

Combining Statistics, Admin. Data & Earth Observation to improve Agricultural Statistics In a period of profound turbulence

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Land Transparency
Supporting Transparent Land
Governance in Ukraine



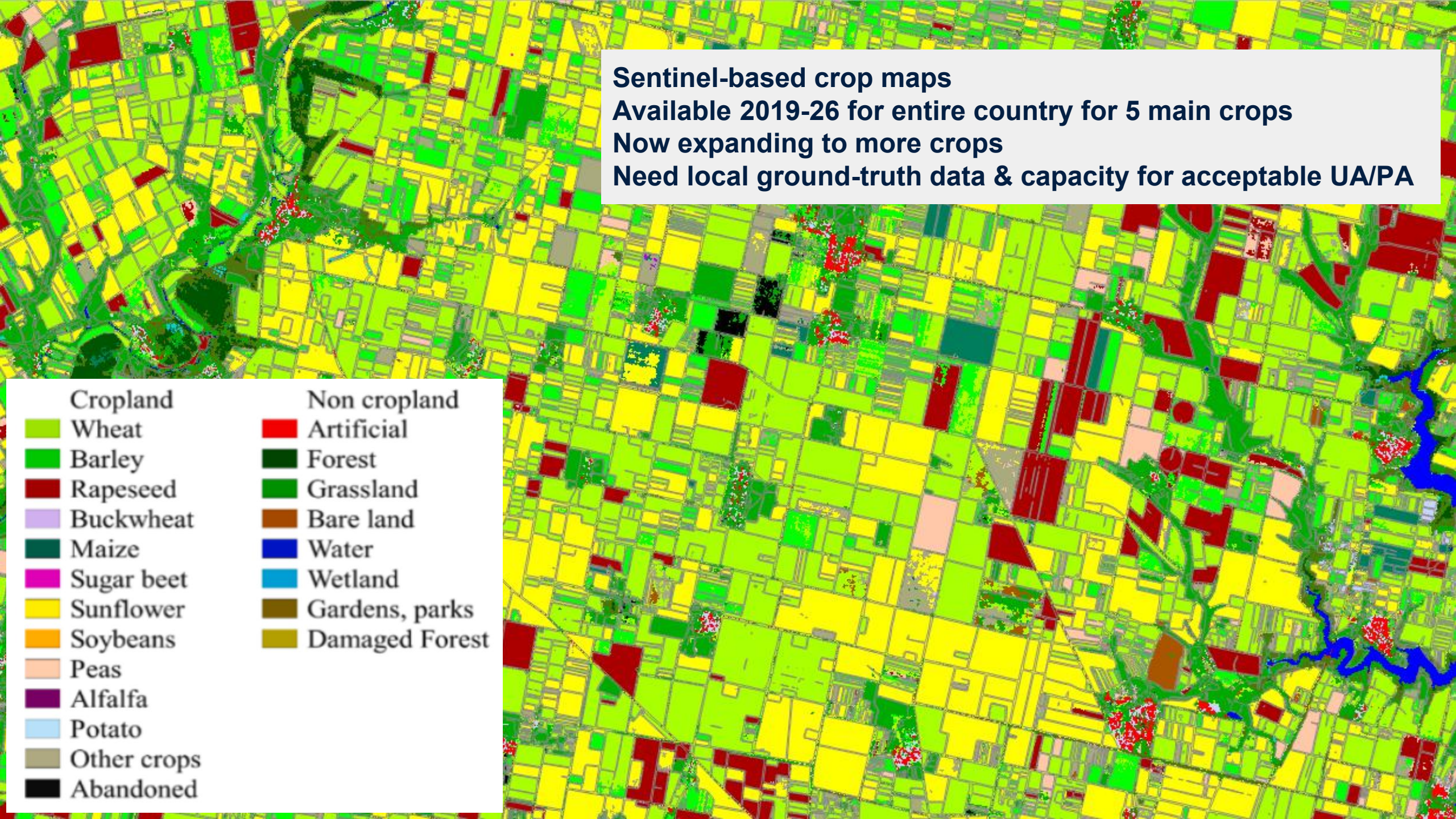
Importance of remote sensing

Sentinel-based crop maps

Available 2019-26 for entire country for 5 main crops

Now expanding to more crops

Need local ground-truth data & capacity for acceptable UA/PA



Cropland

- Wheat
- Barley
- Rapeseed
- Buckwheat
- Maize
- Sugar beet
- Sunflower
- Soybeans
- Peas
- Alfalfa
- Potato
- Other crops
- Abandoned

Non cropland

- Artificial
- Forest
- Grassland
- Bare land
- Water
- Wetland
- Gardens, parks
- Damaged Forest

