

Assessing Contemporary Global Land Cover Products to Study Land Cover Change in Poland



Mahsa Shahbandeh^{1,2}, Dominik Kaim², Jacek Kozak²

¹ *Doctoral School of Exact and Natural Sciences, Jagiellonian University, Łojasiewicza 11, 30-348 Krakow, Poland*

² *Institute of Geography and Spatial Management, Faculty of Geography and Geology, Jagiellonian University, Gronostajowa 7, 30-387 Krakow, Poland*

In this study, the contemporary 10 m global datasets including Google’s Dynamic World (GDW), ESA’s World Cover (ESA WC), Esri Land Cover (ELC) map were compared in Poland to assess their usefulness for the forest cover change studies in Central-European conditions based on EU Land Use/Cover Area Frame Survey (LUCAS) points (table below).

Product	Time period	LULC classes	References
GDW	2021	9 classes: Water, Trees, Grass, Flooded vegetation, Crops, Shrub and scrub, Built, Bare, Snow and ice	<i>Brown, C.F. et al.2022.</i> https://doi.org/10.1038/s41597-022-01307-4
ESA WC	2021	11 classes: Tree cover, Shrubland, Grassland, Cropland, Built-up, Bare / sparse vegetation, Snow and Ice, Permanent water bodies, Herbaceous Wetland, Mangrove, Moss and lichen	<i>Zanaga, D. et al. 2022..</i> https://doi.org/10.5281/zenodo.7254221
ELC	2021	9 classes: Water, Trees, Flooded Vegetation, Crops, Built Area, Bare Ground, Snow/Ice, Clouds, Rangeland	<i>Kontgis, K. et al. 2021.</i> https://doi.org/10.1109/IGARSS47720.2021.9553499
LUCAS	2022	9 classes: Artificial Land, Cropland, Woodland, Grassland, Shrubland, Bare Land, Water, Wetlands, Unclassifiable	<i>Ballin, M.A. et al. 2022.</i> http://dx.doi.org/10.2785/957524

Methods: All three land cover products were harmonized into six unified classes: Forest, Semi-natural Vegetation, Cropland, Built-up, Water, and Others. The respective land cover masks were integrated, and land cover data were extracted for each LUCAS survey point to assess classification accuracy. We calculated precision, recall, and F1-score. In addition, we calculated Intersection over Union (IoU) for forest area at the province level.

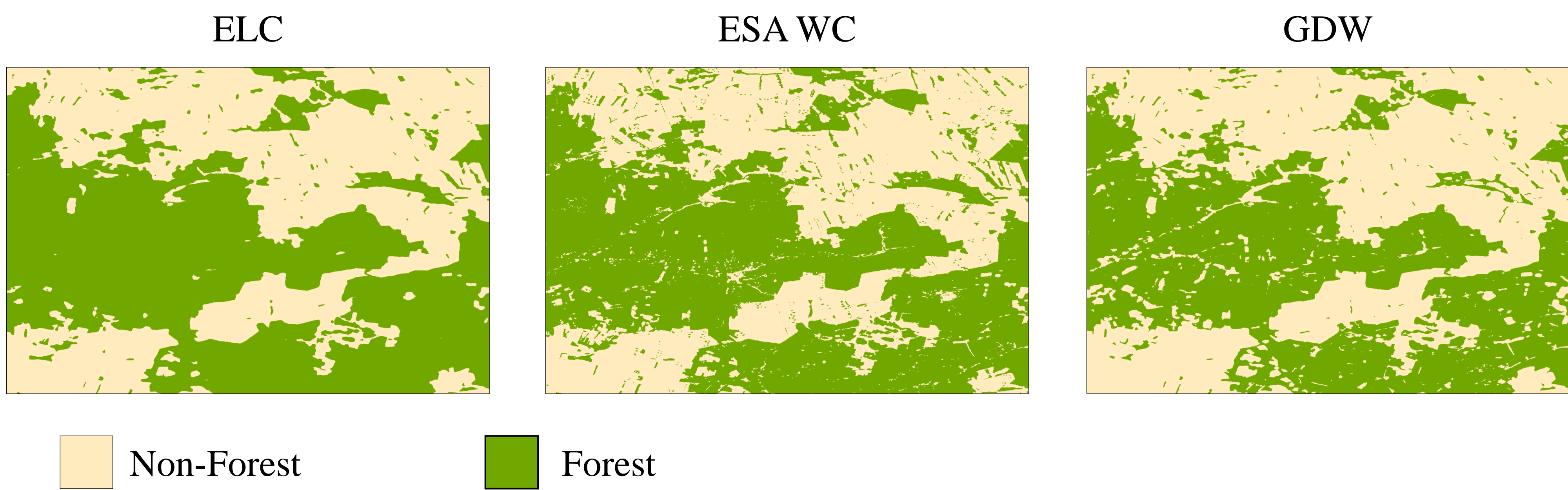


Figure 1. Forest and non-forest area near Dobrodzień town, in Opole Voivodeship, Poland.

