

Supporting Transparent Land Governance in Ukraine

Steering Committee
Sept. 28, 2026



THE WORLD BANK
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Land Transparency
Supporting Transparent Land Governance in Ukraine



Outline

- Program background & progress on legal front
- SAR & EU readiness (LPIS)
- Crop maps & crop statistics module (CSM)
- Land relations & land market monitoring
- Priorities for next 6 months

Program goal, areas & implementation modalities

Goal: Create preconditions for transparent functioning of land markets to

- ...enhance efficiency and sustainability of resource use
- ...provide a basis for rural investment and growth by small and medium farms & rural SMEs
- ...counter rural depopulation and impoverishment

Three broad areas of work

- Legal & regulatory framework for transparent land policy & EU CAP readiness
- Put in place infrastructure for CAP-type programs (small farmers) in ag. Sector (IACS incl LPIS)
- Provide analytical support to improve public & private decision-making

Supported by EU via Bank Executed Trust Fund (BETF)

- Technical assistance only: Analysis, Piloting, Monitoring, Impact Evaluation
- Phase 1 closed (2017-2023); Phase II (2020-2028); Phase III Top-up IACS & SAR: 2024-2028

Implemented in close collaboration with

- Government of Ukraine
- EU Joint Research Center – JRC
- EU-supported projects with FAO & IPRSA
- Universities; think tanks, NGOs: KIIS, KPI, KSE etc.

Link to Bank operations

- RETF to help Government scale up innovations (e.g. LPIS)
- PCGF capitalization to foster private investment
- ARISE to implement EU CAP-type operations
- DPOs to support policy reform, transparency & rule of law

Legal basis for land reform & EU accession

Land laws adopted 2020/21

- Anti-raider law (#340)
- Land turnover law (#552) – allow ag. land sales
- Decentralized/ Local Planning (#711)
- National Spatial Data Infrastructure (NSDI) (#554)
- Transparent state support (#985)
- State Geocadaster Reform (#1423)
- Mandatory e-auction of public land (#1444)
- Partial Credit Guarantee Facility (#3205)

Subsidiary regulation for land laws

- 9 additional resolutions passed in 2026
- 58 out of 61 resolution now complete

Areas requiring attention

- ACL (DL15230) passage to allow drafting of regulations
- Law 11533 restricts access to cadaster
- Bill 10027 additional resolutions passed in 2026
- Valuation law (DL 13435) and mass valuation

Follow up legislation or regulation

- 2022 Land Reform strategy (based on 2020 white paper)
- 2023 Anti-corruption law # 2322-IX: ACLIP-I R.# 220
- 2024 Land relations monitoring law & CMU R. #474
- 2024 NBU liquidity ratio for land as collateral (CMU R #351)
- 2024: Land valuation pilot & mass valuation law
- 2024: SAR law #3980 & CMU R. #549
- 2025: Paying agency law # 13202-1 w. ref. to IACS and SAR law

Program-supported Ukraine plan Indicators

- 12.1: 80% agricultural State Support via SAR
- 12.3: Comprehensive monitoring land governance
- 12.6: Land valuation
- 4.5: Adoption ACL 2026-30 & ACLIP II

SAR, IACS, and LPIS implementation

Land 
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The State Agrarian Register as a national digital platform

Great achievement - provides basis for

- registering agric. producers & provide them w. digital account
- consolidation of data from state registers
- access public & donor-funded assistance
- targeted communication & support

Constitutes a farm registry in line with EU standards

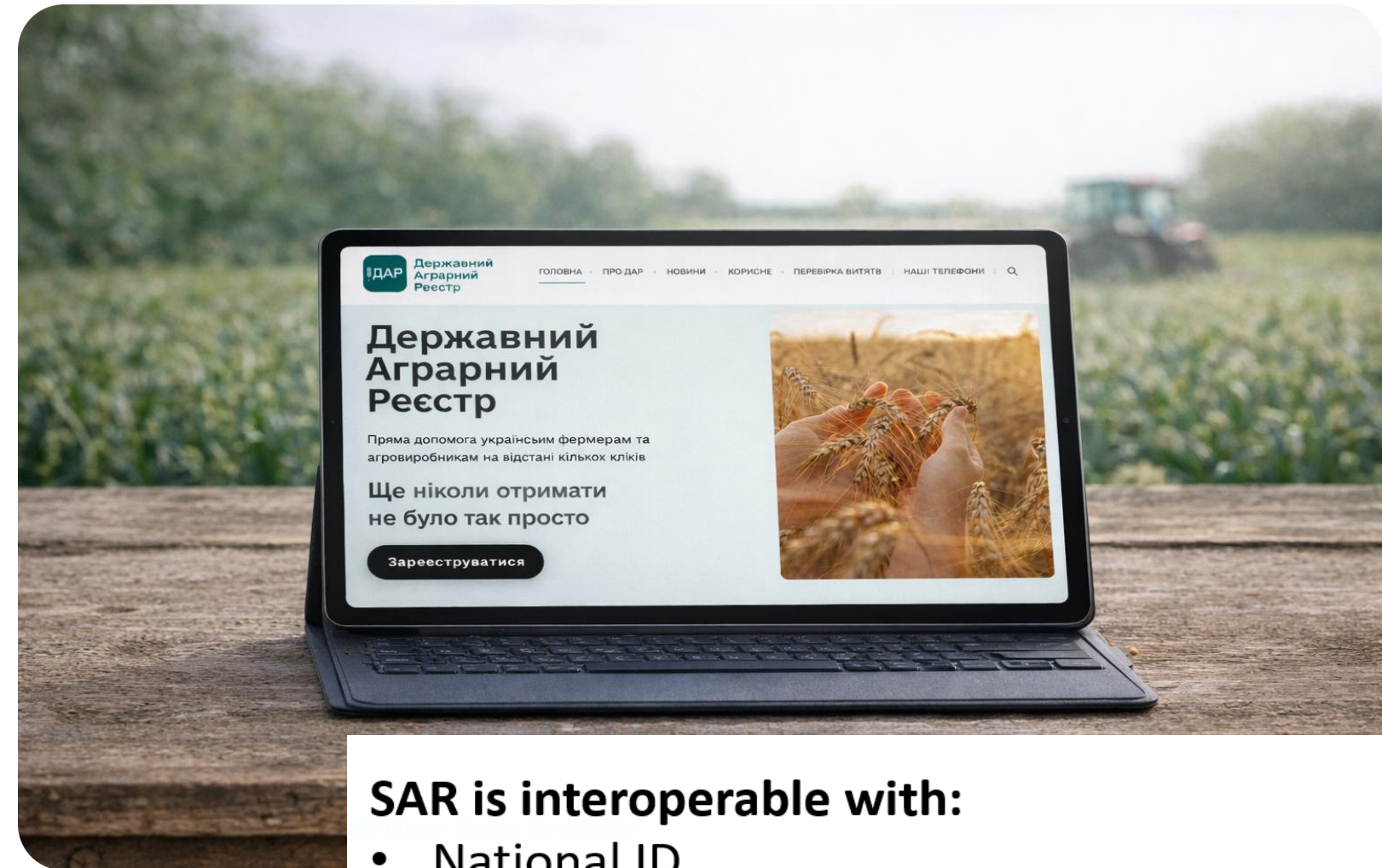
Recognized by Ukraine Plan (80% of state support via SAR)

Covers > 20 mn. ha

- 220,843 users & 177,706 registered farmers (July 8)

Provides the backbone for EU CAP-IACS tools

- AMS: based on sentinel-based crop maps (supported since 2019)
- GSA & OTSC: Developed by FAO, together with SW upgrade
- Requires LPIS as parcel reference layer & farmer declaration



SAR is interoperable with:

- National ID
- Registry of Legal Entities and Sole Proprietors
- State Land Cadastre
- Registry of Real Property Rights
- Animal Register
- Registry of Sanctions
- Demographic Registry
- State Tax Service database

LPIS requirements fall in two categories

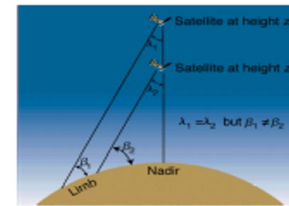
Imagery



Resolution
(< 0.5 m)



Cloud cover
($\leq 10\%$)



Viewing angle limits
(off-nadir angle ≤ 10)



Multi-date mosaic
(Spring image)

Challenges

- Normally via orthophoto
- Not possible under martial law
- Need look for alternatives (VHRSI)
- These are much more cumbersome

Processing



- VHR1 pansharpening
- VHR mosaicking
- VHR radiometric correction
- S2 crop map production

- Expert-driven **manual** delineation of reference parcels
- Land cover classes:
 - Arable land
 - Permanent crop
 - Permanent grassland
 - Agroforestry
 - Personal farming

- **Automated** VHR segmentation (field boundaries)

- Delineation VHR1 & VHR2
- Segmentation vs delineation

What is checked

- ✓ Completeness
- ✓ Consistency
- ✓ Topology
- ✓ Spatial accuracy
- ✓ Thematic correctness

