xine

The Spectral Advantage in Agriculture

Single-date crop classification, pre-symptomatic stress detection and nutrient mapping at 8 metre resolution with daily revisit.

Agriculture

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Contents

Introduction

This paper sets out how hyperspectral imaging supports agricultural production, and how Axine Laboratories applies satellite spectroscopy to crop classification, pre-symptomatic stress detection, nutrient and water status mapping, and yield assessment. It is written for agronomists, farm and estate managers, agribusiness analysts, insurers and agencies administering agricultural programmes.

A maize block under a working sky. One prescription per field has been the default largely because one measurement per field is what has been available.

Motivation: the margin between what is grown and what is harvested

The Food and Agriculture Organization estimates that plant pests and diseases reduce global crop yields by between 20 and 40 per cent every year. Plant diseases cost the world economy more than 220 billion US dollars annually, and invasive insects at least a further 70 billion[1]. These are losses on crops already sown, already irrigated and already fertilised, which makes them the most recoverable losses in the food system.

Input efficiency tells a similar story. Global mean nitrogen recovery efficiency sits at around 48 per cent, meaning roughly half of applied nitrogen is not taken up by the crop it was bought for, and modelling indicates that optimal nutrient, crop and soil management could lift that figure toward 78 per cent[2]. A synthesis of more than 1,500 field observations found that a package of management measures could cut nitrogen losses to air and water by 30 to 70 per cent while raising yield by 10 to 30 per cent[3]. The obstacle is not the agronomy. It is knowing which part of which field needs what, at the time the decision is made.

The exposure sits on top of a sector already absorbing shocks. FAO assessment puts disaster-related losses to global agriculture at 3.26 trillion US dollars over three decades, and around 645 million people were affected by hunger in 2025[4].

Precision agriculture exists to close these gaps, and its constraint has always been observation. Soil sampling grids, tissue tests and scouting are accurate where they are taken and silent everywhere else, and by the time a scout finds a disease focus it has usually been developing for a fortnight. Satellite hyperspectral imaging measures crop biochemistry directly, across whole holdings, at a within-field scale, on a cadence set by orbital revisit.

What is hyperspectral imaging?

A crop canopy is a chemical assembly that changes through the season, and its reflectance spectrum records that chemistry. Chlorophyll absorbs in the blue and red. Carotenoids and anthocyanins, which accumulate under stress, absorb in narrow regions of the visible spectrum. Leaf water absorbs in the near and short-wave infrared. Nitrogen, protein, cellulose and lignin absorb between 2100 and 2400 nanometres. Between the red and the near infrared sits the red edge, whose position shifts with chlorophyll concentration and is the single most informative feature in agricultural remote sensing.

Conventional imagery samples that spectrum too coarsely to separate its parts. An RGB sensor records three broad bands. A multispectral sensor records between four and twenty, each tens of nanometres wide. Hyperspectral sensors divide the spectrum into hundreds of contiguous narrow bands, each typically under 10 nm, producing a complete spectrum for every pixel.

A comparison of RGB, multispectral and hyperspectral imagery.

Type	Number of bands	Bandwidth (FWHM)	Wavelength range
RGB	3	~50-70 nm	450-700 nm
Multispectral	4-20	~15-35 nm	400-2350 nm, discontinuous
Hyperspectral	100-500+	Under 10 nm	400-2500 nm, contiguous

The operational difference is the distinction between vigour and cause. A broadband index reports that part of a field is performing below the rest. Nitrogen deficiency, water stress, compaction, disease and pest damage all depress that index, and the index cannot tell them apart. Narrowband pigment, water and protein features respond differently to each, which is what allows an anomaly to be attributed to a cause and therefore to a prescription.

It is also the difference between one image and a season of images. Distinguishing spectrally similar crops or varieties from broad bands generally requires a multi-date phenological time series, because the separation comes from how the crops develop rather than from how they reflect. Full spectra carry enough biochemical detail to separate many of them from a single acquisition, which matters when cloud has taken the critical dates out of the record.