Can also be used to detect damage from conflict

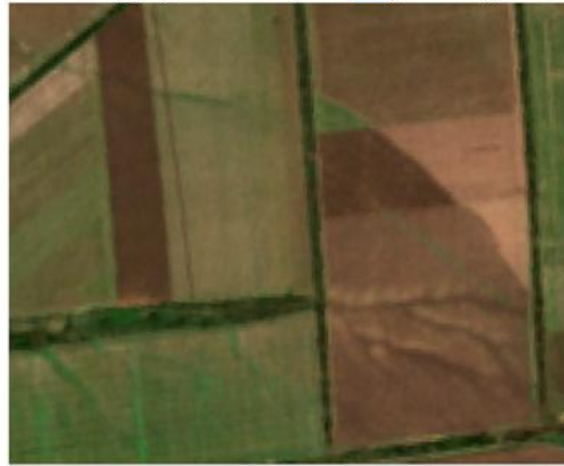
Panel A: Field burning (48.514°N, 38.262°E, 7/2/22 and 7/7/22)



Panel B: Heavy vehicle movement (47.458°N, 36.304°E, 6/12/22 and 7/7/22)

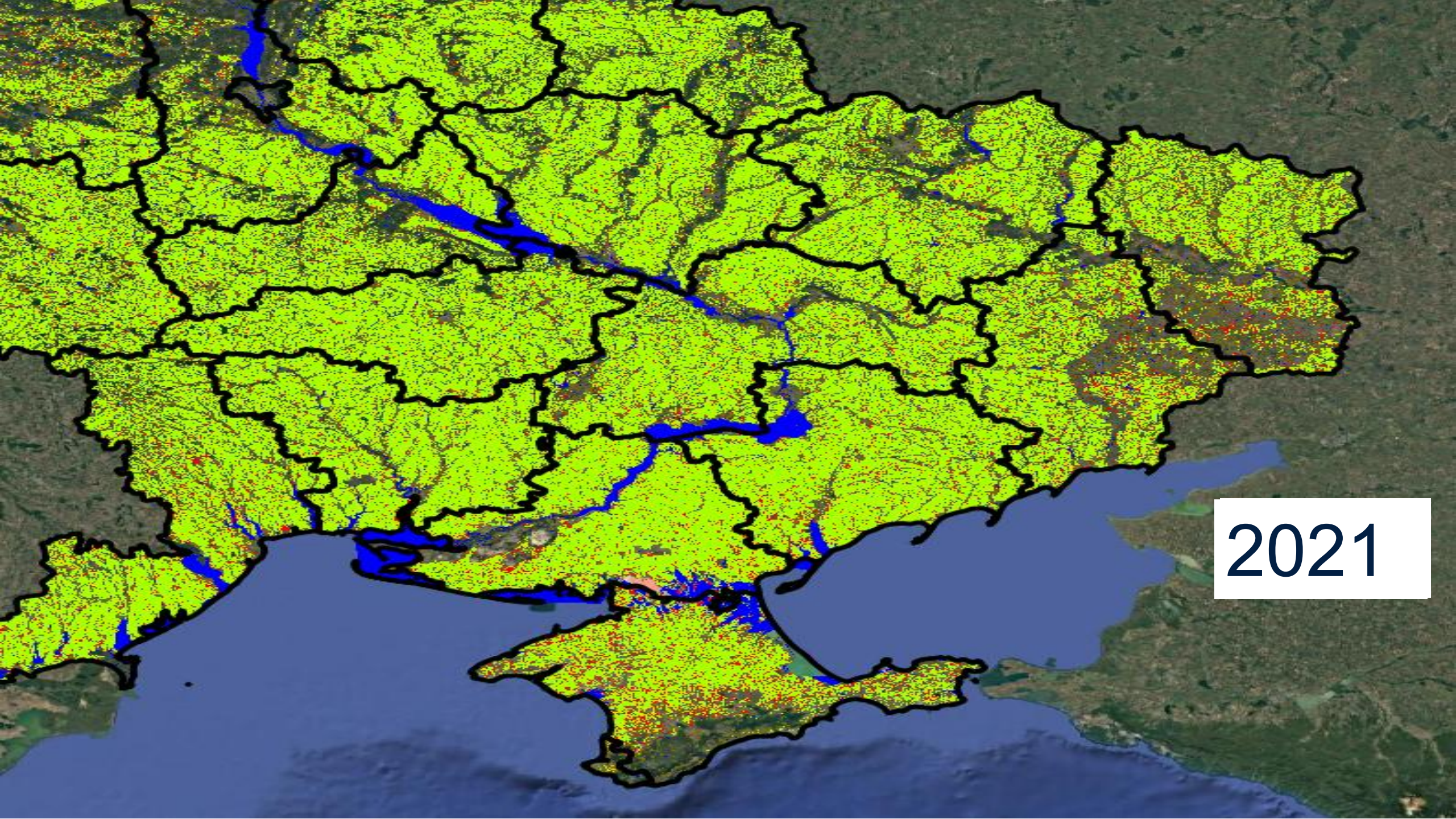


Panel C: Digging of trenches (47.376°N, 35.697°E, 9/8/22 and 5/1/23)

