game Plus: These quiz games are designed to help industrial hygienists prepare for the Board of Certified Safety Professionals comprehensive exam.
- Decibel 10th: This app turns an Apple mobile device into a sound meter.
- Equipment Inspection Mobile Phone App: Developed by the Farm and Ranch Safety and Health Association (FARSHA), this mobile app was designed to assist agricultural employers in conducting equipment inspections.
- Ezy MSDS Lite: Database for material safety data sheets; enter a product name to find related MSD. (Apple devices)
- FallClear LITE - Fall Arrest Clearance Calculators : This app provides fall arrest clearance calculators, tools for supervisors and workers trained in fall protection.
- FarmPAD Mobile App: This app can be used to store farm records, equipment service logs, and spray records or to take notes and pictures.
- Heat Safety Tool: The US Department of Labor, Occupational Safety and Health Administration (OSHA) released this app to enable workers and supervisors to calculate the heat index for their worksites and learn about protective measures to reduce the risk of heat-related illnesses.
- Job Safety Analysis: This iPad app was designed for business managers to increase efficiency through a Job Safety Analysis (JSA) or the Safe Work Method Statement.
- Ladder Safety: The National Institute for Occupational Safety and Health released this app to improve extension-ladder safety.
- LightMeter: Easy to use light meter, allowing you to measure lighting levels. (Apple devices)
- Machinery Sizing: This app estimates tractor horsepower to pull implements.
- Material Safety Data Sheets: Database for material safety data sheets; enter a product name to find related MSD. (Android devices)
- NIOSH Pocket Guide to Chemical Hazards for iPad: This app provides a source for general information about industrial hygiene.
- Respiratory Protection Resource: Quick reference guide to identify respiratory protection that may be needed when handling certain chemicals, as well as information on qualitative fit testing of respirators.
- Sound Meter: Easy to use sound meter that measures SPL (sound pressure level) in decibels (db). (Android devices)
- Winter Survival Kit: If you are stranded in severe winter weather, this app can help you find your location, call 911, notify emergency contacts, and calculate how long you can keep a vehicle's engine running to stay warm.
- WorkSafeBC Safety Videos: This app offers access via a mobile device to more than 150 WorkSafeBC workplace safety videos.

Ag Education Apps

- My American Farm: A variety of agricultural based games for all ages.

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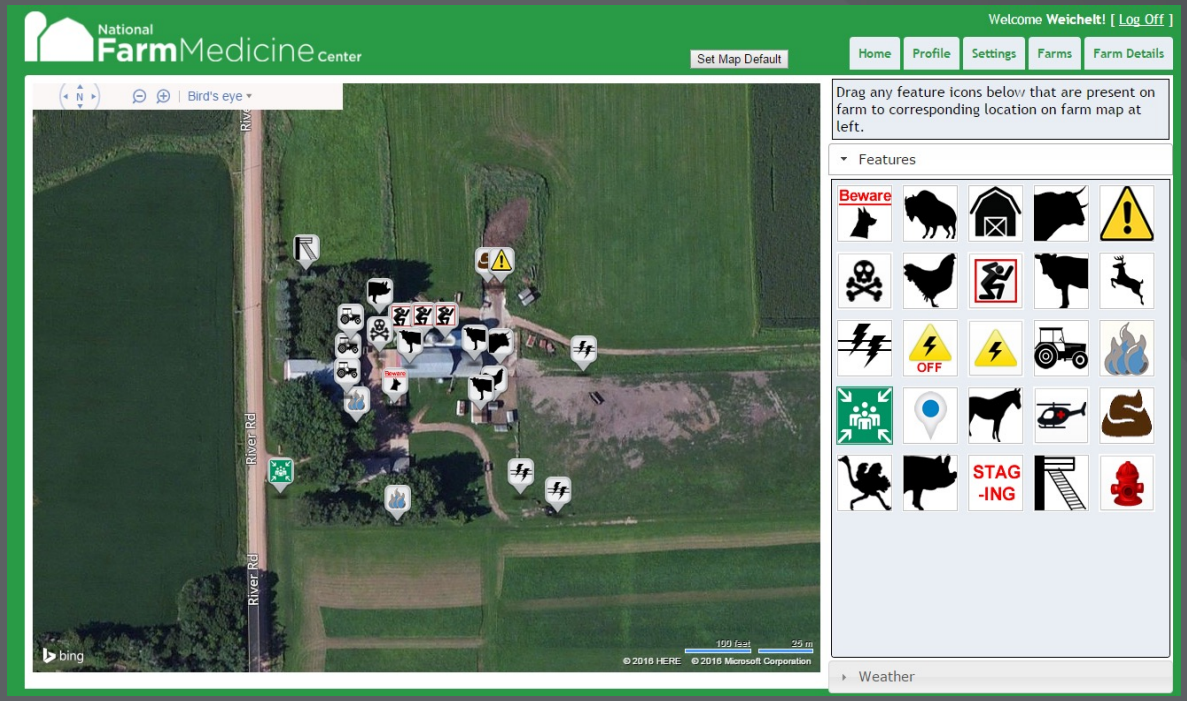
Farm MAPPER

WHAT IS IT?
Farm Mapping to Assist, Protect and Prepare Emergency Responders (Farm MAPPER) is an interactive, device-agnostic, web-based prototype that was developed to information about hazards, resources and the physical environments of agricultural operations.



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http://www.nfmcfarmmapper.com/Account/LogOn

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Sharing time!

Aaron M. Yoder, PhD
aaron.yoder@unmc.edu

The Farm Labor Dashboard

THE FARM LABOR DASHBOARD IS HOSTED BY:

THE UNIVERSITY OF VERMONT EXTENSION

COLLABORATIVE PARTNERS:

THE OHIO STATE UNIVERSITY

CIAS CENTER for INTEGRATED AGRICULTURAL SYSTEMS

PennState

NH Extension

NORTH CAROLINA AGRICULTURAL AND TECHNICAL STATE UNIVERSITY

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