

Identifying Mennonite settlements in a highly varied agricultural landscape

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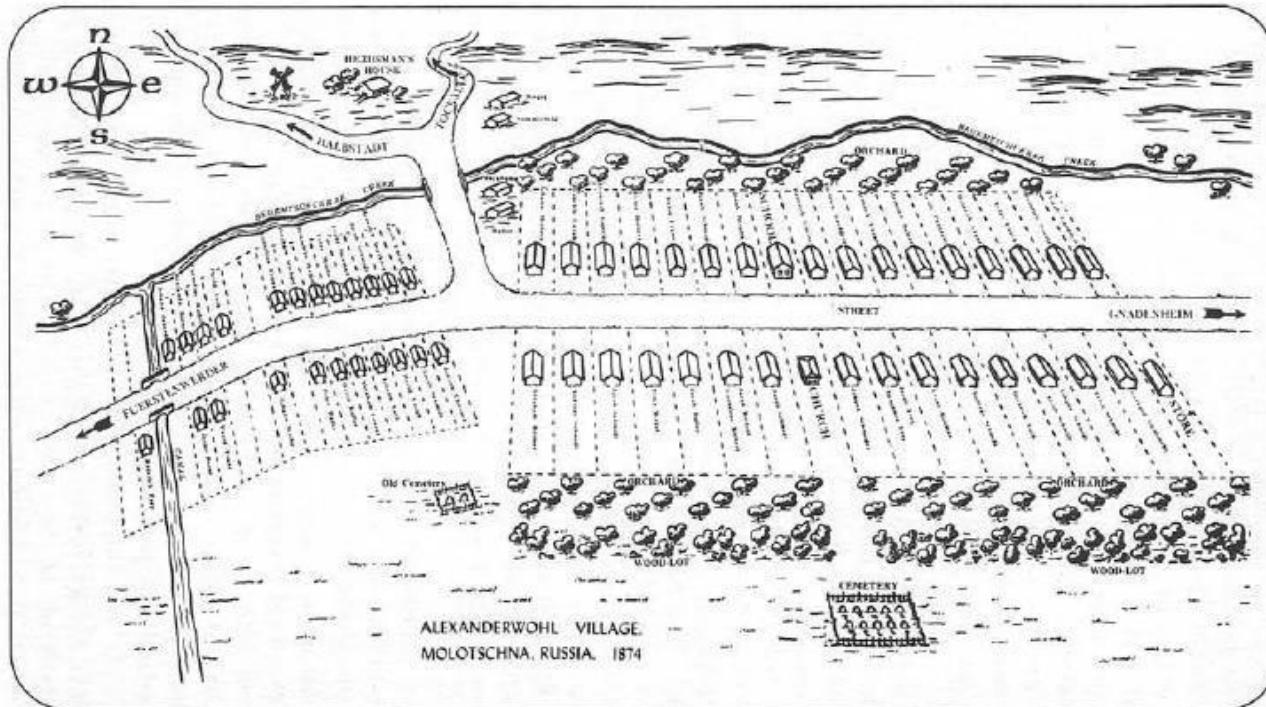