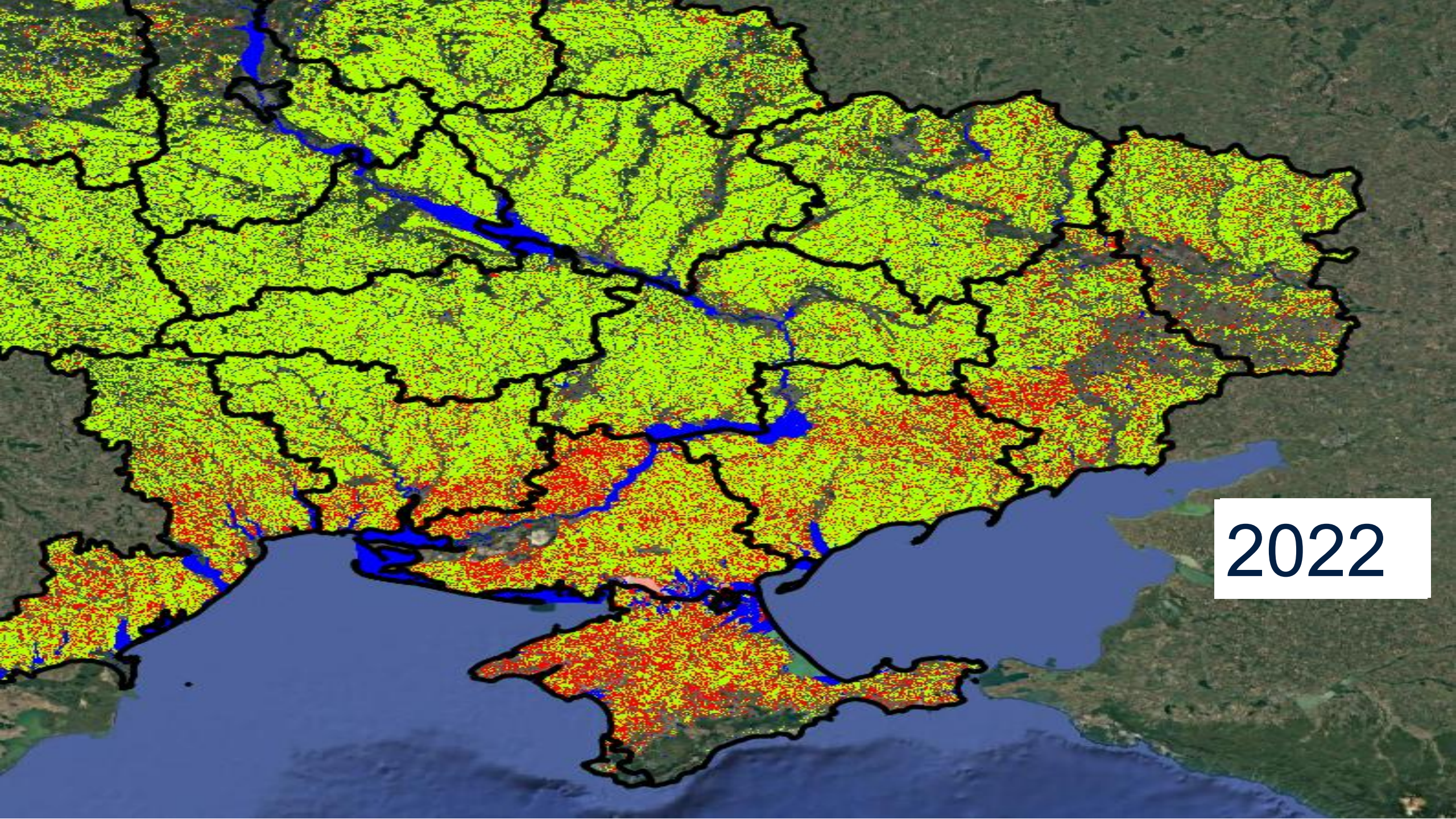


Panel D: Damage from artillery shelling (48.534°N, 38.189°E, 6/2/22 and 7/02/22)