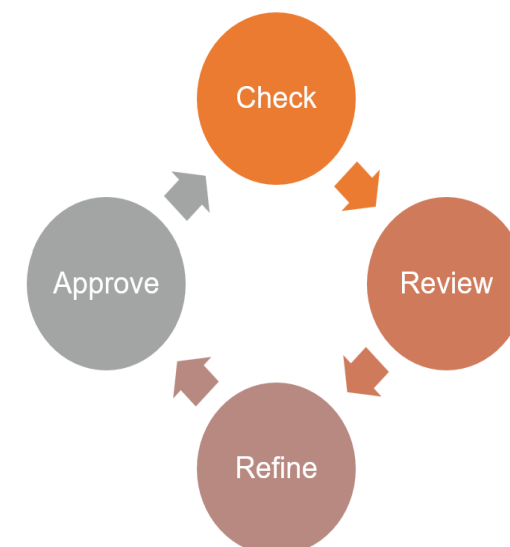
Iterative Process

- Repeat until compliant

Outcome

LPIS-compliant dataset

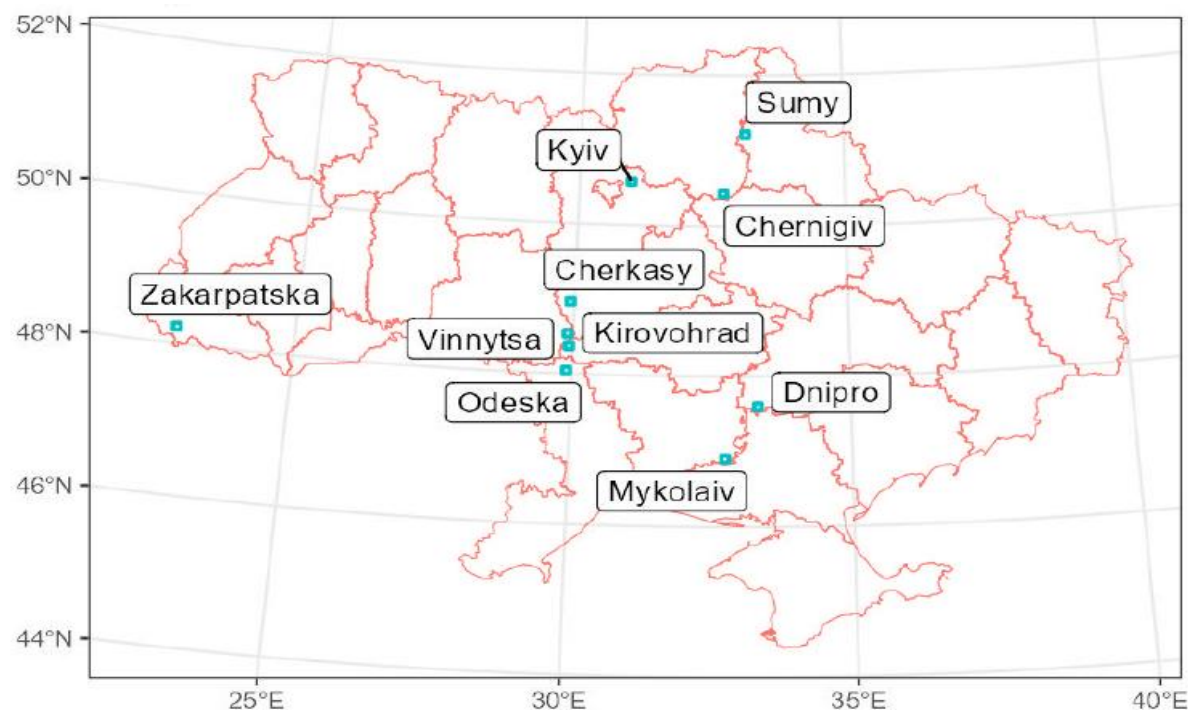
Multi-step validation



Manual delineation: Physical block boundaries = stable features

Automated delineation: Segments = annual/seasonal crop boundaries

Pilot I (2024): Can VHRSI produce EU compliant LPIS?



1,000 km² of Maxar archive imagery in 10 blocks

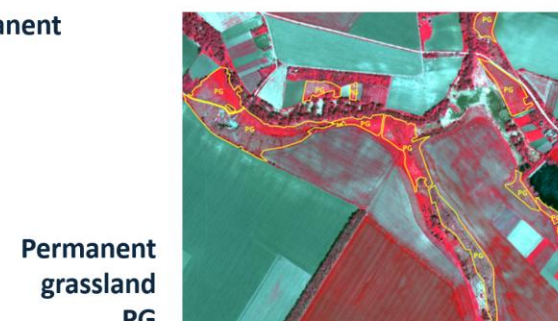
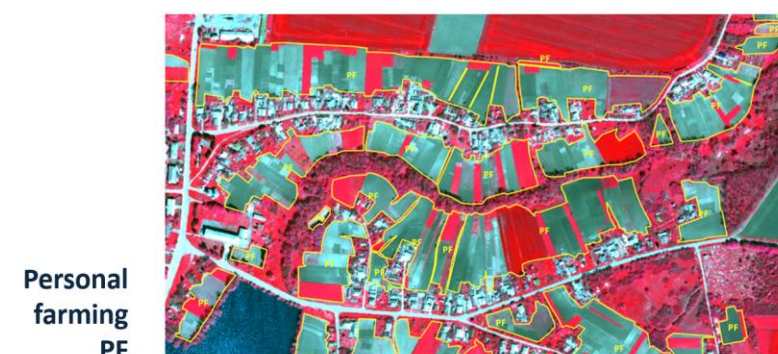
- Enough to identify issues & identify options for scale-up
- Hand digitization by KPI – independent QC overseen by JRC

Result I: Land use classification adapted to Ukraine

- Arable land (AL), personal farming (PF), permanent crops (PC)
- permanent grassland (PG), agroforestry (AF)
- $UAA = AL + PF + PC + PG + AF$

Result II: Confirmation of compliance

- Quality comparable to EU country LPIS
- Can also check program eligibility ('at the disposal of')



Pilot II (2025): Is it possible to task VHRSI for a small geographic unit?

Imagery: • Accuracy • Feasibility • Scalability

Ground-truth & control function



VHR1

Maxar → 0.3 m

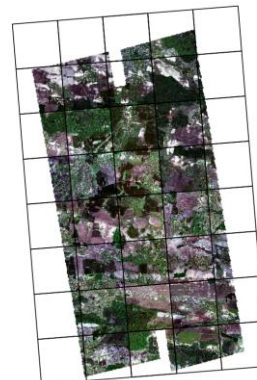
- Coverage: 101 km²
- single-date acquisition:
 - 25 May 2025
 - 6 tiles total
- strip overlap: none
- off nadir angle: 18 (!)



VHR2

Satellogic → 0.7 / 1.0 m

- Coverage: 403 km²
- multi-date acquisition:
 - 22 Apr 2025 → 178 km²
 - 26 Apr 2025 → 159.5 km²
 - 30 May 2025 → 84 km² (1 m !)
- 46 tiles total
- strip overlap: 21.5 km²
- off nadir angle: 10



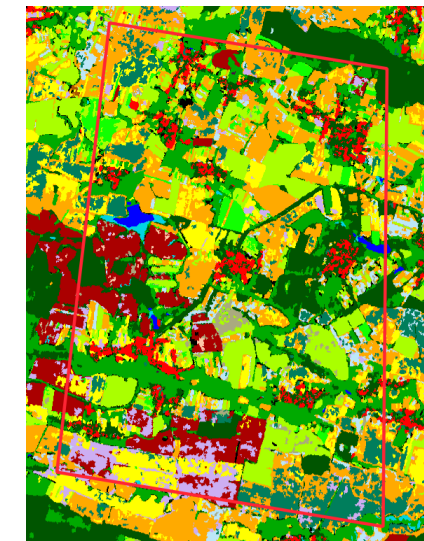
VHR2 is based on multi-date acquisitions with multiple spatial resolution tiles and overlaps, which introduces mosaicking and consistency challenges compared to a single VHR dataset.



Sentinel

10.0 m

- Coverage: **Ukraine**
- multi-date acquisition 2025/6 (since 2019)
- generated crop map supporting land cover classification



Datasets

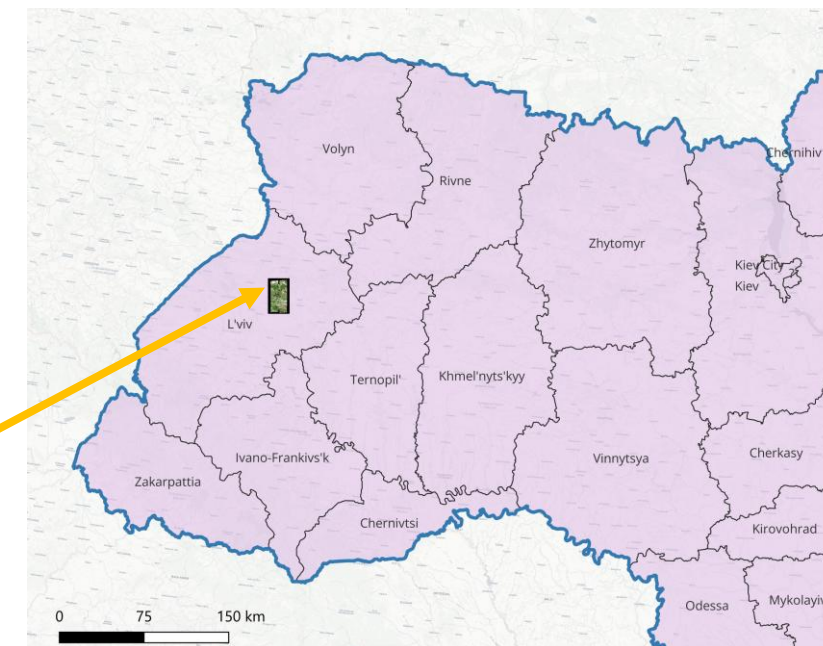
2 satellite imagery datasets



VHR1
Maxar Worldview
RGB+NIR
Spatial resolution: 0.3m
Area: 100km²



VHR2
Satellogic Nusat
RGB+NIR
Spatial resolution: 0.7m-1m
Area: 400km²



Accuracy comparison

VHR 1

VS

VHR 2

Clean, sharp boundaries

Feasible LCC interpretaion

Easy compliance

Minimal correction

0.3 m



Less precise boundaries

More corrections needed

Missing area

LCC confusion

0.7 m

Manual delineation process

Target for EU compliance

≤ 0.5 m positional accuracy

Delineate stable physical features (roads, building, tree lines, block edges, distinct land cover classes)

Refinement process

Cross-checks

(internal & external)