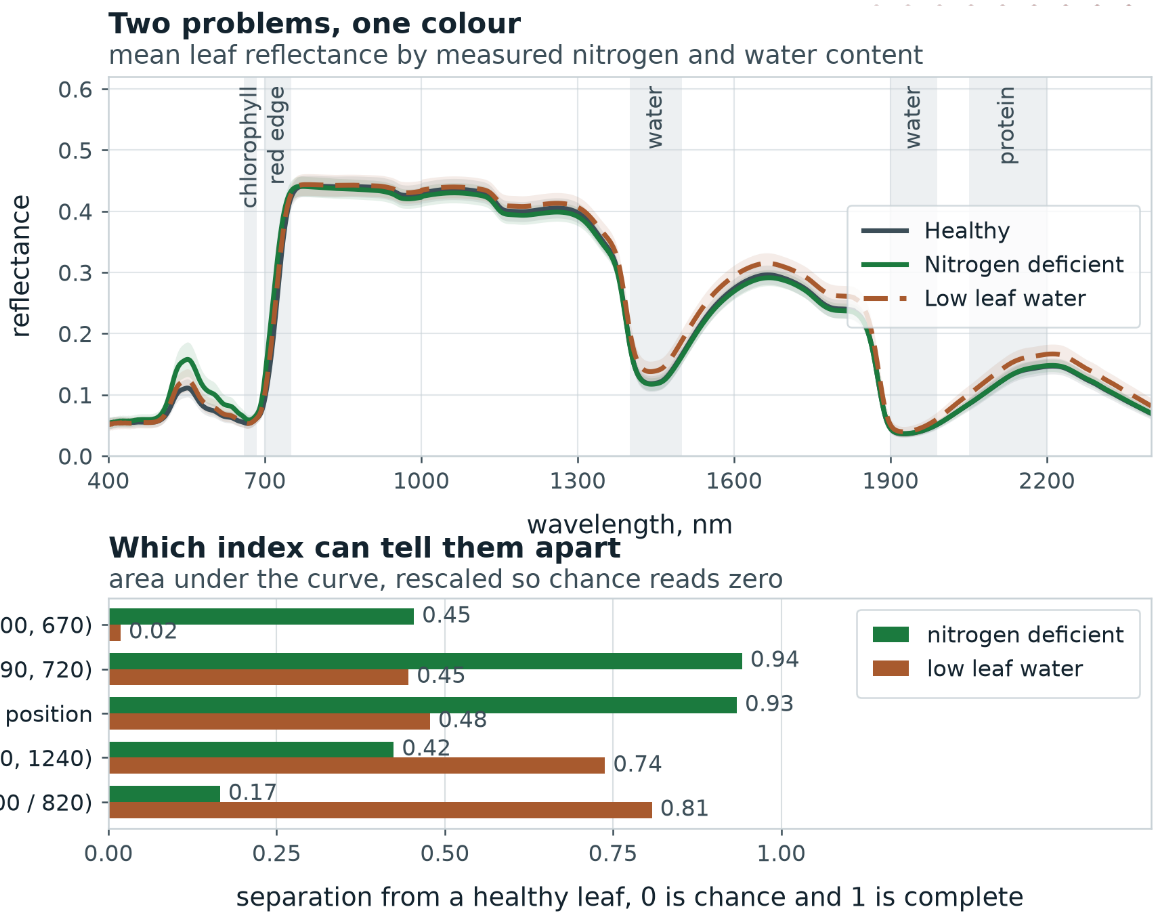
The tasked acquisition tier

For operational monitoring, Axine acquires imagery from a commercial hyperspectral constellation of six identical microsatellites offering:

- 472 contiguous spectral bands across the full visible to short-wave infrared range, 400 to 2500 nm, covering the pigment, water, nitrogen and residue features together.
- 8 metre ground sample distance in the hyperspectral channels, the finest commercially available hyperspectral resolution currently in orbit.
- 3 metre panchromatic imagery co-acquired for spatial context and field boundary definition.
- Revisit of up to daily for most locations worldwide, with directed tasking over a specified holding.

Resolution determines the management unit. At 30 metres a pixel spans nearly a hectare, which resolves field-to-field difference and averages away the within-field variation that variable-rate application exists to exploit. At 8 metres a pixel covers roughly 64 square metres, which sits comfortably below the scale of the management zones most equipment can act on and comfortably below the scale at which a disease focus becomes economically significant.

The full short-wave infrared range to 2500 nm matters as much as the resolution. Nitrogen, protein, cellulose and lignin features sit between 2100 and 2400 nm, and they carry the residue, soil organic matter and canopy nitrogen information that sensors stopping short of that range cannot reach.



Groups are set by destructive measurement, not by the spectra: nitrogen per cent and water held per unit leaf area, each stress group holding the other trait high so the contrast is attributable. The brief for this figure expected both problems to depress a broadband index similarly. They do not. NDVI separates nitrogen deficiency from healthy at 0.45 and low leaf water at 0.02, which is chance: a leaf can lose a quarter of its water with no broadband response at all. The red edge separates nitrogen at 0.94 and the shortwave water bands separate dryness at 0.74 to 0.81, and no single index does both. The argument for narrowband is two axes, not one better number. Leaf spectra carry no canopy structure, soil or shadow, so these bound what the same bands do over a field.