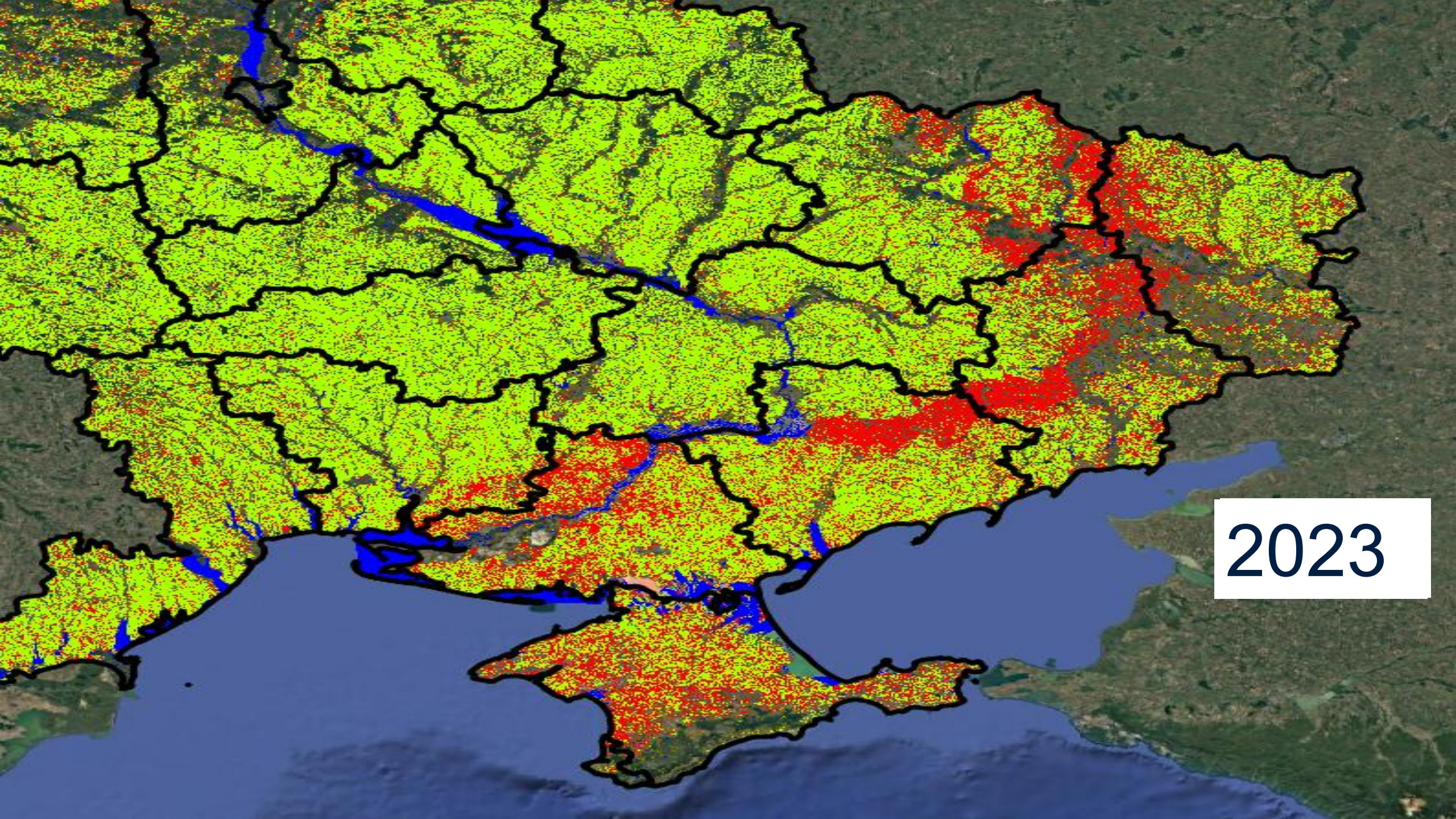




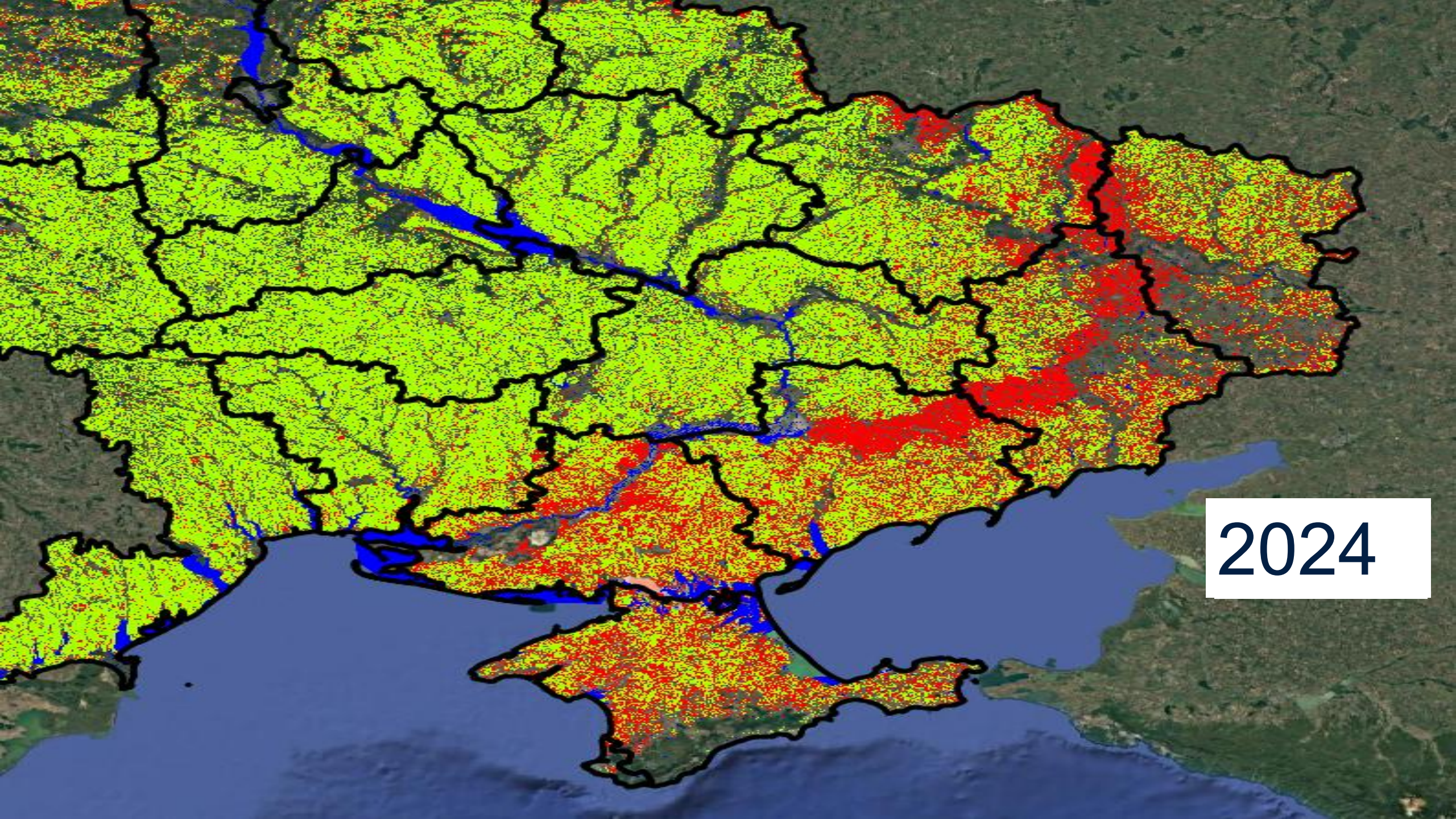
2021



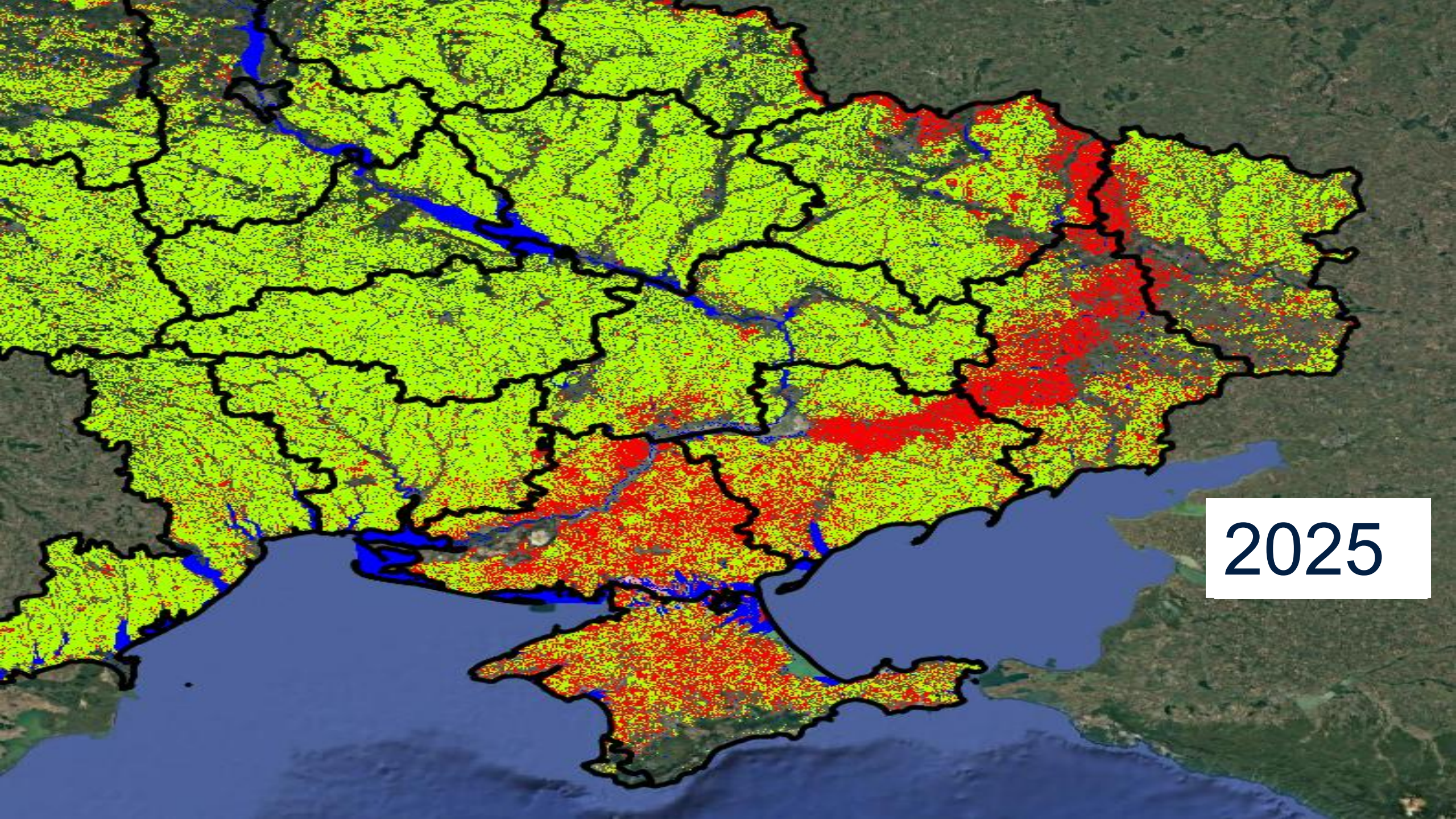
2022



2023



2024



2025

Allows to identify spatial incidence of cultivation

	2019	2020	2021	2022	2023	2024	2025
Total cultivable area							
Part or fully Russian-occupied	7.87	7.98	8.12	8.19	8.24	8.27	8.33
Oblasts bordering the front line	7.99	8.08	8.17	8.24	8.29	8.35	8.42
All other oblasts	15.37	15.75	16.26	16.58	16.82	16.97	17.38
Cropped area							
Part or fully Russian-occupied	7.18	6.98	7.27	5.37	4.84	4.17	4.50
Oblasts bordering the front line	7.55	7.44	7.69	6.75	6.84	7.12	7.27
All other oblasts	14.08	14.60	15.32	15.07	15.36	15.47	16.04
Uncultivated area							
Part or fully Russian-occupied	0.69	0.99	0.85	2.83	3.40	4.10	3.83
Oblasts bordering the front line	0.44	0.63	0.48	1.49	1.45	1.22	1.15
All other oblasts	1.28	1.16	0.94	1.51	1.46	1.49	1.33

... and crop composition

	2019	2020	2021	2022	2023	2024	2025
Cropped area (mn. ha)	21.64	22.04	23.00	21.82	22.20	22.59	23.31
% cereal	35.7	30.3	32.4	31.3	27.9	26.1	27.8
% maize	24.7	25.1	25.2	21.2	21.2	21.1	22.0
% rapeseed	5.3	4.1	3.8	5.5	7.4	5.9	5.6