Geometry > Spectral signal

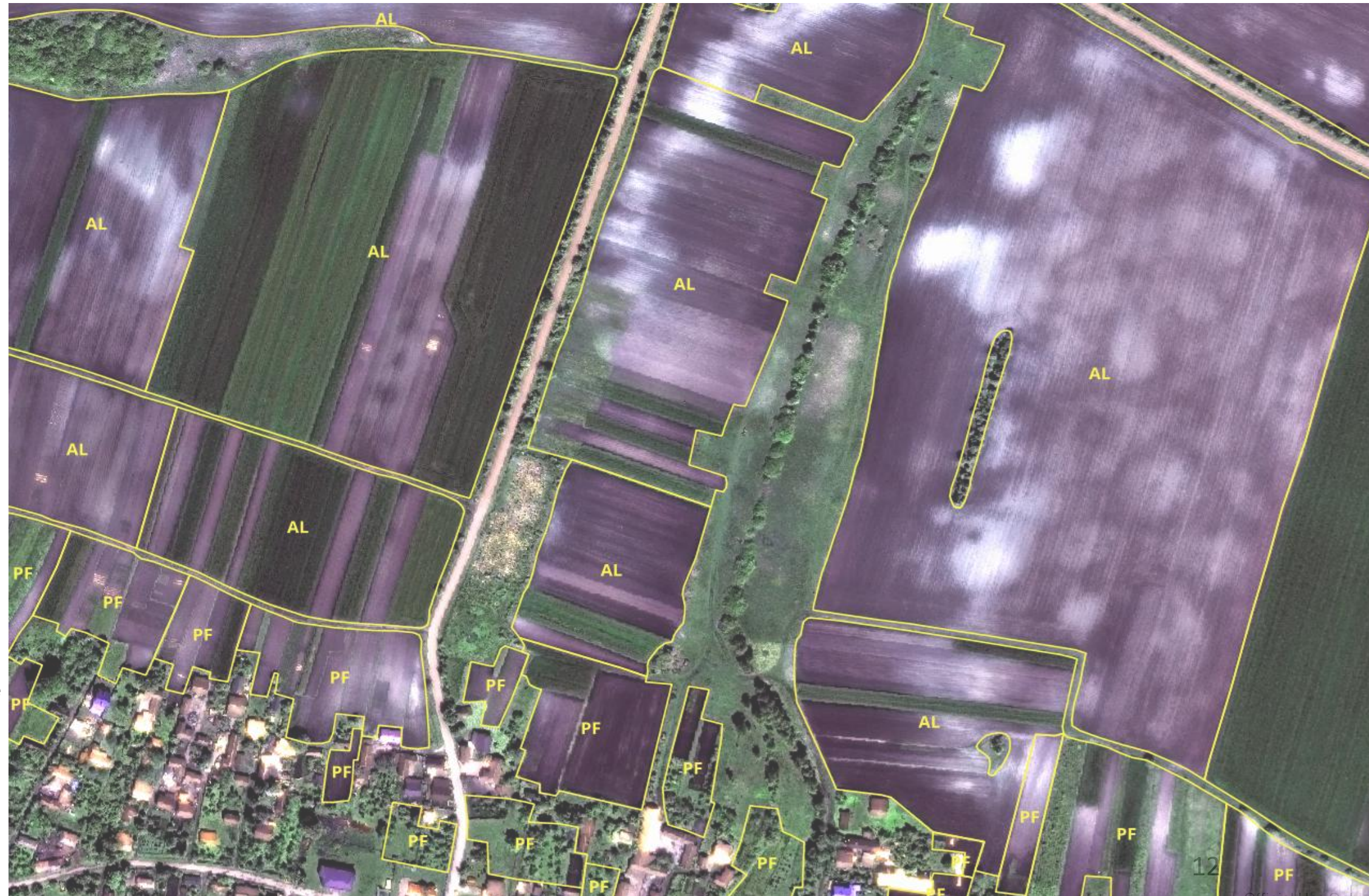
Results

VHR1 & VHR2 produce EU compliant LPIS layer

Methodology & workflow proven

Image acquisition the key bottleneck

Careful advance planning key for scale



Ground truth: Can LPIS layer be used for farmer declaration/control?



Goal of LPIS land use: Aid GSA & OTSC

- Crop map as primary evidence base cultivation
- Is the data reliable?
- Can farmer provide evidence if needed?
- Can be assessed only while crops in field!

Test undertaken in Lviv hromadas

- Selected 195 points of challenging cses
- Had students take geotagged pictures
- One picture per crop even if same type (e.g. AL)
- Took 285 pictures (instructed to enter field)
- Arrows: Compass direction (metadata)
- Follow-up on similar exercise in 2025



Овочеві культури (картопля)



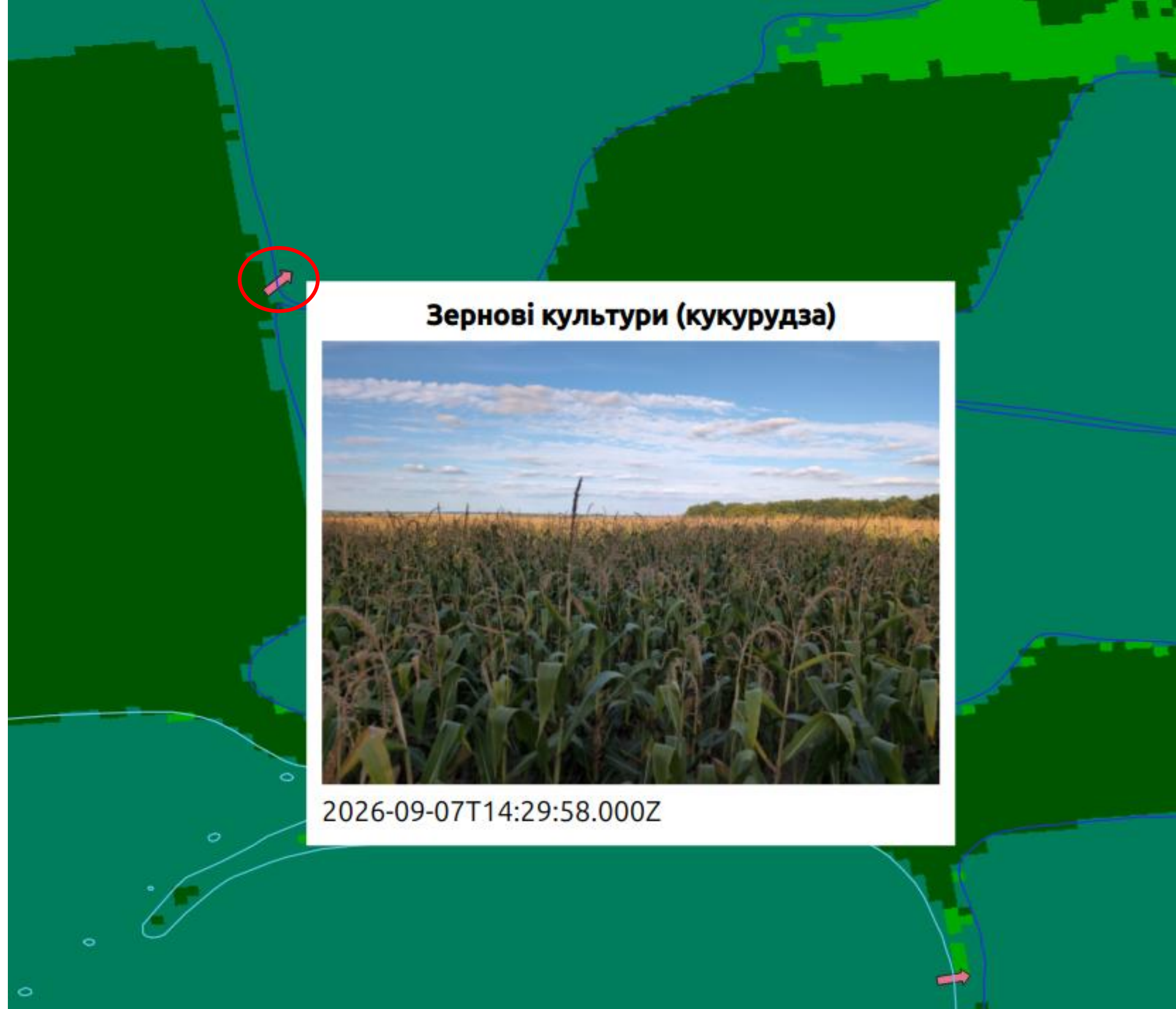
2026-09-04T13:59:19.000Z

Potato correctly identified

- Ridges, stalks, green leaves still visible
- Interesting as not one of 5 major crops
- ML model significantly improved since 1st iteration

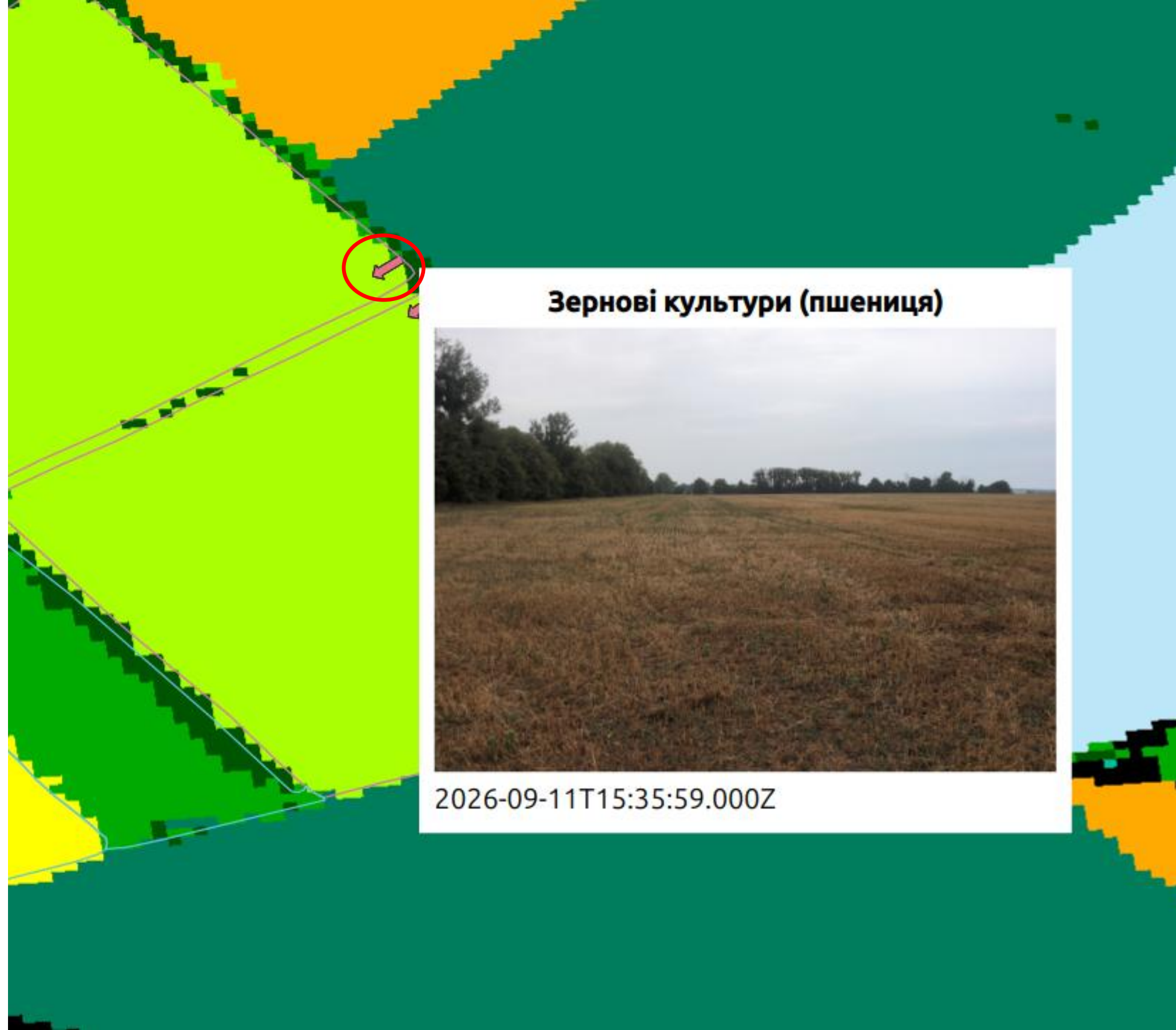
Maize correctly identified

- Bluish green
- Maize still present



Wheat: Too late

- Light green on crop map
- But identification correct: Stubble still visible



Soybean correctly identified

- Orange in crop map
- Plants clearly visible on photo

Олійні культури (soя)



2026-09-04T13:38:04.000Z

Sunflower correctly identified

- Yellow on crop map – still on field

Summary

- 181 of 195 (92.8%) tags in line with 2026 crop map
- Incorrect tags either imprecise coord's, on edge betw. 2 parcels, or undet. crop type (Не обробляється)

Conclusion

- OTSC with farmers/controllers taking pictures is feasible
- Can help to improve crop maps over time



Key lessons & next steps on LPIS

Lessons from the pilots

Creating EU compliant SI-LPIS possible

- Despite challenging conditions (ortho much easier)

Key issue: Imagery for EU standards

- Not a routine task for any of the providers (EU or US)
- Unless done in spring, no in-season use possible (snow-free, no leaves, no clouds, correct angle)
- Advance discussion required to ensure spring acquisition

Delineation & LPIS creation easily tendered

- KPI students in 1st round; EU firm in 2nd round
- JRC can provide oversight & validation

LPIS +crop maps basis monitoring & control

- In-season application possible w. 2 crop map delivery dates
- Control possibly by anybody (farmer, contractor, inspector)
- Traffic light system & OTSC implementable

Use in programs integrated w. GSA software

- Not different from the field test conducted in Lviv

Implications for upscaling through RETF

Size & cost parameters (JRC estimate)

- One oblast about 20,000 km² (Lviv: 22,000)
- Imagery (Maxar - € 25-45/ km²; Satellogic (€ 10/km)
- Delineation: € 30/km or less
- QC: (€ 0.75/km)
- Hosting arrangements on SAR servers

BETF, joint w. JRC, can provide TA support

- TOR for image acquisition/delineation
- QC to ensure imagery corresponds to EU specs
- Help identify consultants for QC
- Perform random check of final delineation as specified

Further discussion will be useful

- JRC invitation early Nov. on scientific collaborations

Analytical support: Crop maps, crop statistics module, land market monitoring

Land 
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Motivation: Need for a spatially grounded evidence base

How is land use changing?