Figure 1 — *Leaf reflectance for healthy, nitrogen-deficient and water-stressed material, with the groups set by destructive measurement rather than by the spectra. NDVI separates nitrogen deficiency at 0.45 and low leaf water at 0.02, which is chance. The red edge separates nitrogen at 0.94 and the shortwave water bands separate dryness at 0.74 to 0.81: two axes, not one better number.*

Challenges in agricultural production

Growers and agribusinesses are being asked to raise output, cut input use, document their practices and absorb more weather volatility, all at once. The constraints below are the ones satellite spectroscopy is well positioned to relieve.

Stubble and wheelings running back to the yard. Establishment decisions are made on ground whose variability is already present, and mostly unmeasured, before the crop goes in.

+ **Inputs applied without field-level evidence:** Fertiliser, water and crop protection are applied against estimates rather than measurements across most of the world's cropland. Uniform application across a variable field overspends on the strong parts and underserves the weak ones.
+ **Detection after symptoms appear:** Scouting finds a disease or infestation focus once symptoms are visible, by which point the intervention window has narrowed and the treated area has grown. Earlier detection changes both the cost and the chemistry of the response.
+ **Point sampling against a variable field:** Soil tests and tissue samples are precise at a point and are extrapolated across areas that are not uniform. Nutrient and moisture variation within a single field is frequently larger than the variation between fields.
+ **Yield uncertainty:** Yield forecasts drive procurement, storage, logistics and pricing decisions, and forecasts built on sparse observation carry a risk premium that is paid somewhere in the chain.
+ **Verification and reporting:** Sustainability schemes, carbon programmes, subsidy regimes and buyer requirements increasingly ask for evidence of what was grown and how, at plot level, rather than for declarations.

- **Climate volatility:** Drought, heat, flood and shifting pest ranges are raising variance in outcomes, and management responses depend on knowing which parts of a holding are affected while there is still time to respond.
- **Programme administration at scale:** Programme administrators and insurers must verify claims across large areas and many holdings, where field inspection is neither affordable nor timely.

Hyperspectral imagery in action

Across the growing season, hyperspectral imagery supports three fundamental capabilities.

+ **Detection:** Identifying stress, disease, pest damage, weed patches and anomalies across the full extent of a holding, including in parts of a field no one has walked this season.
+ **Classification:** Determining crop type and variety, and separating stress causes from one another so that an anomaly maps to a prescription rather than to a question.
+ **Quantification:** Measuring canopy chlorophyll, leaf nitrogen, leaf area index, canopy water content and residue cover as continuous surfaces rather than as plot values.

The table below sets out the spectral regions used in agricultural analysis, the parameters diagnosed in each, and their significance.

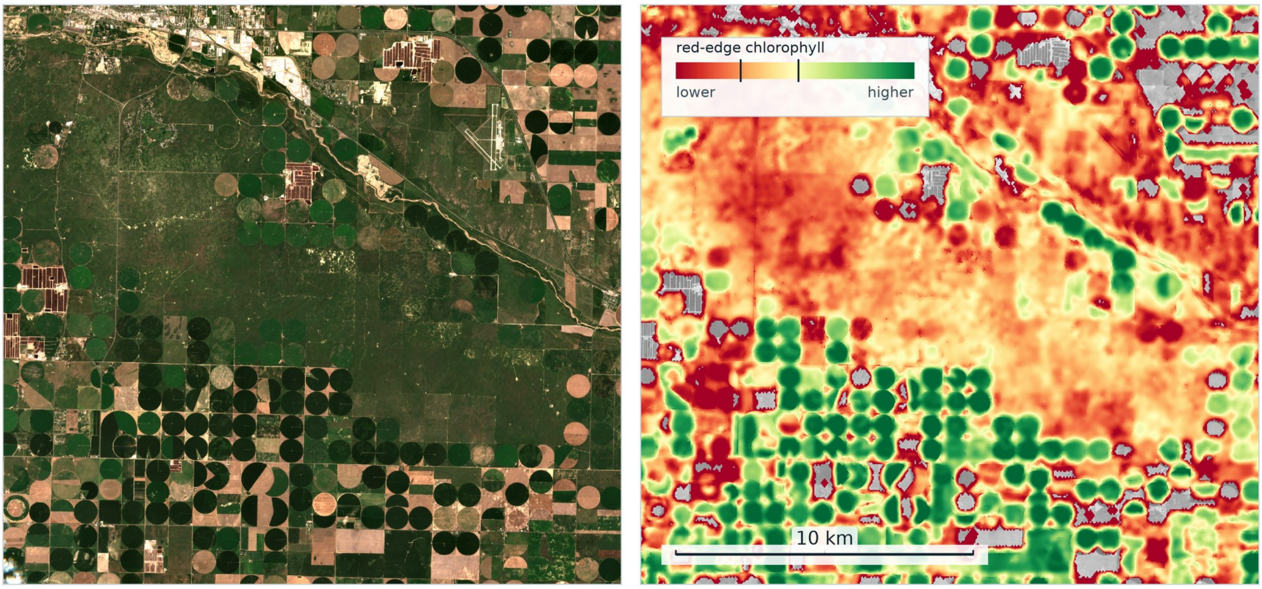
Diagnostic spectral regions and their significance in agriculture.