% sunflower	23.6	25.6	25.4	26.4	28.0	24.5	26.6
% soybeans	8.1	6.1	5.9	10.2	11.9	17.7	14.3
% other crops	2.6	8.8	7.3	5.4	3.5	4.8	3.7

The potential of linking remote sensing to rights

3 reasons to link parcels (registry/cadaster) to persons (ID)

Provide support to certain crops, types of producers, or areas

- Allowed Ukraine to revolutionize subsidy delivery transparency & plan logistics/demining
- Avoids 'leakage' of subsidies to ghost farmers – only owners/users can claim
- Can verify if parcel is cultivated & with crop maps, which crop (risk-based follow-up & impact)
- Risk-based validation process provides in-built feedback loop to improve data

Bridge to private sector finance/insurance – reduce information asymmetries

- Authoritative land ownership data reduce banks' cost of client acquisition & loan processing
- Shapefiles & historical imagery to expand supply & decrease processing cost for insurance
- Requires regulation for consent-based data sharing – not too difficult as already regulated

Link small farmers to markets/value chains, advisories, traceability

- Traceability easiest administratively – just requires crop declaration & chain of transactions
- Reputation creation for forward contracting: still relatively under-exploited
- Users have an incentive to keep data updated & consent to sharing

Agri-stack as the basis for digital credit scoring in India

Farmer



Farmer ID
4352-758-123

- ▶ Who is a Farmer?
- ▶ Is someone a Farmer?

Geo-Referenced Village Maps



Khasra No.
122/1/a-2

- ▶ What Plots does a Farmer own?
- ▶ Where are the plots?



Farm ID
MP1234567890

Crop Sown



CropCode
WH-123
National Name- Wheat
Local Name- गेहूँ

- ▶ What Crop has been sown?
- ▶ On a Plot?
- ▶ By A Farmer?

AI Led Farm Assessment (Khetscore) & Monitoring (Khetscore Now)



Sample Use-Case: Contactless Straight-Through Processing of Kisan (Farmer) Credit Card

(KCC – A Central Government Scheme)

[Only 15 Minutes for Disbursement + Green Initiative]



Farmer Himself
applies in CSC



Aadhar Based Digital Verification and
eKYC within seconds



Standard
Digital Form

**Reserve Bank of India's (Innovation Hub)
Developed Unified Lending Interface
Accessed by > 150 banks
Banking correspondents to cover last mile**

Autofill using
Agri Stack

Digital Land Ownership
Verification, Crop pattern
verification, GPS Farm Co-
ordinates