- Whose land is damaged – and who abandons it or brings it back into cultivation afterwards? How much is abandoned?
- Are farmers expanding into environmentally sensitive areas?
- Is unauthorized cultivation of public land increasing?

Who is registered in SAR?

- Does it reach the target group of small (indiv.) farmers?
- Is coverage expanding or does support go to same farmers?
- Do farms split to fit into ARISE/PCG size limits?

How is land cultivated?

- Is land concentration increasing? At local/national level/both?
- Are there discrepancies btw land classification & actual use?
- Are there parcels/fields with overlapping rights/boundaries?

How are land markets/prices evolving?

- Prices reflect expectations & are key for collateral valuation
- Do we see distress sales in war-affected areas?
- Are sales eating into the lease market or vice versa?
- Are there 'leasing companies' that consolidate land?
- Is there more informal leasing & de-facto consolidation

Are supply chains adjusting?

- Are exporters claiming to export more than they produce?
- Is 'farm to fork' tracing possible?

Can coops help small farms get scale?

- Who are the coops – or their members?
- What functions do they provide (other than marketing)?
- Can they help provide advisories/markets/services?

To answer these, crop maps & admin data (spatial & textual) need to be combined

If it is done, smart programs (organic, EUDR) can be designed & improved with experience

This can also provide a basis for new legislative & regulatory initiatives

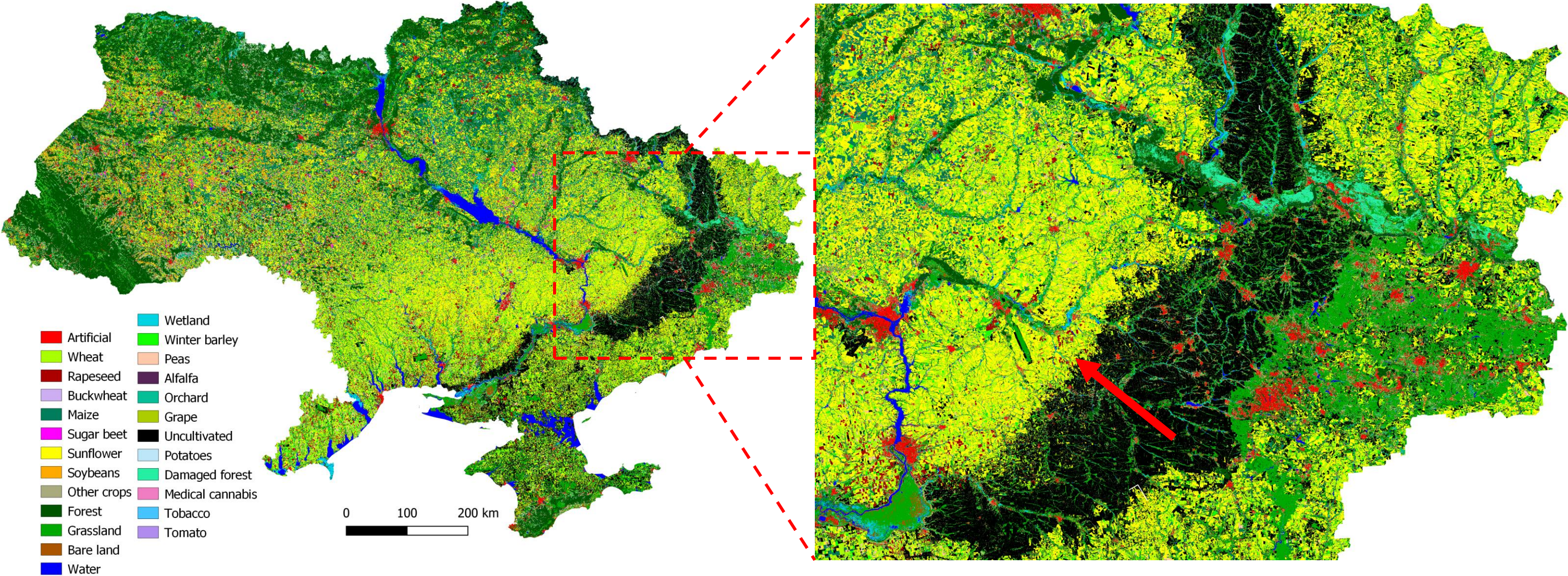
Crop map elaboration 2026 (since 2019 by KPI team)

Methodology: ML based on training data collection (3,257 pictures on 3,800 km road trips) & 1,230 farmer-provided pictures

2026

Overall accuracy – 97.4%

Increase in uncultivated areas near the front line



But the total area of uncultivated land is **decreasing**

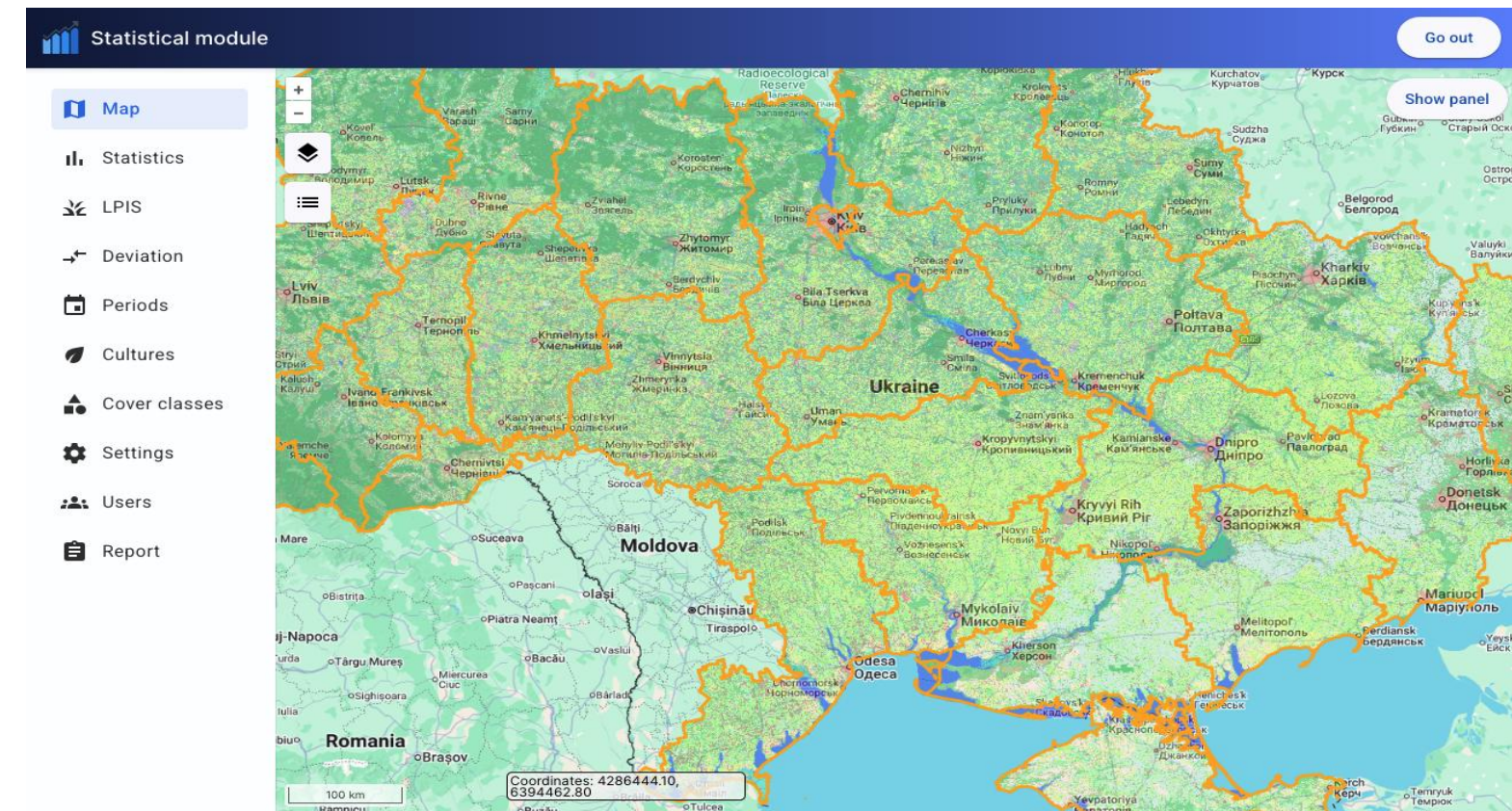
Crop statistics module (CSM) gives MAPF answers

CSM combines admin. & geospatial data to understand

- Where production takes place
- Who cultivates the land (in which legal form)
- How much cult. land is visible in formal records
- What share of producers are in SAR
- Basis for spatially grounded agricultural intelligence

What it shows – supports calculation of UAA (Utilized Agricultural Area)

- 35.29 mn. ha crops or grassland
- 24.47 mn ha cultivated & registered (by size/crop)
- 10.82 mn. ha outside of linked coverage
 - Not eligible SS;
 - Cannot be used for collateral,
 - Does not generate tax/lease revenue
 - May be managed unsustainably
 - Prime candidate for detailed monitoring



Basic analysis provides important insights...