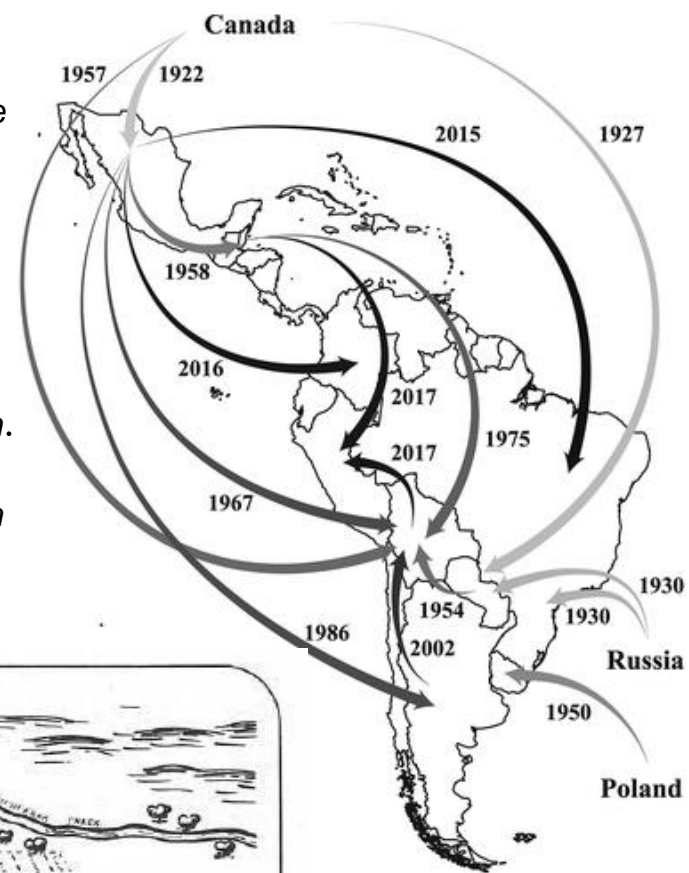
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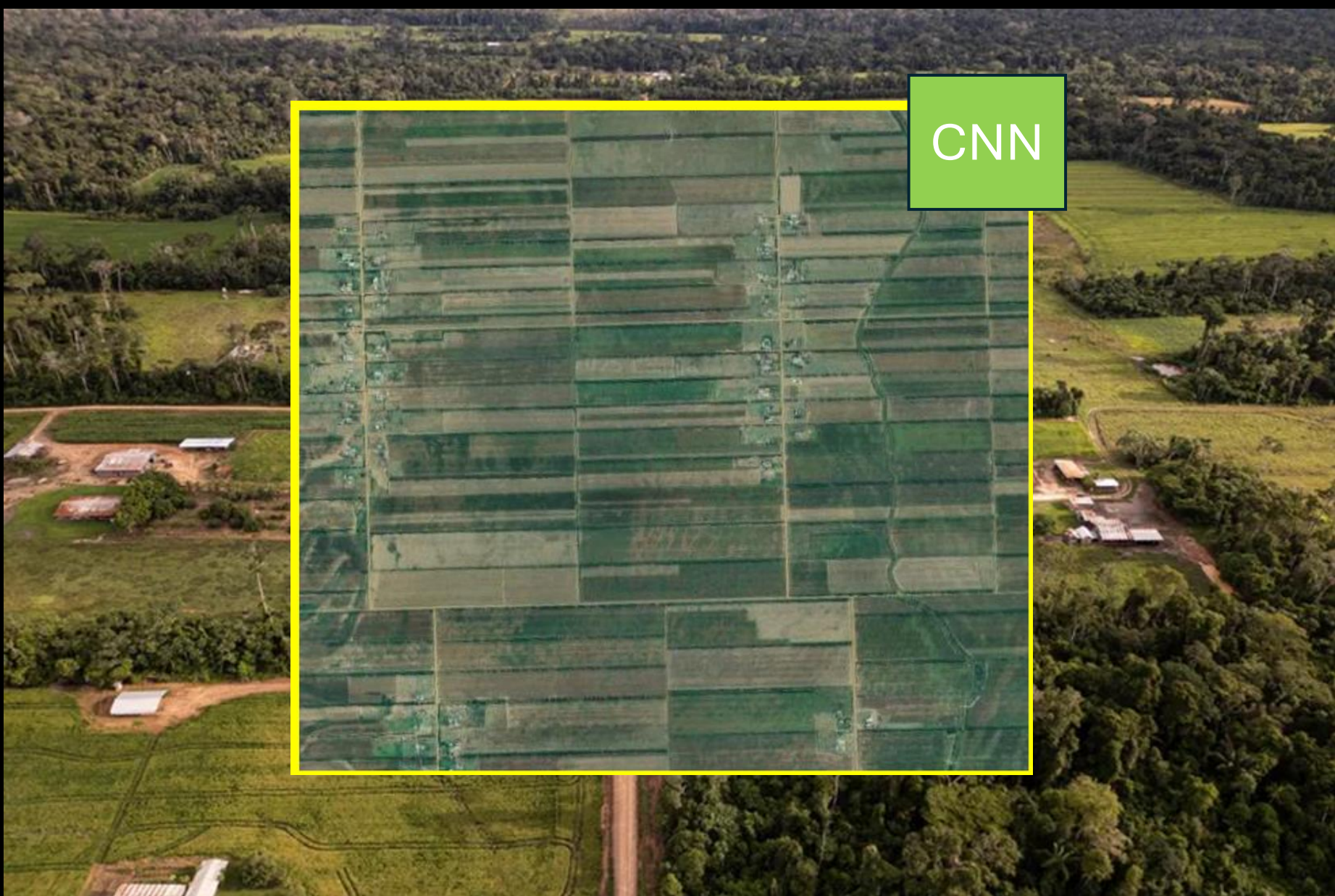
25 km