API Integrations

<https://rbihub.in/projects/unified-lending-interface>



Digital
Approval or
Rejection



Digital Agreement
by Farmer and
Manager's eSign



DBT disbursements
into Farmers Bank
Account



UPI based
purchase of seeds,
fertilizers and
pesticides

Agri Stack

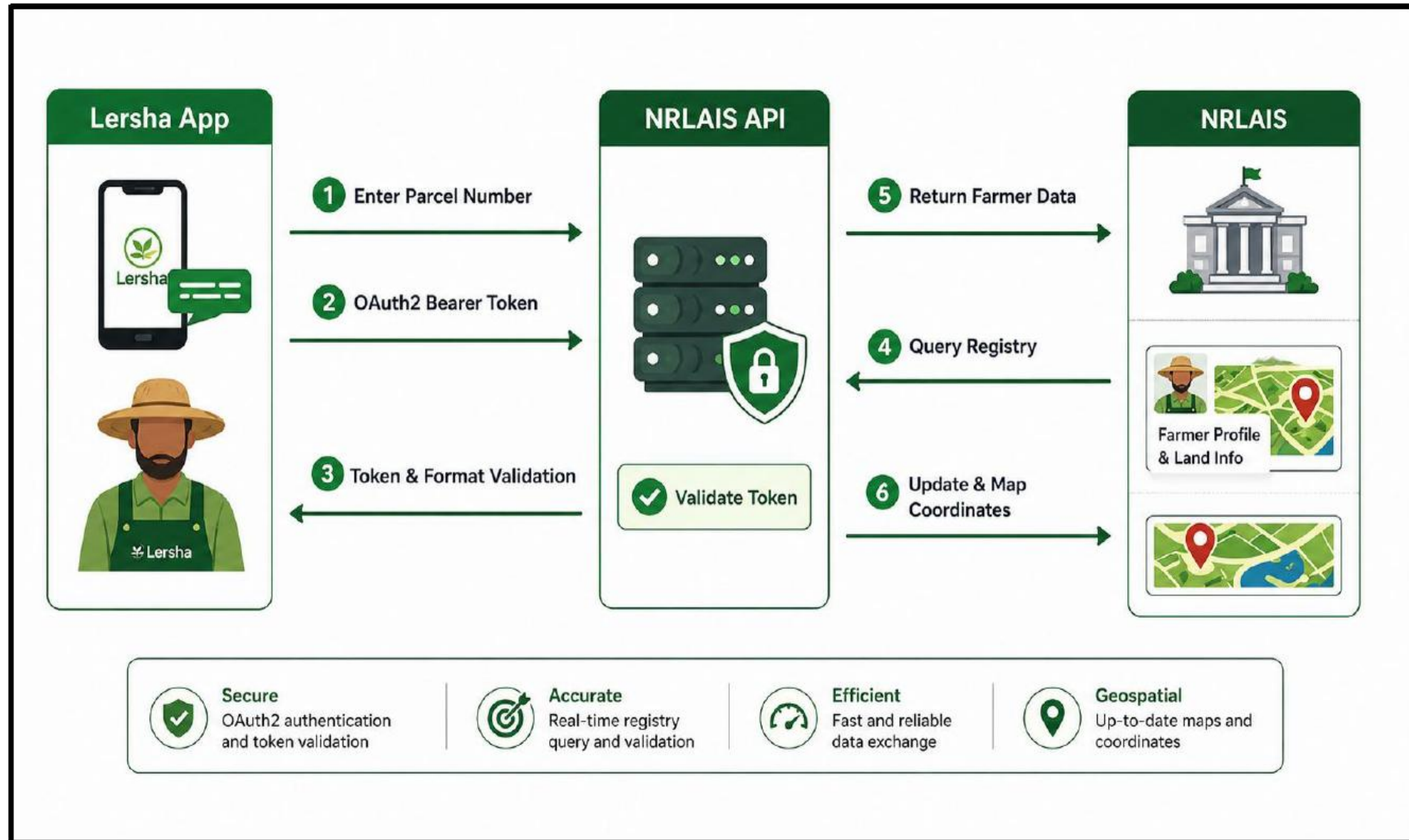


Digital Crop verification
(actually grown vs what
farmer has declared)
from Agri Stack