Size group in ha	Legal entities (LE)				Individual farmers (IF)			
	Units	Area	Units in SAR	%	Units	Area	Units in SAR	%
	#	Mn ha			#	Mn ha		
<1	25,842	0.007	147	0.006	1,931,977	0.486	13,767	0.007
1–2	7,733	0.009	244	0.032	469,296	0.574	19,131	0.041
2–5	10,655	0.027	680	0.064	449,541	1.161	25,681	0.057
5–10	6,112	0.032	1,204	0.197	210,516	1.205	20,492	0.097
10–20	5,059	0.057	2,003	0.396	67,861	0.726	11,646	0.172
20–30	3,491	0.070	1,870	0.536	13,596	0.260	3,678	0.271
30–50	5,208	0.177	3,374	0.648	10,030	0.316	3,651	0.364
50–100	6,712	0.402	4,545	0.677	7,919	0.447	3,750	0.474
100–500	11,510	2.252	7,714	0.670	4,709	0.664	2,252	0.478
500–1000	3,447	2.054	2,396	0.695	134	0.067	27	0.201
1000–2500	3,321	4.400	2,257	0.680	27	0.024	9	0.333
>2500	1,669	9.049	1,028	0.616	3	0.006	0	0.000
Total	90,759	18.536	27,462	0.303	3,165,609	5.938	104,084	0.033

Key aggregate results

- Significant share of LE < 500 ha
- 75% of IFs < 2 & 90% < 5 ha
- SAR cvg. 3.3% among IFs

Can replicate at any admin. level (e.g. OTG)

- Identify tax revenue gaps
- Allows to quantify war damage
- Assess level of SAR coverage by farm type/size
- Basis for actions & concrete plans/targets

Regular reporting allows to show progress

- Has SAR (smallholder) coverage increased?
- Are relevant taxes collected?
- Is all cultivated land registered/progress made?
- Do public programs (e.g. demining) have visible impact on extent of cultivated area?

CSM improvements I: Help MAPF make policy decisions

Identify administrative/economic actors

- Allow disaggregation of data at OTG level
- Generate reports
- Add filters to search by EDRPOU/cadastral number
- Switch from maps to tables a parcel level

Статистичний модуль

Карта

Статистика

LPIS

Відхилення

Періоди

Культури

Класи покрову

Налаштування

Користувачі

Звіт

Деталізовані дані

Згруповані дані

Помилки розрахунку

Калькуляційний період: Ярові 2025

Пошук по кадастровому номеру: 2526904824

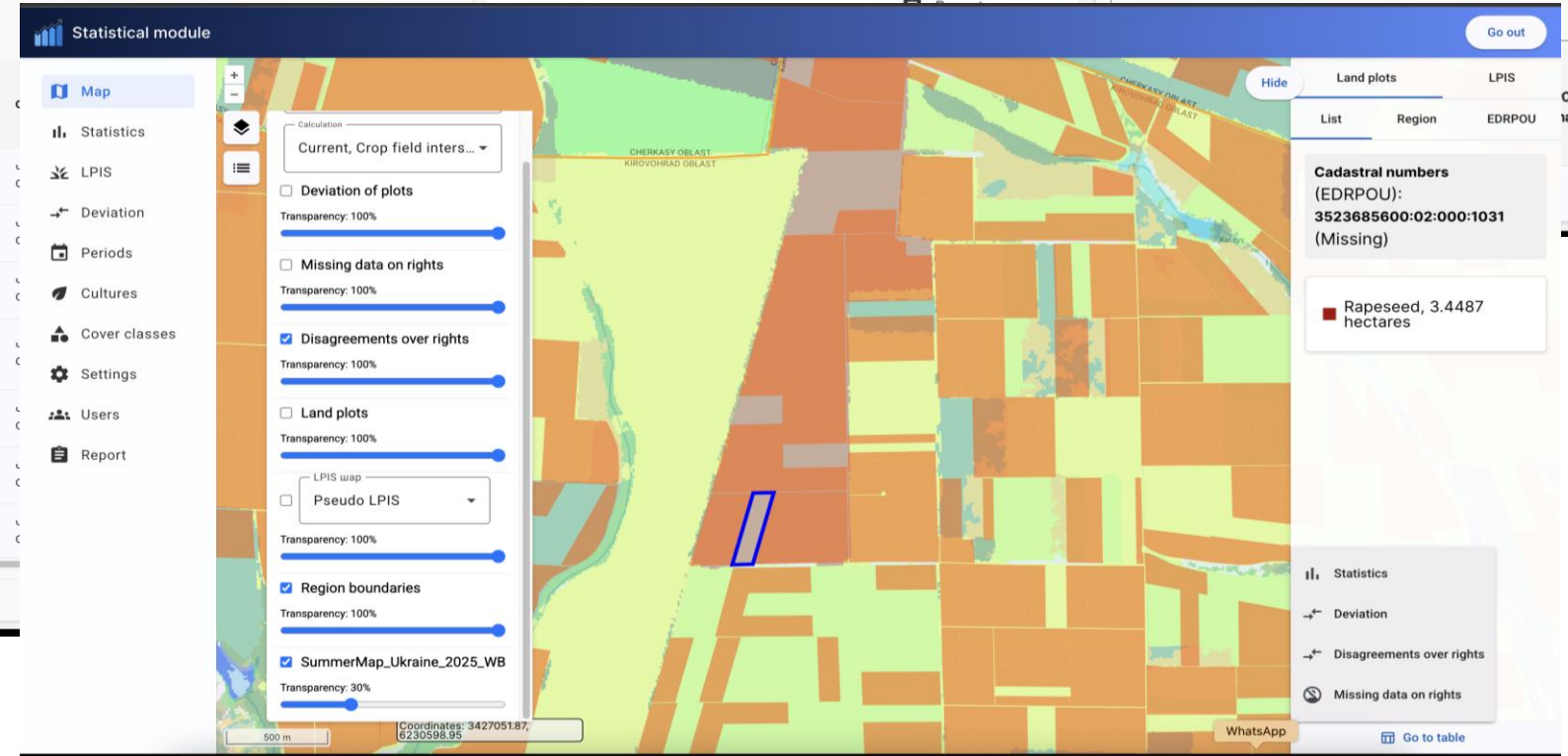
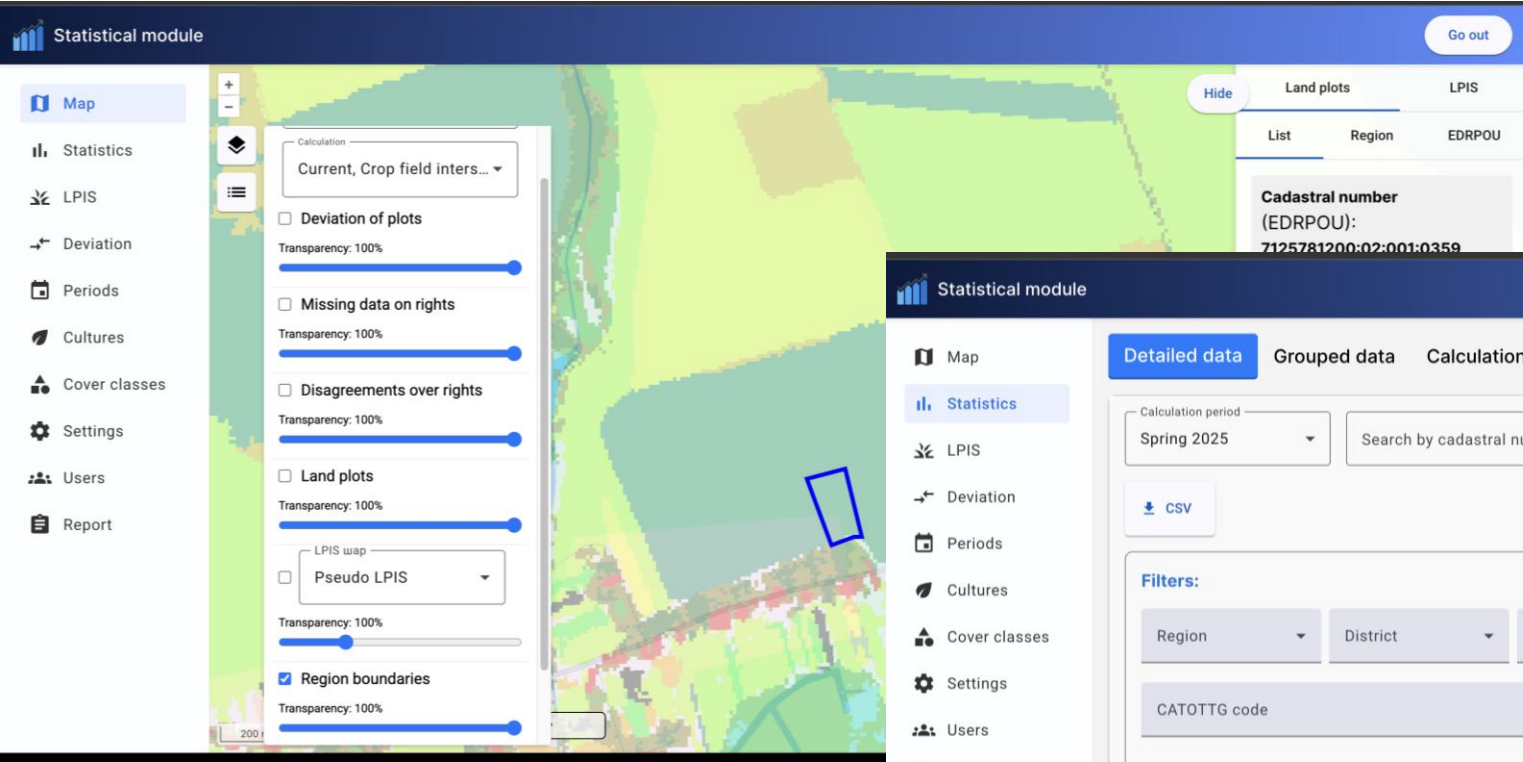
Пошук по коду ЄДРПОУ: 2526904824

	Кадастровий номер ділянки	ДЗК - НГО дата	Рік	Сезон	Назва класу культури	Назва культури	Частка культури на ділянці, %	Площа культури, га
☐	7125781200:04:001:0122	02.01.2026	2025	Літо	Орні землі (лише орні землі, теплиці)	Кукурудза	100.00	1.8963
☐	7125781200:04:001:0105	02.01.2026	2025	Літо	Орні землі (лише орні землі, теплиці)	Соняшник	96.51	3.8592
☐	7125781200:04:001:0105	02.01.2026	2025	Літо	Орні землі (лише орні землі, теплиці)	Ячмінь	0.50	0.0199
☐	7125781200:04:001:0105	02.01.2026	2025	Літо	Невикористовувані сільськогосподарські землі (змішане/інше землекористування)	Некультивована земля	2.99	0.1197
☐	7125781200:02:001:0391	02.01.2026	2025	Літо	Орні землі (лише орні землі, теплиці)	Соя	96.50	1.9397
☐	7125781200:02:001:0391	02.01.2026	2025	Літо	Орні землі (лише орні землі, теплиці)	Кукурудза	3.50	0.0704
☐	7125781200:04:001:0196	02.01.2026	2025	Літо	Орні землі (лише орні землі, теплиці)	Соняшник	100.00	1.7134