Bolivia, lowland Amazon
Department of Santa Cruz
Imagery: GoogleEarth.



The first Mennonite families to arrive in the Paraguayan Chaco region, after fleeing religious persecution in the Soviet Union. NORBERTO DUARTE/AFP via Getty Images





Vue aérienne de terres appartenant à des mennonites à Masisea, département d'Ucayali, Pérou, le 21 mars 2025 ERNESTO BENAVIDES / AFP <https://www.la-croix.com/fleches-contre-tracteurs-la-bataille-silencieuse-dans-l-amazonie-peruvienne-20250505>



Sun 11 Sep 2022 01.00 CEST

The Mennonites being accused of deforestation in the Peruvian Amazon

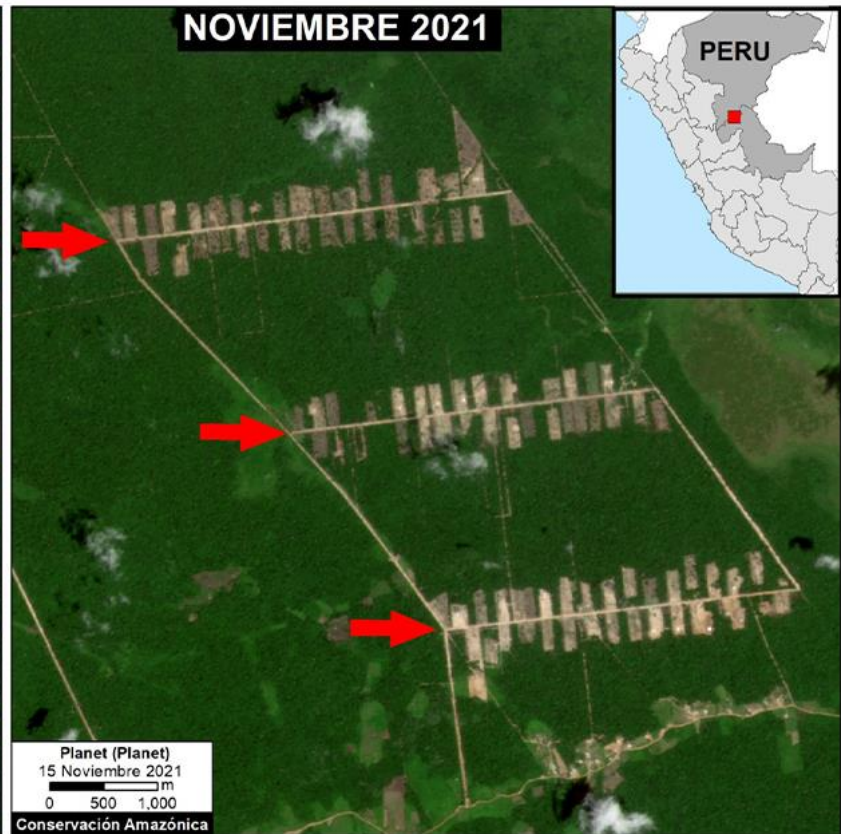
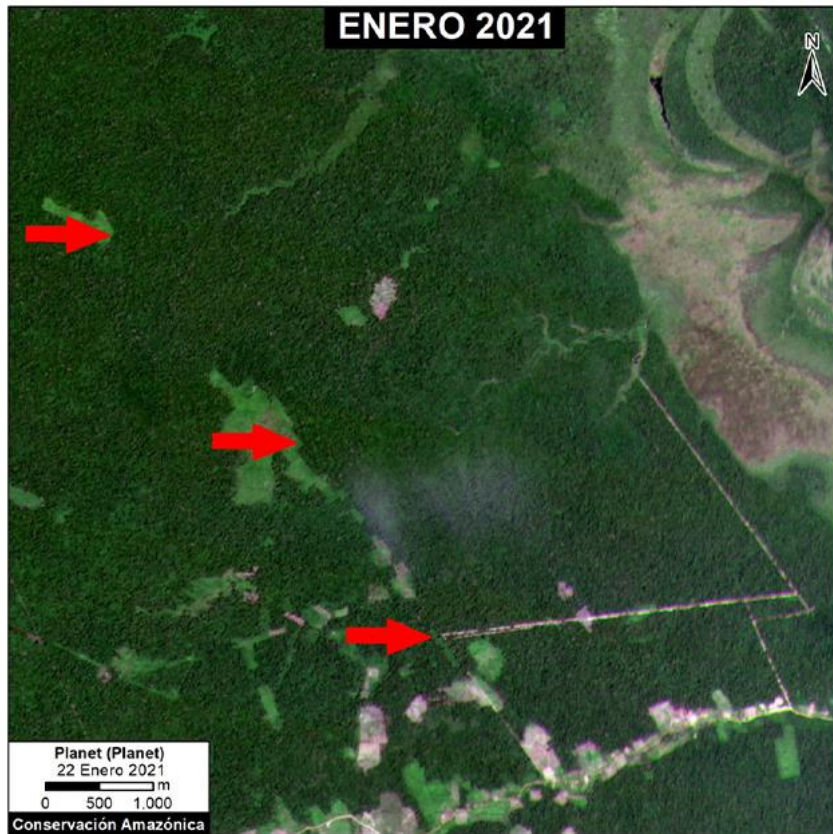


📍 Mennonite men in Wanderland, Loreto region, in the Peruvian Amazon. Photograph: Dan Collins/The Guardian

A brush with the law has alarmed the community of about 100 families who fear losing the land they have made their home

Advertisement





METHODS

CNN: ResNet50

Pretrained
fine tuning at all layers

Sampling

Unique image chips:
512x512 (2.4km)

Mennonite: polys

Non Mennonite:

> 60% ag

ESA WorldCover

n = 5541

Menn= 1733

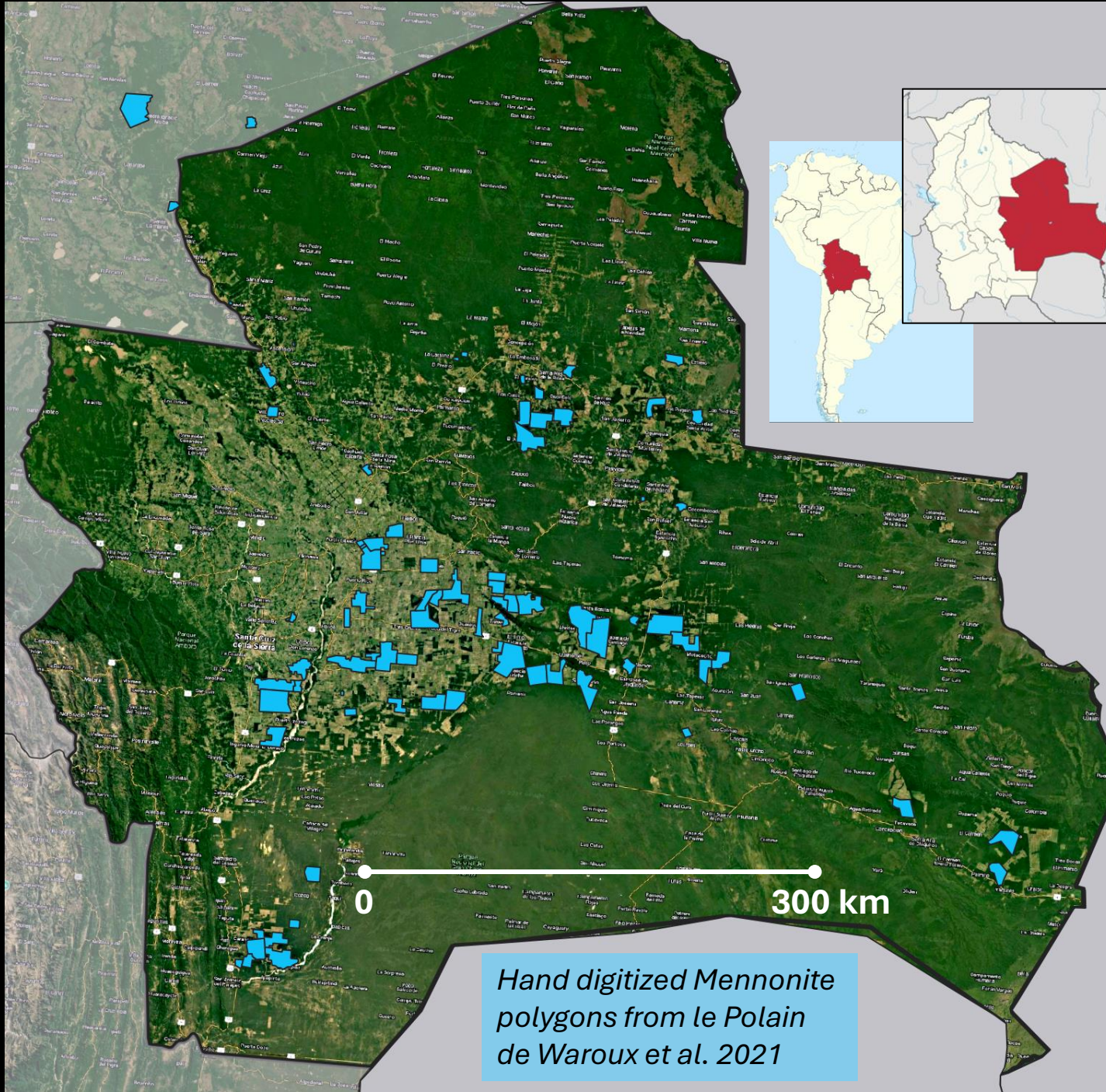
Non = 3808

Training:

Testing

90:10*

*weighted by the inverse of
class frequency



Imagery:

~5m Planet mosaics
October 2020



Additional questions? Please reach out to support@planet.com

What products are included in the TFO subscription?

The TFO subscription allows you to continue with the **same** high-resolution monitoring products you've become accustomed to for your **tropical forest monitoring** needs. This includes:

- Tropical Monthly PlanetScope Visual Basemaps over natural lands
- Tropical Monthly PlanetScope Surface Reflectance Basemaps over natural lands
- Planet Platform and APIs

The Basemaps include **all Archive and Monitoring Basemaps previously available under the NICFI Satellite Data Program** (Bi-annual Basemaps from December 2015 through August 2020; Monthly Basemaps from September 2020 through January 2025).