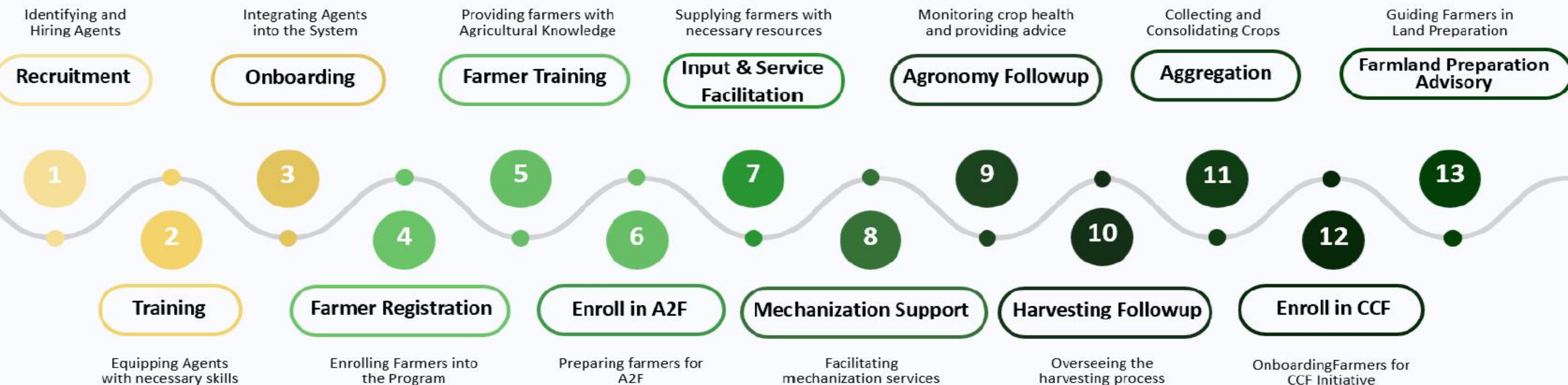


Digital Processing of
Subsidy and MIS
data sent to Agri
Ministry for Interest
subvention

Ethiopia: Tractors, traders, and banks need land & ID registry



Agents complement public data to collateralize in-kind loans



How linking data sources can improve statistical systems

Obtain an unbiased estimate of the Universe

Size group in ha	Legal entities		Individuals/FOPs	
	Units #	Area mn ha	Units #	Area mn ha
<1	25,842	0.007	1,931,977	0.486
1–2	7,733	0.009	469,296	0.574
2–5	10,655	0.027	449,541	1.161
5–10	6,112	0.032	210,516	1.205
10–20	5,059	0.057	67,861	0.726
20–30	3,491	0.070	13,596	0.260
30–50	5,208	0.177	10,030	0.316
50–100	6,712	0.402	7,919	0.447
100–500	11,510	2.252	4,709	0.664
500–1000	3,447	2.054	134	0.067
1000–2500	3,321	4.400	27	0.024
>2500	1,669	9.049	3	0.006
Total	90,759	18.536	3,165,609	5.938

Gets all land (UAA) in 3 groups

Land cult. & registered (24.47 mn. ha)

- A list frame is readily applied
- Any strat.n (LE/Ind; tenure, size,...)

Land cult. & unreg. (10.5 mn. ha)

- Mainly a regulatory challenge
- Area frame needed, if relevant
- More knowledge useful (% hh farms?)
- RS data help (55% past.; 15% wheat
9% sunflower, 6% maize, others)
- Can use parcel segmentation

Land reg. & not cult. (2.4 mn. ha)

Provide the missing link for policy & private sector

Data to help understand farm profits and their determinants

- What is the impact of changes in prices, manpower, profitability, profits & production location?
- Have support programs been effective? Are certain market imperfections overlooked?
- What is the regional impact of disruptions & shocks on the long-term trajectory of farm sector

Data on food security and household production, resilience & welfare

- Food security - household production a safety net?
- How are households affected by current & future shocks (UXOs and mine contamination)
- Paths towards intensification and creation of livelihoods

Collecting good data is not enough – ensuring its use & modification in real time

- Data timeliness & access by government & private sector essential
- Can be done without impinging on confidentiality
- Highlights importance of regulatory framework

Admin/RS data, statistics & reality should match

Harness registry/RS data to ensure sample frames reflect reality

- Ukraine: straightforward for commercial farmers (forms 50&2)
- May also be possible for household survey under some broad assumptions
- Comparing with registry coverage a first step – calls for within-government coordination

Address new policy issues by adapting instruments & adding new data sources

- Include technology & services (irrigation, credit, insurance & market links)
- Productivity, effects of shocks, labor markets, advisories, state support digital administration
- Explore consistency & sources of discrepancies across data source increasingly important

Tighten links to new sources of data to improve quality & accessibility & usability

- Regulatory frameworks (privacy) to build on digital data recorded by farmers already
- Update registries in real time (pre-filling of questionnaire) – provide trusted data in return
- Enormous potential for win-win – statistics increasingly as an aggregator of information

Conclusion

Shocks force to expand traditional tools - Ukraine is a prime example

- Crop maps & identification of areas affected by conflict damage
- Requires local capacity (ground-truthing in Ukraine's case)
- Fully digital system (SAR) backed by RS/registry/cadaster/digital ID to transfer state support

Integration of RS & geo-referenced admin. data a key for private sector

- Distribute subsidies in a transparent way that can be monitored
- Allow access to credit & risk reduction for insurance to bundle both
- Reducing moral hazard through integrated value chains & traceability (EUDR)

This makes agricultural statistics more important & also easier to produce

- Productivity & profits, food security not from RS/adm. records – critical for private sector response
- Representativeness, granularity, coverage, and timely access essential
- Ukraine show one example – look forward to discussing it and many others here at ICAS