Елементів на сторінці: 25

1 - 25 з 238

< >



OU

tenant use)

EDRPOU (Rent)

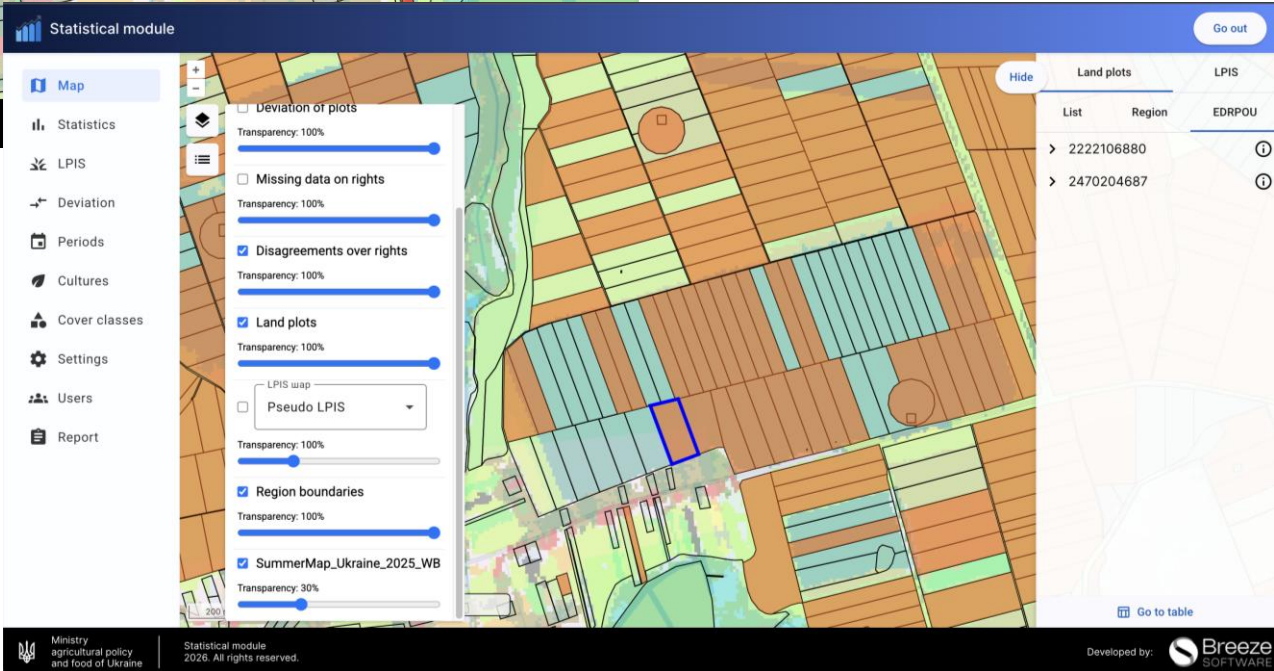
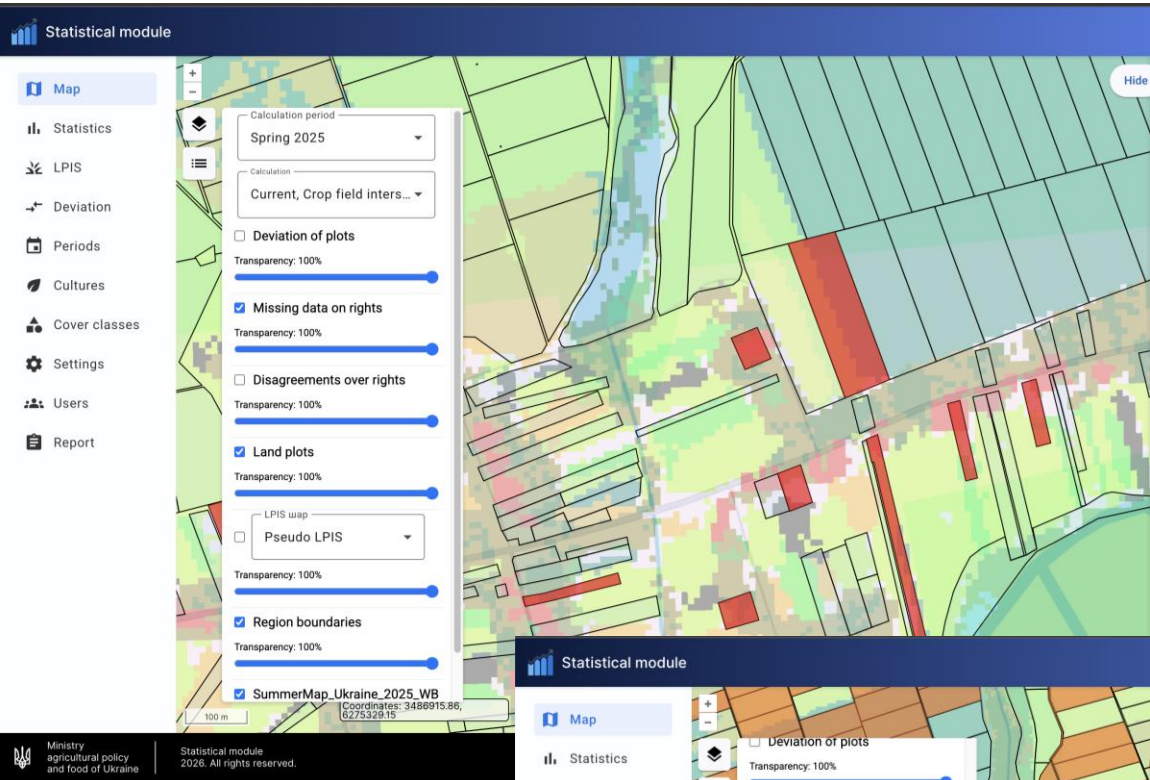
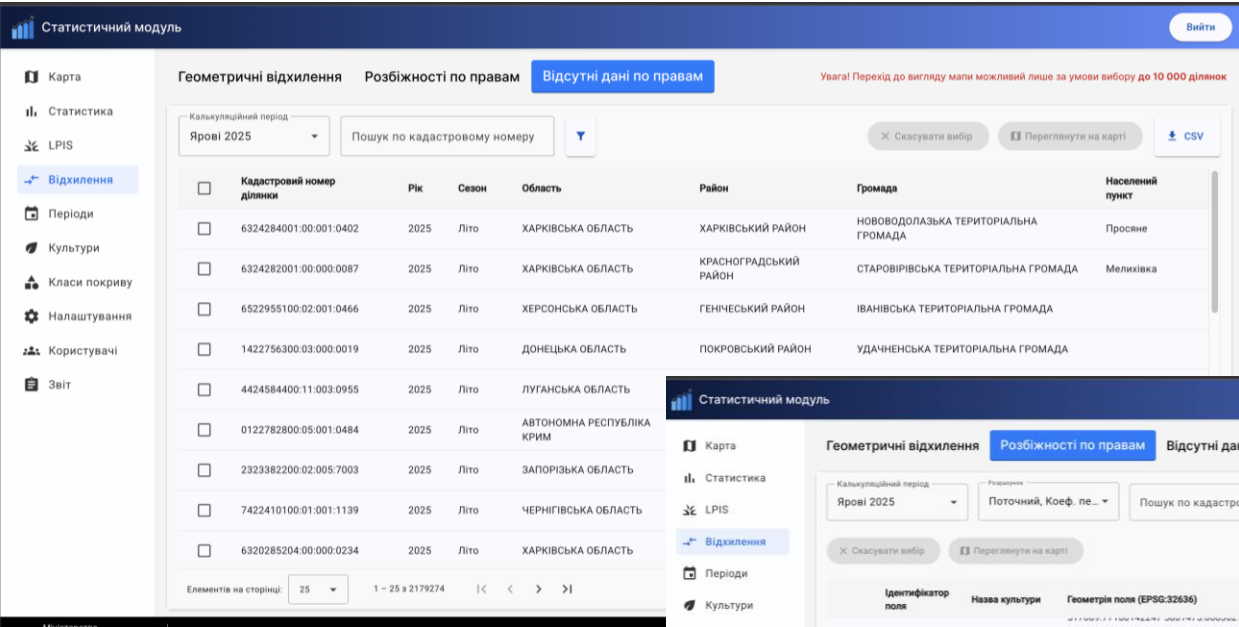
EDRPOU (Sublease)

	OU	tenant use)	EDRPOU (Rent)	EDRPOU (Sublease)

CSM improvements II: Help MAPF make policy decisions

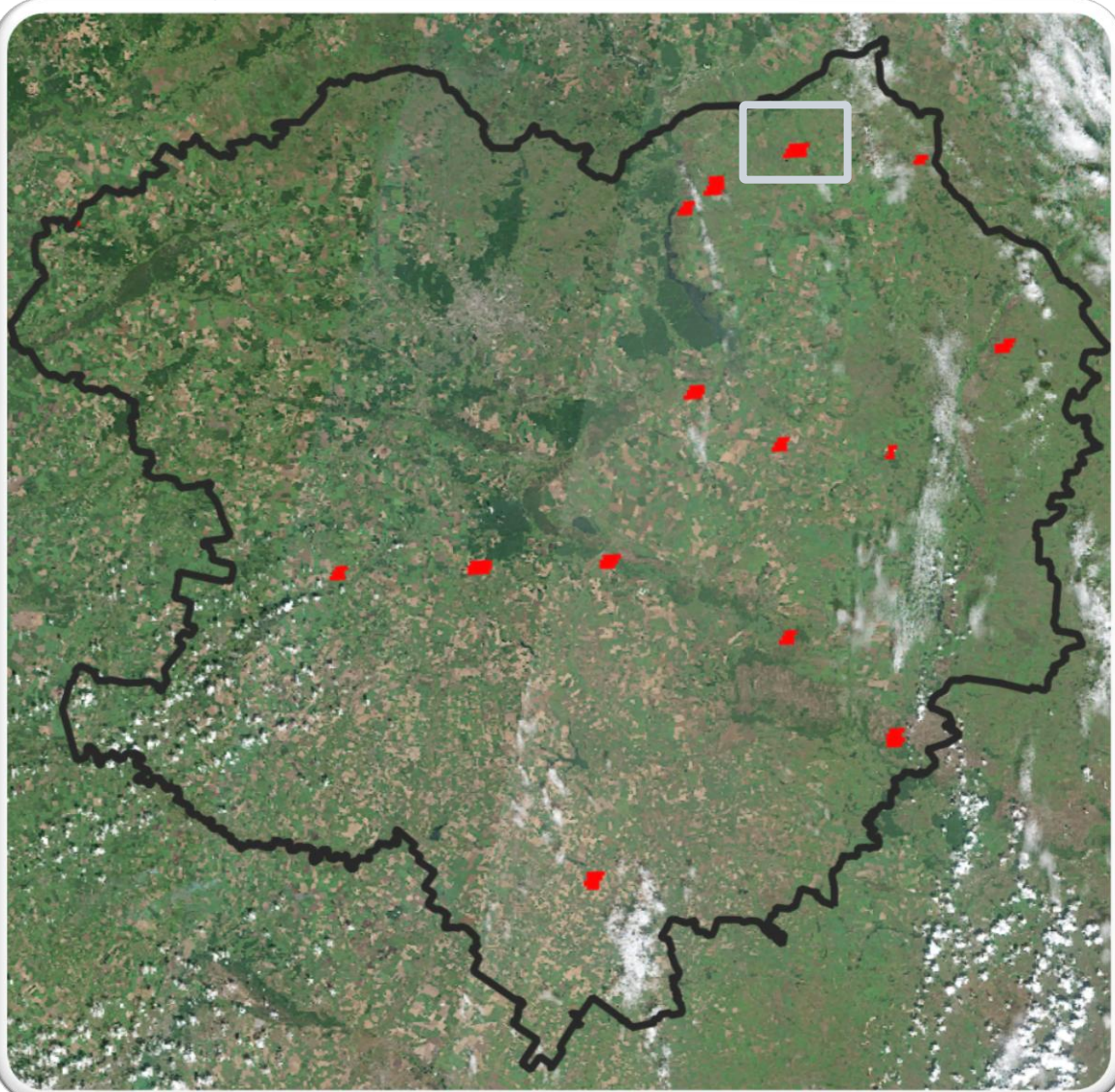
Parcel level spatial analysis

- Identify (cult.) parcels with missing rights
- Show deviations/overlaps in rights in a field on map & in table
- Possibility to download reports in CSV/GeoJSON formats