Band group	Wavelength (nm)	Parameter	Significance
Blue	450-490	Chlorophyll a and b	Pigment status, ripening and senescence onset
Green	510-550	Leaf nitrogen, carotenoids, total chlorophyll	Photosynthetic activity and nitrogen status
Red	670-680	Chlorophyll absorption maximum	Canopy greenness and biomass
Red edge	700-730	Chlorophyll content and stress	The most sensitive region for nitrogen status and early stress
NIR	750-900	Leaf area index, biomass	Canopy structure, vigour and yield potential
NIR	915-975	Leaf water content	Hydration status and early water stress
FNIR	1100-1300	Canopy water sensitivity	Water status under partial canopy cover
SWIR	1450, 1940	Canopy water absorption	Direct canopy water content measurement
SWIR	1600-1750	Plant water stress, cellulose	Irrigation scheduling and drought response
SWIR	2100-2300	Nitrogen, protein, cellulose, lignin	Canopy nitrogen, soil organic matter and residue discrimination

Axine layers are released progressively and each carries an explicit validation posture, described in section 8.

One flat green
true colour, irrigated cropping district

The same fields, ranked
red-edge chlorophyll over the identical ground



The brief asked for canopy nitrogen. This product has no nitrogen retrieval, so none is drawn: the right-hand panel is a red-edge chlorophyll index, which responds to canopy nitrogen among other things and is not a measurement of it. It is drawn continuously over 439,187 closed-canopy pixels, with the two tercile breaks marked on the key so a three-zone map can be read straight off it; the ranking is relative to this district on this date. The pairing is the argument: in true colour the circles read as one green, and a broadband index agrees, sitting at a median of 0.75 with 64 per cent of the crop above 0.70. The red-edge layer spreads the same canopy across its full range. The 60 m values are edge-aligned to the 10 m optical image so a zone boundary falls on a field boundary; every number above is counted on the 60 m pixels before any smoothing, and ground with no closed canopy is left unpainted rather than coloured.

Figure 2 — *An irrigated cropping district in true colour, beside a red-edge chlorophyll index over the identical ground. In true colour the circles read as one green and a broadband index agrees, sitting at a median of 0.75. The red-edge layer spreads the same canopy across its full range, with tercile breaks marked so a three-zone map reads straight off the key.*

Hyperspectral versus multispectral imaging in agriculture

Multispectral imagery is the established basis of satellite crop monitoring and performs that role well for vigour, extent and change. Hyperspectral imagery extends it into biochemical measurement and cause attribution, because separating pigments, water and protein signals requires bands narrower than the features that distinguish them.

Parameter	Multispectral imaging	Hyperspectral imaging
Crop classification	Reliable with a multi-date phenological series	Achievable from a single acquisition, including similar varieties
Vegetation stress	General indication through broadband indices	Early detection through narrowband pigment and water response
Stress attribution	Not resolvable	Nutrient, water and biotic stress differentiated
Disease and pest	Established outbreaks	Pre-symptomatic detection through anomaly against expected spectra
Nitrogen status	Broad greenness proxy	Canopy nitrogen through red edge position and protein features
Canopy water	Coarse moisture indices	Direct water absorption measurement at 1450 and 1940 nm
Soil and residue	Bare soil and vegetation separation	Residue, cover crop and bare soil discriminated by cellulose and lignin features
Weed detection	Large infestations	Patch-scale discrimination within the crop canopy
Spatial detail	10-30 m typical	8 m, resolving within-field management zones
Revisit	Fixed orbital schedule	Directed tasking, up to daily for most locations

The distinction is a matter of physics rather than vendor preference: biochemical discrimination requires narrow contiguous bands, and narrow contiguous bands are what defines a hyperspectral sensor.

