PICS: Post-Image-Collection Specification for Agricultural Remote Sensing



PICS in a Nutshell PICS seeks to take the friction and guesswork out of using remote sensing in agriculture.

It uses an existing format (GeoTIFF) and metadata tags defined within it to specify what images **mean.**

The main deliverable of PICS is a freely-available implementation guideline.

"Before PICS we had to talk to the customer for hours, even days, to understand the content of their images, and everyone got frustrated. With PICS it takes seconds, and the computer does it alone." –Nathan Stein, senseFly



Maximize the Value of your PICS! *Implement this new standard to better extract data from remote images*

Remote sensing imagery has the potential to deliver great value to growers. Images from satellites, airplanes, and unmanned aerial systems ("drones") can be used to detect drought, pest damage, flooding, spatial patterns of canopy growth, and provide growers with an edge in crop management.

Growers need seamless interoperability to bring the images into their farm management information systems (FMIS) and convert them into actionable information in a straightforward way. This should happen regardless of the system manufacturer.

Remote sensing data formats have reached a point where they can describe the **geometry** of an image very accurately: the location of any image pixel is typically very clear to an FMIS without any human intervention. This is the natural consequence of decades of industry experience using imagery for photogrammetry and other mapping-related purposes.

The **meaning** of the data is a different problem, however. Over time images have become more complex: the black-and-white pictures used in photo-grammetry have given way to complex multispectral images involving red, green, blue, and infrared bands, often with very specific wavelengths and band widths. **The usability and scalability of remote sensing solutions in ag are often limited by incomplete descriptions (metadata) of this complexity;** i.e., the grower's FMIS can't automatically understand what the image means. The user has to get involved, and that leads to inefficiency and frustration.

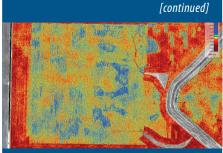
PICS, a project of AgGateway's Precision Ag Council was chartered to tackle the problem. It was organized following a simple plan:

- Agree on gaps in current remote sensing image data that lead to interoperability pain points.
- Agree on a stepwise strategy to tackle the problem, based as much as possible on existing standards.
- Narrow the scope; focus initially on a single, popular image format.
- Create implementation guidelines as PICS' main deliverable.

Gaps and pain points

PICS focused on fundamentals with immediate impact for the industry: ensuring we can understand **when** an image was taken, **where** it was taken, **what** bands it contains and in what order, and identifying if the writing software is PICS-aware. Future PICS phases may involve creating a registry of derivative products (NDVI, etc.), expressing mathematical conversions from digital values to reflectances or irradiances, and so forth.

PICS



Modified Triangular Vegetation Index (MTVI) showing moisture in a corn crop captured by a drone in late season.

The PICS Deliverable

PICS members wrote an implementation guideline showing how to use GeoTIFF tags to solve the pain points in scope. Find it at http://bit.ly/2z90aeD or scan the QR code below.



PICS Members

As of November 17, 2017

Ag Connections, Ag Leader, Agrian, Agritrend, BASF, Bayer, DuPont Pioneer, Entira, Farmers Mutual Hail, John Deere, Land O' Lakes, Planet Labs, senseFly, Syngenta, SSI, Wilbur-Ellis

Questions?

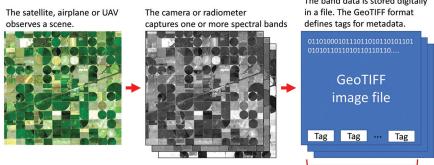
Email us at: pics.feedback@aggateway.org

For more information, including materials for joining PICS, visit: http://www.aggateway.org

www.AgGateway.org Member.Services@AgGateway.org Phone: (+1) 866.251.8618 Twitter: @AgGateway

Scope, and how PICS works to enable data conversion

PICS narrowed its scope to GeoTIFF, a popular, royalty-free format with a sophisticated tagging system. The figure below shows how PICS uses it.



PICS' deliverable is an implementation guideline to ensure the tags are used consistently and convey information needed by FMIS software: band definitions, band order, geometry and acquisition time.

Pain points and the GeoTIFF tags used to solve them

Pain point	Why it hurts	The PICS solution
Band order	Identifying individual bands in multi-channel images often requires a sidecar file or arbitrary naming conventions.	Implement the standard tag Xmp.Camera.BandName
Band Definition	An accurate description of a band's width and central wavelength enables knowing if it can be used to make specific indexes and other products.	Implement two standard tags: Xmp.Camera.CentralWavelength Xmp.Camera.WavelengthFWHM
Acquisition Time & Duration	Knowing when an image was captured helps sort files for proper analysis, and flag / filter unwanted data. This is important with long UAV acquisition times.	Implement three standard tags: Exif.GPSInfo.GPSDateStamp Exif.GPSInfo.GPSTimeStamp Xmp.Camera.AcquisitionDuration
Projection Information (Geolocation)	It's critical to locate individual image pixels, and support multiple coordinate systems and projections.	PICS chose the GeoTIFF image format because it natively enables the needed functionality.
PICS compliance & version	Can the FMIS trust that the tags are used in a PICS-compliant way?	A private AgGateway tag is added to the image See the implementation guide for details.

More PICS features

- All the PICS metadata is contained within the GeoTIFF file itself: there are no sidecar or auxiliary files to lose!
- Most of the tags used by PICS are standard XMP or EXIF standard tags, and can be read with open-source tools like GDAL.
- The metadata is public domain, and the format is free to use.
- The PICS approach enables adding AgGateway field operations data to the image. This can grow in the direction of including weather data, scouting, etc.

If you are interested in remote sensing in ag, contact us! Learn more about the project and implement

this standard in your organization!