Burned Area Detection: Proof of concept Kharkiv

Request by Ministry to explore pot. compensation program
Access to PlanetScope data
Fire damages July1-Oct. 31, 2026, due to military action
Give also crop grown 2026, date of fire, probability
Could base on self-declaration using GSA-type workflow
Analytical output can provide a validation layer/check
Now being upscaled for war-affected oblasts



01 Screen Potential Fire Events *NASA FIRMS, 1 km, daily*



02 Burned Area Mapping *Harmonized Sentinel Landsat, 30 m, 2-3 days*



03 Burned Area Refinement *PlanetScope, 3 m, daily*



04 MAPF/DZK can map to cadaster

- burned area (ha)
- LC/crop type class
- share of burned (%)
- pre-post visualization



Can in principle be used for field-level reporting

Shows what is happening at parcel level

- Detailed pdf reports for any cad. parcel/ field w satellite imagery before/after damage events
- Reports based on user/staff queries: cadastral numbers, time, crop/use class, VC, EDRPOU etc.
- Use for program documentation/control (e.g., demining)
- Can link to any data from **CSM analytical module**

Allows for improved user interaction

- Routine summary reports for a specified area/time period for control/PA staff
- AI allows natural language input (no typing needed))
- Flexible user interface: Including bots
- Language support: Ukrainian / English

Зведений звіт про втрату врожаю

Територія моніторингу: Північна Харківщина

Період: 01.07.2026 - 31.08.2026

Загальна інформація

Кількість пошкоджених кадастрових ділянок	Кількість пожеж
2368	2797

Розподіл пошкоджених ділянок за класами

Клас / культура	Кількість пошкоджених ділянок	Пошкоджена площа (га)
Трав'яні угіддя	2071	2351.04
Дерева	148	159.55
Ліс	67	78.81
Озимий ячмінь	29	
Штучні об'єкти	21	
Пшениця	12	
Пошкоджений ліс	11	
Кукурудза	4	
Болото	2	
Соняшник	3	

Кадастрова ділянка 6321688700:03:002:0058

Площа ділянки (га)	Клас / культура	Стан врожаю до пошкодження
14.9903	Пшениця	Не зібрано

Інформація про пошкодження

№	Дата пожежі	Площа пошкодження (га)	Частка пошкодження від площі поля (%)	Джерело
1	08.07.2026	6.3225	42.18 %	Sentinel-2

Супутникові зображення

До пошкодження - 24.06.2026



20.07.2026



Discussions on export tracking

Motivation

- **Indiv. Producers:** Linking area cult. (cadaster, registry, crop map) to pre-fill crop declaration (or eventually automatically assign export quota)
- **Cooperatives:** Better awareness of membership & needs to help better serve smallholders in integrated way

Activity I: SAR/crop map analysis

- Compute national export quota for each producer
- Unambiguously link coops to members & do the same
- Identify & cross check anomalies

Activity II: Survey of producers/coops

- Ease of interaction with declaration system
- Other issues & constraints faced
- Suggestions for regulatory/implementation improvement
- Critical to assess potential for expansion

Activity III: Recommendations/report

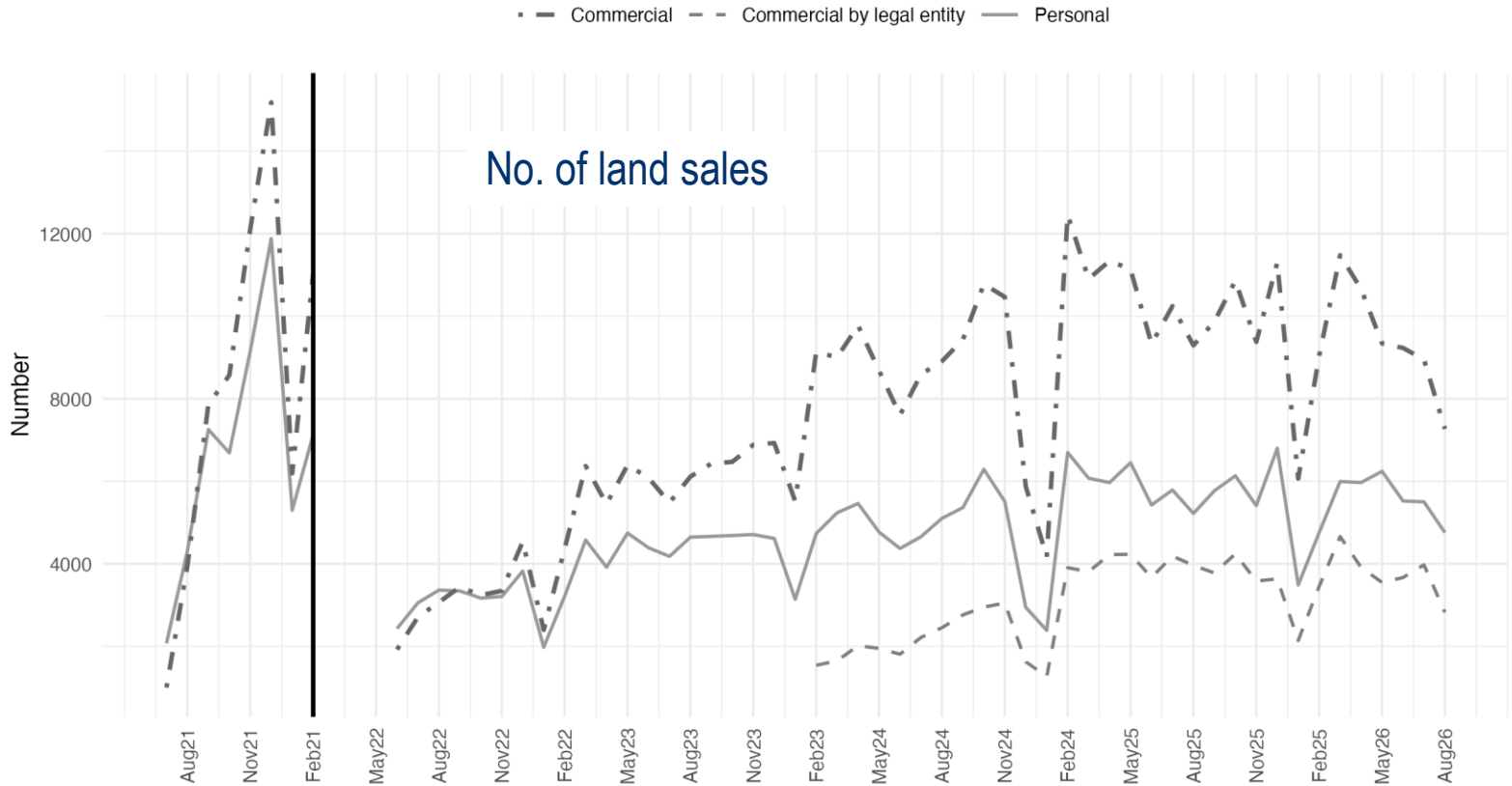
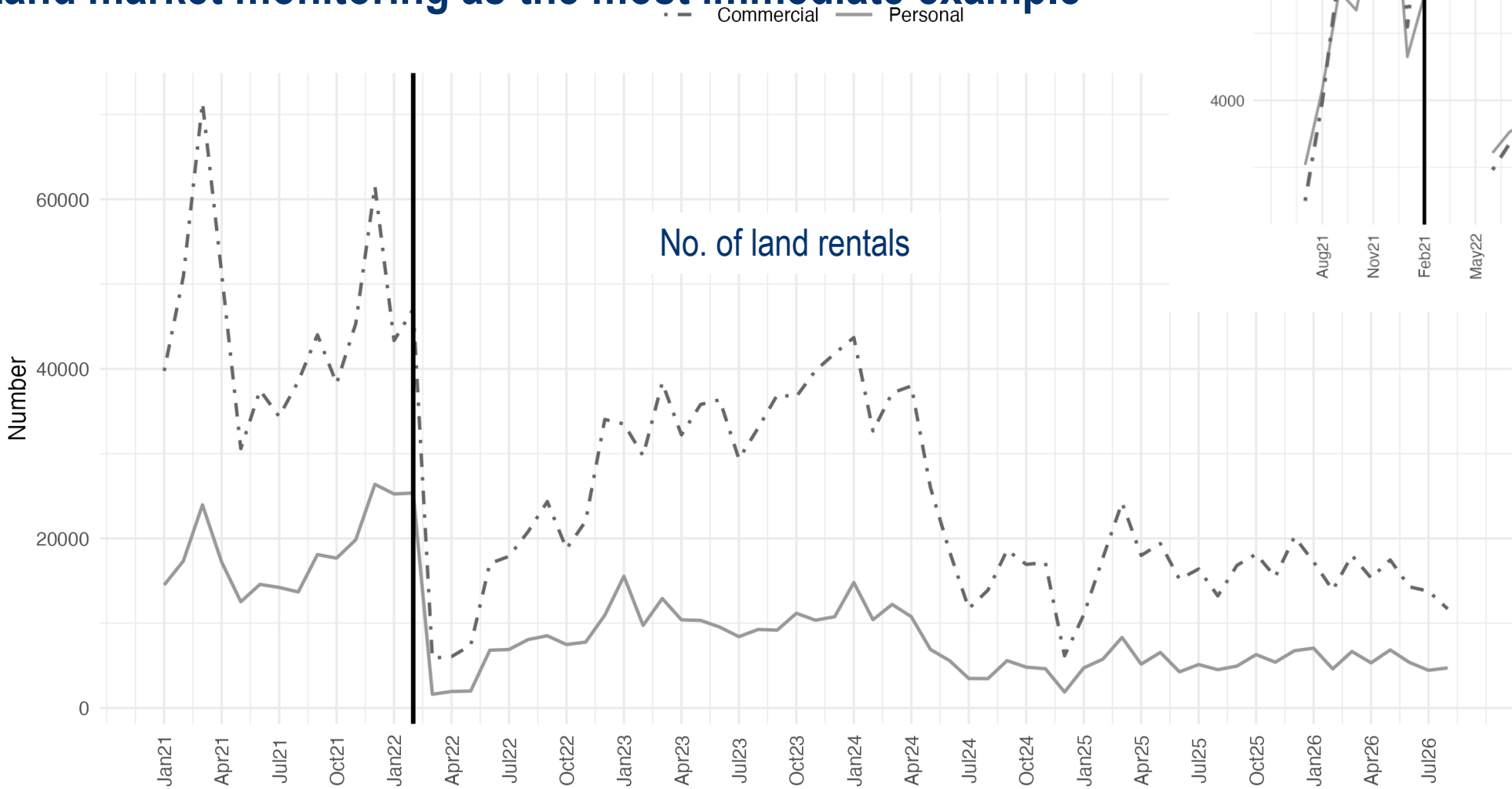
- Lessons for use & roll-out of GSA
- Potential to link coop registration to SAR
- Identify other ways to engage w. coops to reach smallholders