The Axine analytical method

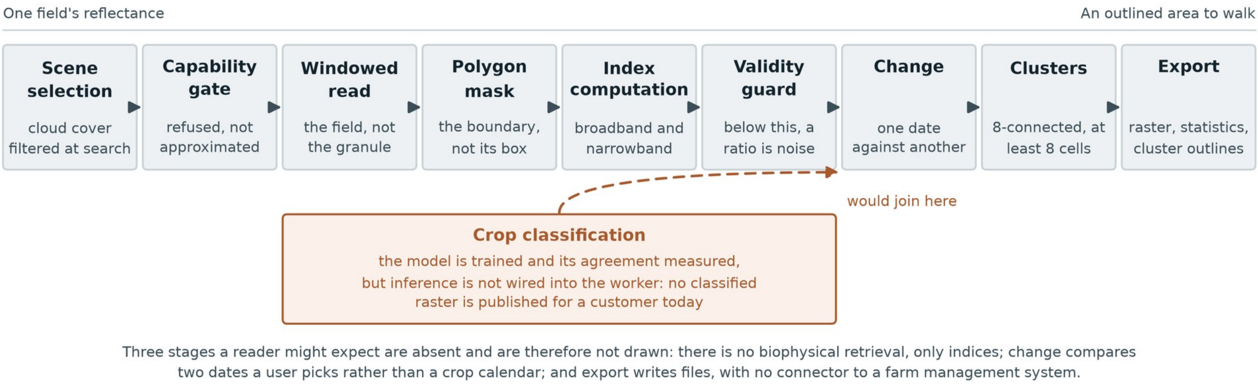


Figure 3 — *The processing chain, from one field's reflectance to an outlined area to walk. Three stages a reader might expect are absent and so are not drawn: there is no biophysical retrieval, change compares two dates the user picks rather than a crop calendar, and export writes files rather than connecting to a farm management system.*

Reflectance and screening

Imagery is ingested from any supported sensor and reduced to surface reflectance. Cloud, cloud shadow, non-agricultural cover and, where required, non-crop features within the field are screened, and screened ground is reported explicitly as not evaluated rather than as unremarkable.

Narrowband index computation

Pigment, red edge, water and residue indices are computed at native spectral resolution, resolving bands by wavelength rather than by band number, so identical definitions apply across every supported sensor. Every ratio-based layer carries a validity floor, so that unwritten or near-zero cells cannot divide out into apparent maximum readings.

Biophysical and biochemical retrieval

Leaf area index, canopy chlorophyll, leaf nitrogen and canopy water content are retrieved from the full spectrum and delivered as continuous surfaces. These parameters underpin most of the downstream products, which is why they are built as a shared layer rather than recomputed per application.

Crop classification

Crop type and, where the spectra support it, variety are classified from full spectra rather than from a small band set, with red edge position as a principal derived feature. Classification is calibrated per region and reports per-pixel confidence alongside the class, so that a field with an ambiguous signature is visibly ambiguous rather than confidently wrong.

Anomaly detection against expected state

Pre-symptomatic disease and pest detection works by comparing measured spectra against the expected spectrum for that crop at that growth stage, and flagging departures. This requires a phenology-indexed spectral reference, which is a data asset built from matched imagery and field records rather than a formula. Axine treats that reference library as a core part of the product rather than as a preprocessing detail.

Zone generation and prescription support

Continuous surfaces are aggregated into management zones at a resolution that matches application equipment, and exported in formats that variable-rate controllers and farm management systems accept. A measurement that cannot reach the machine does not change an outcome.

Time series and change

Repeat acquisitions build per-field trajectories across the season, supporting growth stage tracking, deviation from expected development, and season-to-season comparison against the same field boundary.

Use cases across the growing season

A combine in ripe wheat. Yield and quality are largely settled before the header goes in; the value of in-season measurement is that it arrives while something can still be done about it.

Planning and establishment

+ **Residue and cover crop mapping:** Residue, cover crop and bare soil separated through cellulose and lignin absorption in the short-wave infrared, quantifying ground cover for conservation tillage verification and seedbed assessment.
+ **Soil condition:** Soil organic matter and surface soil variation mapped across exposed fields before canopy closure, informing zone design at the point in the season when the soil is actually visible.
+ **Emergence and establishment:** Early canopy development mapped to identify establishment failure, gappy emergence and replant candidates while replanting remains an option.