The subscription includes 70,000 processing units per month for streaming, downloading, and processing.

How do these products differ from what I received under the NICFI program?

While some naming has changed, the underlying data products are the same. You will have access to the full archive, which runs bi-annually from December 2015 through August 2020 and monthly from September 2020 onward. The coverage area is also the same right now; however, we are limiting use to only natural lands (i.e., excluding primarily agricultural and developed areas) within the pantropical extent to meet the intended use of the program for deforestation and degradation monitoring.

What is the cost of the Tropical Forest Observatory subscription?

We are pleased to offer steep discounts to users in order to continue their non-commercial tropical forest conservation and climate work.

Register in March 2025 to receive a **promotional price of \$110 per user, per month** for the first six months (or \$1,100 per user, per year if paying for an annual plan).

After March, users can continue to register at \$180 per user, per month (or \$1,800 per user, per year if paying for an annual plan).

RESULTS

Testing

Class	# of Observations	Precision	Recall	F1-score
NON	281	0.92	0.98	0.95
MENN	273	0.98	0.91	0.94
Overall Accuracy		95%		

Per-class performance metrics for the test set.

Training

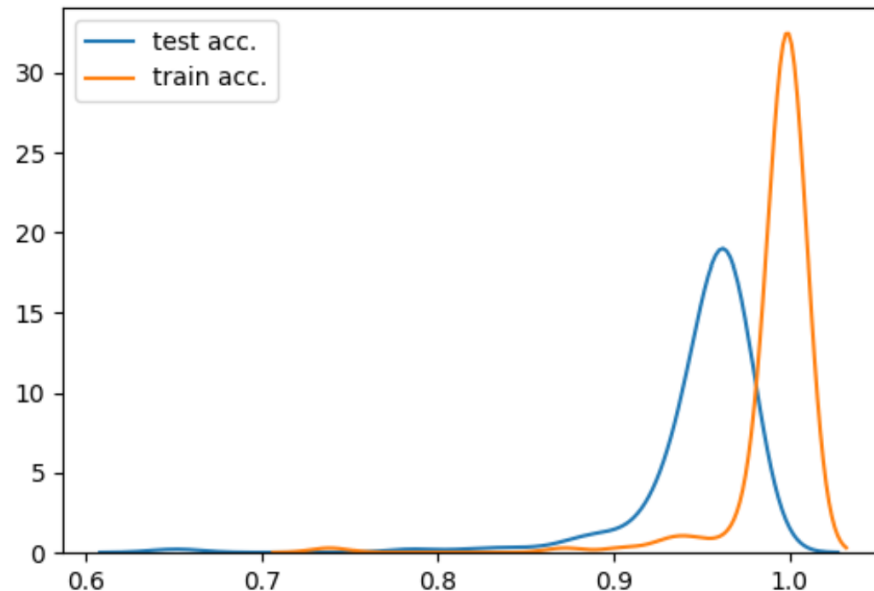
Class	# of Observations	Precision	Recall	F1-score
NON	3,527	1.00	1.00	1.00
MENN	1,460	1.00	0.99	0.99
Overall Accuracy		100%		

Per-class performance metrics for the training set.

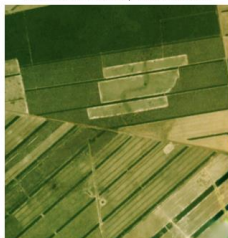
- Successful!
- Detecting a specific agricultural culture among all other agriculture