Land relations & market monitoring

Land relations monitoring portal finalized by DZK

- **Content:** Transactions, payments, court cases, NMV, urban planning doc.
- Updates should be automatic in case of API link
- Potential to expand coverage with APIs can be discussed

Land market monitoring as the most immediate example



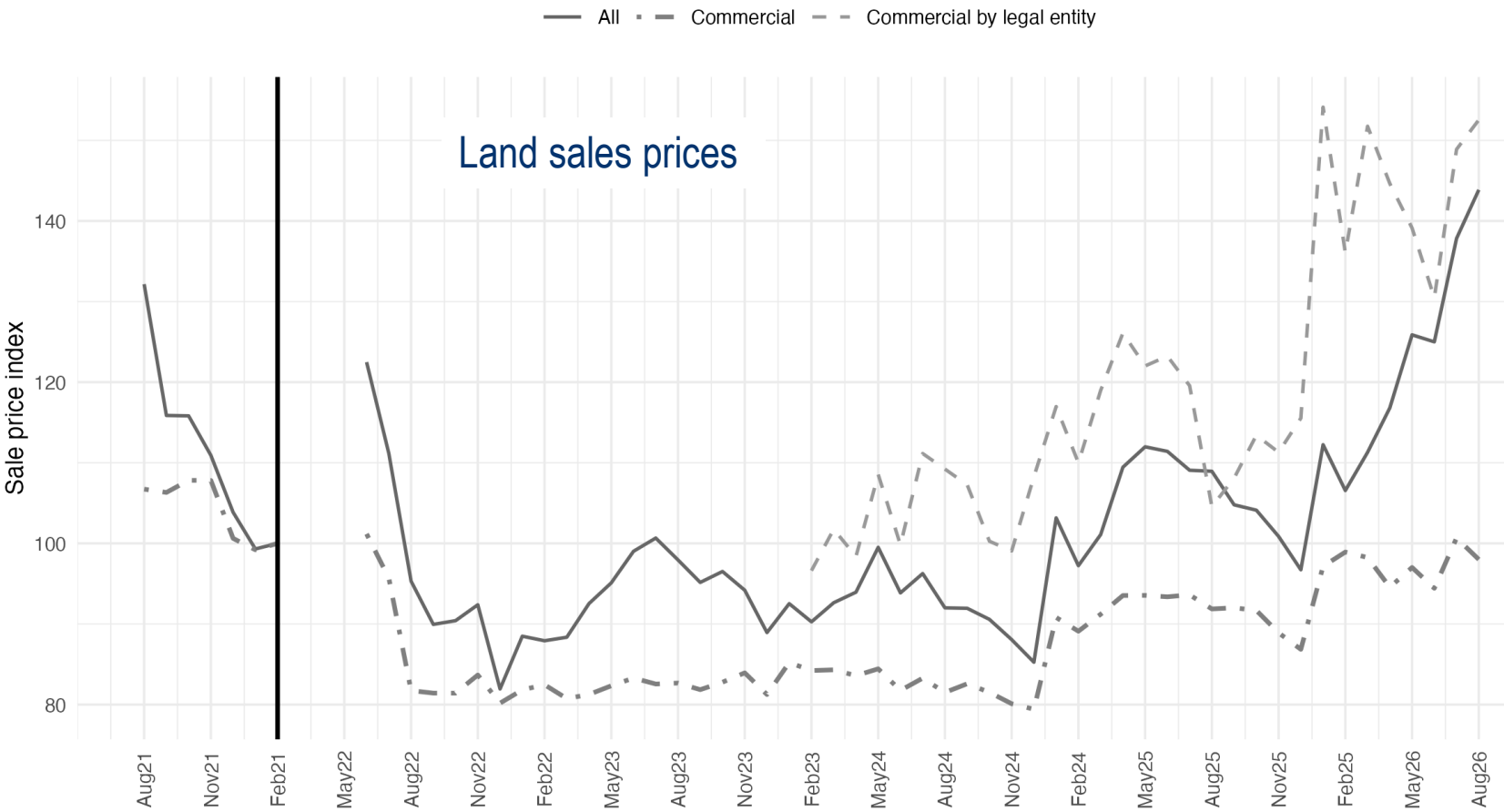
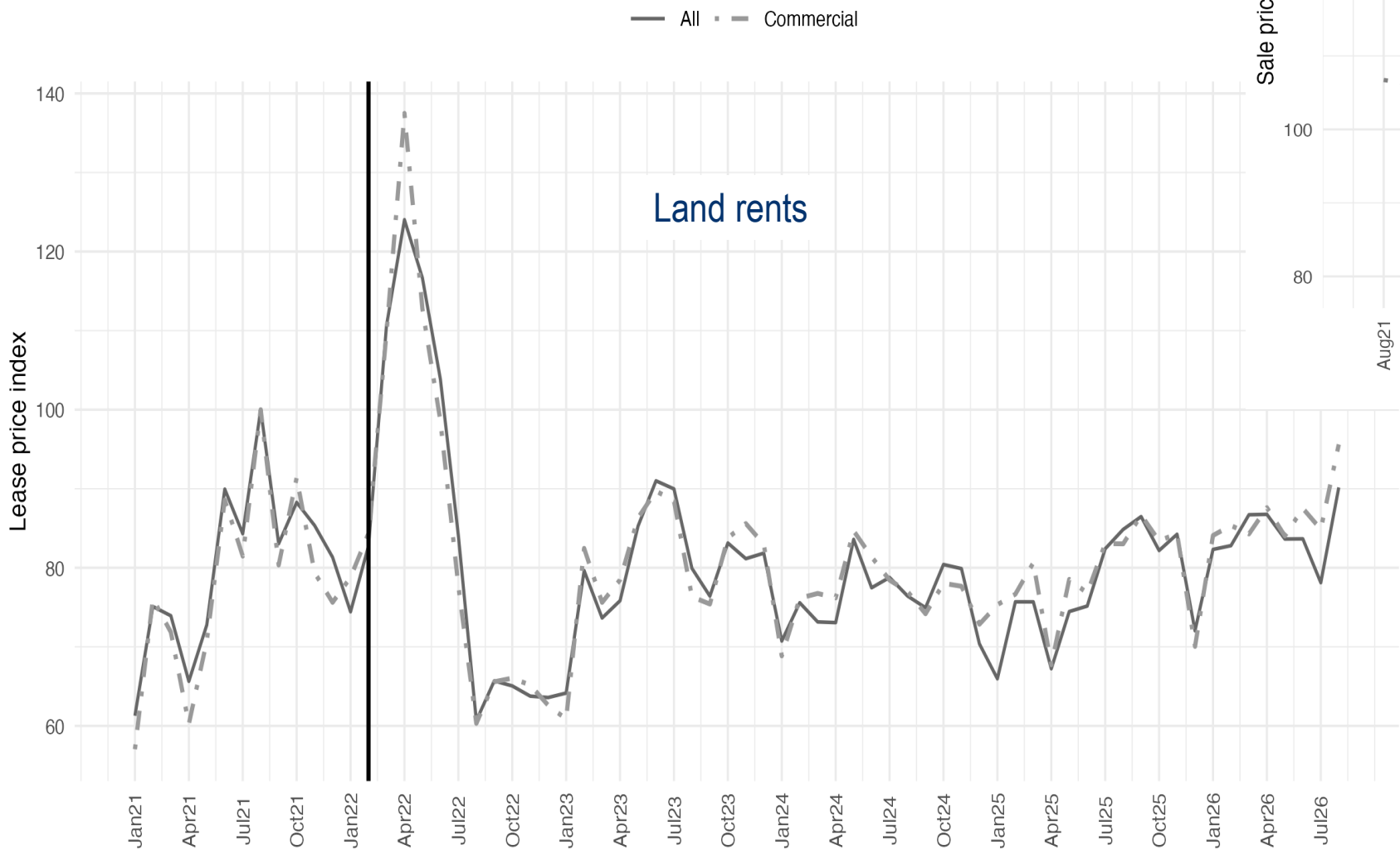
Key takeaways

- Significant drop in rentals
- No. of land sales well above pre-war level (once open)
- No. of land rentals much lower (< 20K vs 40K pre-war)
- Are expiring leases renewed?

Land market monitoring: Prices

Lease prices

- Trending upward but relatively stable in the aggregate
- Dynamics very different between war-affected & un-affected areas
- Quantities adjust more than prices



Sales prices

- About 40% above pre-war levels
- Driven by entry of legal entities
- More detailed analysis warranted

Sharing Ukraine's advances

World Bank land conference (May 2026)

- Country session with OTP (O. Mudryi), SAR (D. Manzhura) & ProZorro Sale (S. But)
- Plenary presentation by D. Bashlyk on Ukraine's farmer registry's contribution to B-READY
- Technical session with JRC, KPI, FAO & IGN(France) on satellite data, AI, and land parcel management

10th International Conference on Agricultural Statistics, Krakow (July 2026)

- Plenary chaired by DG Eurostats w. presentations by MAPF; Ukrstats; WB
- Technical session with Univ. MD; JRC, GAF(Germany), KPI



Priority areas for next 6 months

Support whatever decision MAPF & EUD reach on LPIS upscaling in 2027
Further develop CSM to allow analysis & its translation into programs/policy
Produce data/analysis on burned areas & grain tracking/coops
Provide legal support (to ACLIP, Valuation, IACS regulation) as needed
Support strengthening MAPF/PA/DZK capacity to administer SAR

Thank you!