In-season crop management

+ **Nitrogen status and prescriptions:** Canopy chlorophyll and leaf nitrogen mapped as continuous surfaces, converted into management zones and exported as variable-rate prescriptions, so that nitrogen is placed where the crop can recover it.
+ **Water status and irrigation:** Canopy water content measured directly through water absorption features, supporting irrigation scheduling against crop demand rather than against a calendar.
+ **Pre-symptomatic stress detection:** Departures from the expected spectral state for the crop and growth stage, flagged before symptoms are visible, directing scouting to the specific part of the specific field that warrants a walk.

+ **Weed patch detection:** Weed patches discriminated within the crop canopy at patch scale, supporting targeted rather than blanket application. Individual-plant discrimination remains the domain of ground and aerial platforms, and satellite mapping is designed to direct them.
+ **Crop phenotyping:** Leaf area index, canopy cover and pigment status tracked through the season as objective measures of phenotypic expression, supporting trial assessment and variety selection.

Yield, harvest and quality

+ **Yield estimation:** Biophysical parameters and growth-stage trajectory combined into yield estimates calibrated against regional historical data, supporting procurement, storage and logistics planning ahead of harvest.
+ **Harvest timing:** Senescence and maturity indicators tracked across fields, supporting harvest sequencing across a holding rather than a single decision for the whole farm.
+ **Quality indicators:** Nitrogen and protein-related features tracked through grain fill as indicators of quality outcomes, informing segregation decisions at harvest.

Verification, insurance and programme administration

+ **Crop declaration verification:** Crop type verified against declarations across large administrative areas, supporting subsidy administration and reducing reliance on field inspection.
+ **Loss assessment:** Damage extent from hail, flood, drought or frost mapped objectively and time-stamped, supporting rapid and consistent claim assessment.
+ **Practice verification:** Residue retention, cover cropping and land use documented plot by plot with acquisition dates attached, providing the evidence base that carbon and sustainability programmes require.
+ **Cropland inventory:** Consistent crop maps across regions and seasons supporting acreage estimation, supply forecasting and market analysis.

Validation and confidence

Axine treats validation as a product feature. Agriculture is the vertical where independent, public, national-scale ground truth genuinely exists, which means classification accuracy here can be quoted against an external reference rather than asserted.

Independent reference data

+ **Crop type:** The United States Department of Agriculture Cropland Data Layer provides an annual, national, independently produced crop-type reference, and equivalent national land parcel and crop declaration datasets exist across the European Union and other jurisdictions. Classification performance is measured against these rather than against internally held labels.
+ **Yield:** Regional historical yield statistics provide the calibration and test basis for yield estimation, and performance is characterised per crop and per region rather than pooled.
+ **Disease and pest:** Scouting records and field-verified infestation and infection polygons provide the reference for pre-symptomatic detection, with detection rate characterised against days from onset.
+ **Biophysical and biochemical:** Tissue tests, soil samples and trial plot data provide the matchups for nitrogen, water and biophysical retrievals.