Swenson, Faraj, Runfola *Submitted*.
Remote Sensing Letters

Distribution of model accuracies over 100 runs



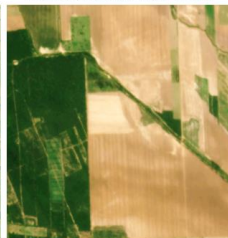
Predicted: COMM, True: OTHER



Predicted: COMM, True: OTHER



Predicted: OTHER, True: OTHER



Predicted: COMM, True: OTHER



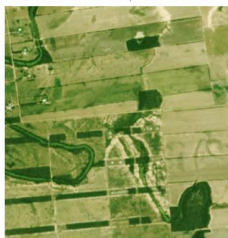
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Predicted: COMM, True: OTHER



Predicted: OTHER, True: OTHER



Predicted: OTHER, True: COMM



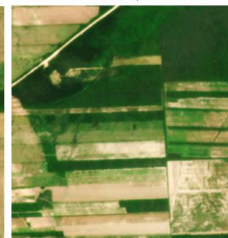
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Predicted: OTHER, True: COMM



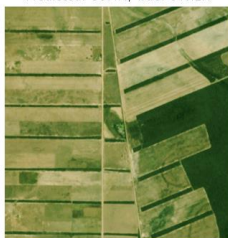
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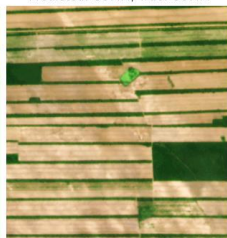
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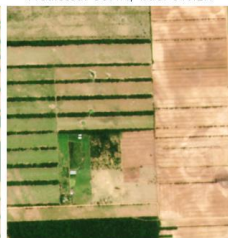
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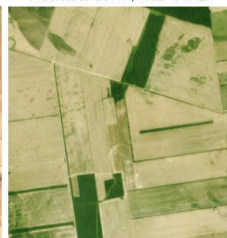
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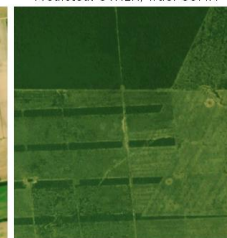
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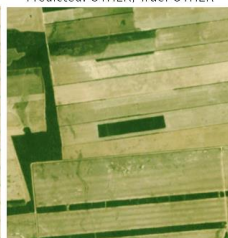
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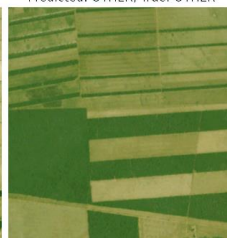
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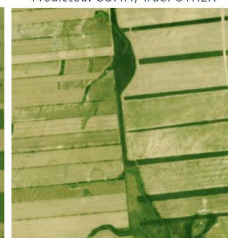
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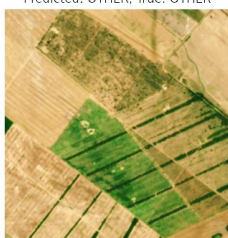
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Predicted: COMM, True: COMM



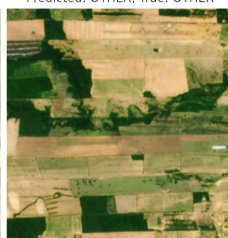
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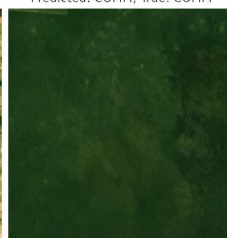
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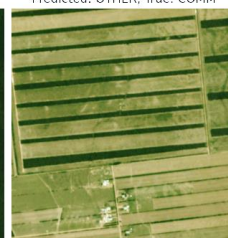
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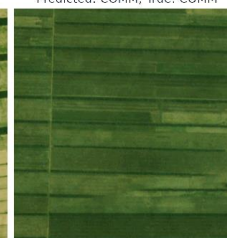
Predicted: COMM, True: COMM