Protocol

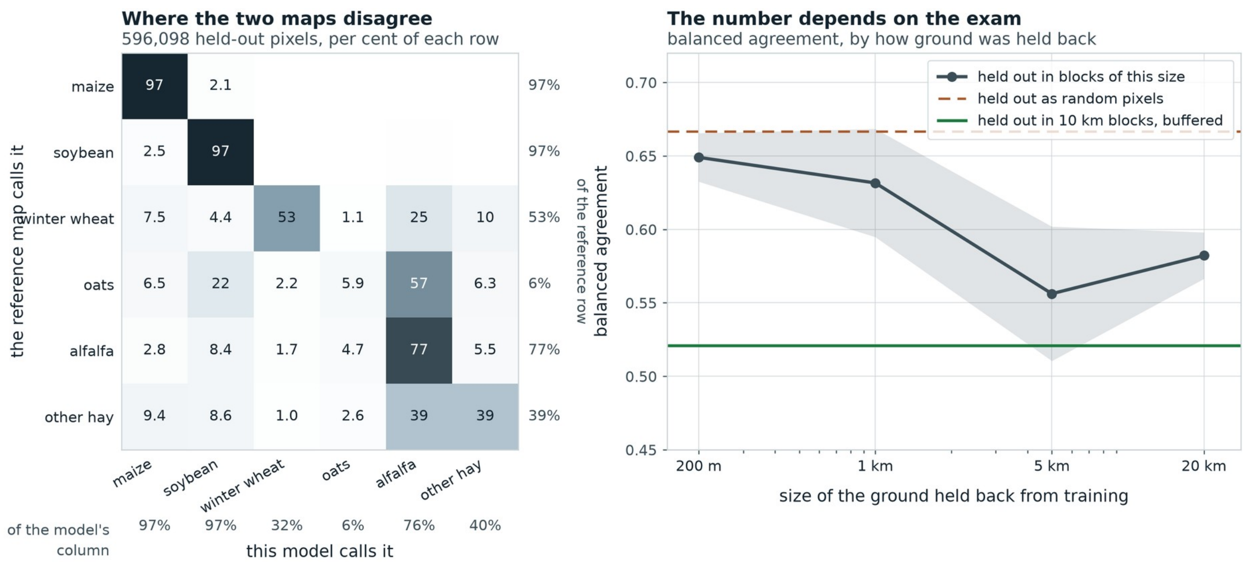
+ **Pre-registration:** Test design, thresholds and success criteria are fixed and recorded before evaluation data is examined.
+ **Frozen parameters:** Model and index parameters are fixed prior to evaluation and are not adjusted after results are seen.
+ **Hash-sealed inputs:** Input imagery and reference data are hashed, so any published result can be reproduced against the exact data that produced it.
+ **Spatial validation:** Spatially blocked, leave-one-region-out and single-site-removal runs confirm that reported performance is not carried by any single region and does not rest on spatial autocorrelation between neighbouring training and test pixels.
+ **Leakage controls:** Label permutation runs confirm that measured performance collapses when labels are destroyed, the standard test for information leakage.
+ **Append-only logging:** Every comparison run is written to an append-only log, providing a complete audit trail behind any figure we quote.

Reporting practice

Classification performance is reported as full confusion matrices with per-class accuracy, producer and user accuracy and Cohen's kappa, rather than as a single headline figure, because an overall accuracy on a landscape dominated by two commodity crops says almost nothing about the minor crops in it. Retrieval performance is reported as error against matched field measurement with the sample and the range stated. On the mineral products where this discipline is longest established, Axine publishes comparisons against independent United States Geological Survey reference products and quotes ranking performance as an area under the ROC curve of 0.7465 with a 95 per cent credible interval of 0.663 to 0.819 under spatially blocked validation. The same reporting standard governs every vertical.

Validation posture on every layer

Each layer renders with an explicit posture: calibrated region, validated region, or screening. Deterministic index mathematics quotes no accuracy figure because none is claimed for it. Classified and learned products quote accuracy where they have been tested against ground truth for that region and cropping system, and ship as screening elsewhere with the reason stated.



Agreement, not accuracy: the reference map is itself a classifier reading the same imagery this model reads, so two maps agreeing is not evidence either is right, and no accuracy is quoted for this product anywhere. Maize and soybean agree at 97 per cent and carry the raw pixel figure of 96; balanced agreement averages over classes instead, so the four minor crops pull it to 61 and oats at 6 is where a screening product stops being useful. Neighbouring pixels are nearly the same observation, so holding out random pixels tests the model on its own training data's neighbours: the further apart the held-out ground, the more the agreement falls, and that is the only honest end of the curve.

Figure 4 — *Agreement against a national reference layer — not accuracy, since the reference is itself a classifier reading the same imagery. Maize and soybean agree at 97 per cent; winter wheat, oats and other hay pull the balanced figure to 61. On the right, agreement falls as the held-out ground moves further from the training data, which is the only honest end of that curve.*

Operational benefits

- **Whole-holding coverage:** Every hectare is measured rather than a sample of it, and within-field variation is resolved at the scale variable-rate equipment can act on.
- **Lead time on stress:** Anomalies flagged before symptoms are visible narrow the treated area and widen the choice of response, which is where both the cost saving and the chemistry reduction sit.
- **Inputs matched to need:** Nutrient and water status measured rather than estimated turns uniform application into zone application, recovering input value that currently leaves the field.
- **One acquisition, several answers:** Nitrogen, water, disease risk, residue and crop type derived from the same acquisition, replacing several separately contracted data services with one coherent record.
- **Evidence-grade reporting:** Plot-level, time-stamped, reproducible evidence of crop and practice, which is the form that subsidy administration, insurance and sustainability programmes now require.
- **Predictable economics:** Everything derived from public satellite data is free, permanently. Tasked acquisition is priced per square kilometre against a defined area of interest, so programme cost is known before commitment.
- **Complements agronomy:** Satellite monitoring directs scouting and sampling rather than replacing them, concentrating agronomic attention where the imagery indicates it will pay.