Predicted: OTHER, True: COMM



Predicted: COMM, True: COMM



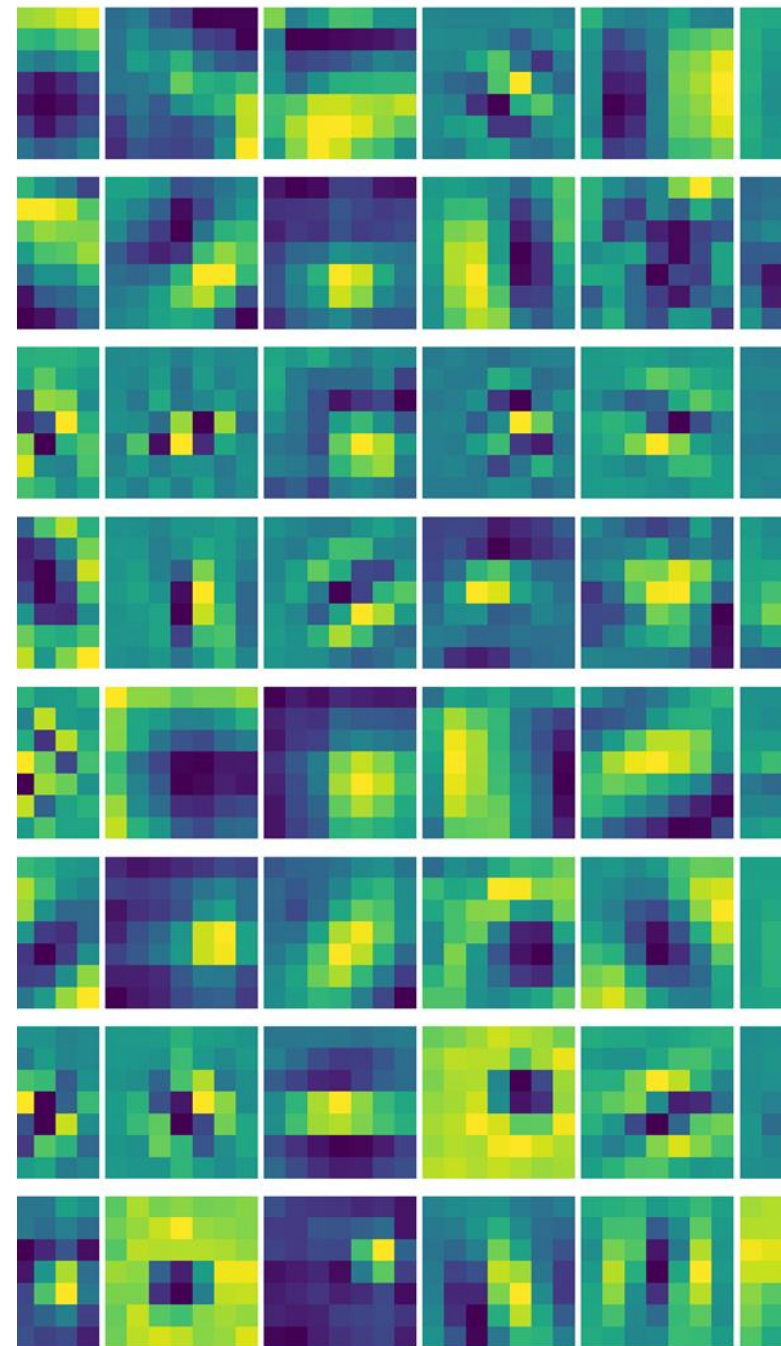
Predicted: **Non**

“True” label: **Mennonite**



Next steps

- What features is the CNN leveraging?
 - Explainable AI
 - Grad-CAM (Gradient weighted Class Activation Mapping)
 - SHAP-CAM(SHapley Additive exPlanations-Shapley value)
- Image chips: R,G,B $\rightarrow$ R,G,NIR
- Expand area of classification $\rightarrow$ Latin America
- Planet 5m mosaic $\rightarrow$ Sentinel 2
- Expand to time series $\rightarrow$ last 10 years
- Expand to other landuses/agents e.g. cattle



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COOPERATIVA



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