Enclosed grassland from the air. Boundaries, swards and stocked ground can be characterised across a whole holding in one pass, at no cost wherever archive imagery will do the job.

Inherent product properties

Harvested cobs beside standing crop. Quality is a compositional question, and composition is what a narrowband measurement exists to answer.

- **Biochemical sensitivity:** Contiguous narrow-band coverage resolves red edge position shifts and pigment features of a few nanometres, which is what makes pre-symptomatic detection and cause attribution possible.
- **Full short-wave infrared range:** Coverage to 2500 nm reaches the nitrogen, protein, cellulose and lignin features that shorter-range sensors cannot, which is what brings residue and canopy nitrogen into scope.
- **Single-date classification:** Full spectra permit crop and variety discrimination from a single acquisition rather than from a cloud-dependent multi-date series.
- **Within-field resolution:** 8 metre hyperspectral ground sampling with 3 metre panchromatic context, resolving within-field zones at a scale application equipment can act on.
- **Monitoring cadence:** Revisit of up to daily for most locations, which is what allows detection to arrive inside the intervention window rather than after it.
- **Analysis-ready delivery:** Cloud-optimised GeoTIFF outputs, prescription-ready zone exports and API access, designed to enter existing farm management and variable-rate systems.
- **Explicit data integrity:** Screened ground reported as not evaluated and validity floors applied on every ratio layer, so unmeasurable canopy is never rendered as a measurement.

Optimal operating conditions

Optical spectroscopy measures the illuminated canopy and soil surface, so the method performs best in daylight, cloud-free conditions across the growing season. Biochemical retrievals are calibrated per crop and per growth stage, which is why the phenology-indexed reference described in section 6 is treated as part of the product. Patch-scale weed and disease mapping is delivered at satellite resolution and is designed to direct ground and aerial platforms where individual-plant discrimination is required, which is how precision programmes are built in practice.

Platform, access and data handling

Terraced paddy. Field geometry that no uniform prescription can serve is precisely where zone-level mapping pays for itself.

The platform

Work is ordered and delivered through a web application. Users define a holding or upload field boundaries, search available imagery or request a tasked acquisition, and follow the order through a staged job queue. Results are served as cloud-optimised GeoTIFFs with map tiling, and any pixel can be opened to inspect its full spectrum and the indices computed from it. Management zones export in formats farm management systems and variable-rate controllers accept. Monitoring subscriptions run the same analysis on a schedule and raise alerts against a baseline. Results are catalogued, reports are generated as PDF, and workspaces support teams, roles and notifications. An API is available for clients integrating outputs into their own agronomy platforms.

Lisa

Lisa is a client-facing assistant that runs entirely on Axine infrastructure rather than on a third-party model service. She searches imagery, estimates pricing, retrieves results, saves and lists areas of interest, geocodes, and reports the current model version with its validation metrics. Order submission is confirmation-gated by design, and any request requiring judgement is escalated to a human analyst.

Self-hosting is a procurement decision rather than an engineering preference. Field boundaries and yield data are commercially sensitive, and they remain within Axine infrastructure.

Access tiers

Tier	Coverage
Free	Everything derived from public satellite data, including the index pack, crop mapping, visualisation, Lisa and API access. Axine does not charge for information obtained freely.
Tasked	Directed 8 metre hyperspectral acquisition over a specified holding, with full analysis, priced per square kilometre against a stated minimum area.
Monitoring	Scheduled repeat acquisition through the season with change detection, alerting and reporting between epochs, on volume terms.

About Axine Laboratories

Axine Laboratories builds commercial hyperspectral analytics for agriculture, forestry, water monitoring, energy and mining. The company is registered in the United States and run by a technical team of geologists and engineers.

Our approach rests on three commitments. Detection is physics-based and reproducible, derived from measured spectra and published formulations rather than inferred by an untraceable model. Every published figure is backed by a pre-registered test against an independent reference, with the validation regime stated alongside it. And analysis derived from public satellite data is free and will remain so, because we do not charge for information obtained freely.

Revenue comes from tasked high-resolution acquisition and the analysis performed on it, which aligns our interest with delivering observations a client could not otherwise obtain rather than with metering access to imagery that is already public.

Axine Laboratories

axinelabs.com | contact@axinelabs.com

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