Results: ESA WC showed the most balanced forest classification in Poland, with a precision of 0.85, recall of 0.70, and F1-score of 0.77. ESA WC and ELC both achieved 91% overall accuracy, outperforming GDW, which tended to overestimate non-forest areas. Among the three, ESA WC proved most effective for forest monitoring in Central Europe. In northwest Poland, classifications were highly consistent, especially in Lubuskie province, where over 80% was identified as forest by all products—the highest agreement nationwide.

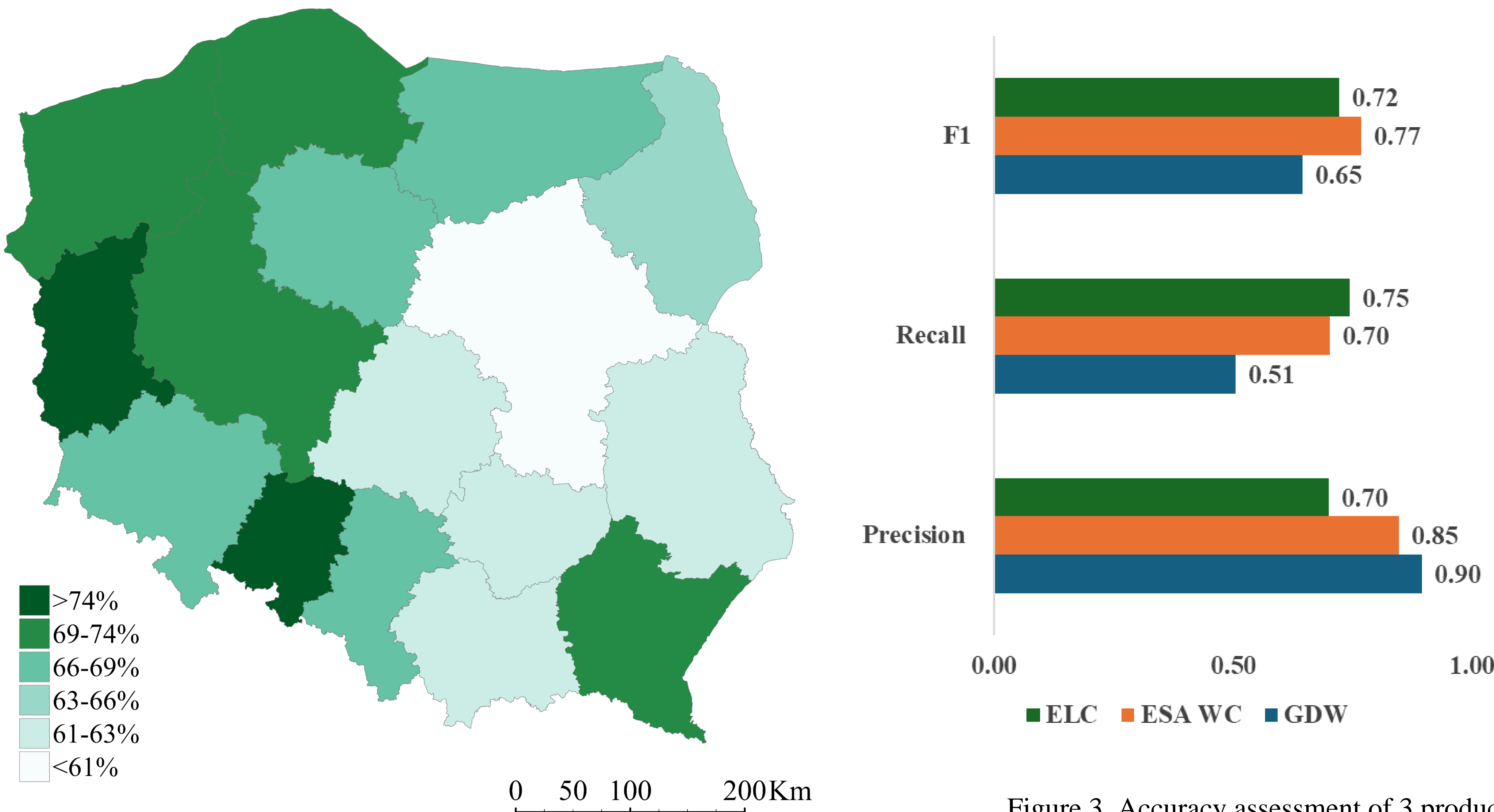


Figure 2. IoU for forest area at the province level in Poland

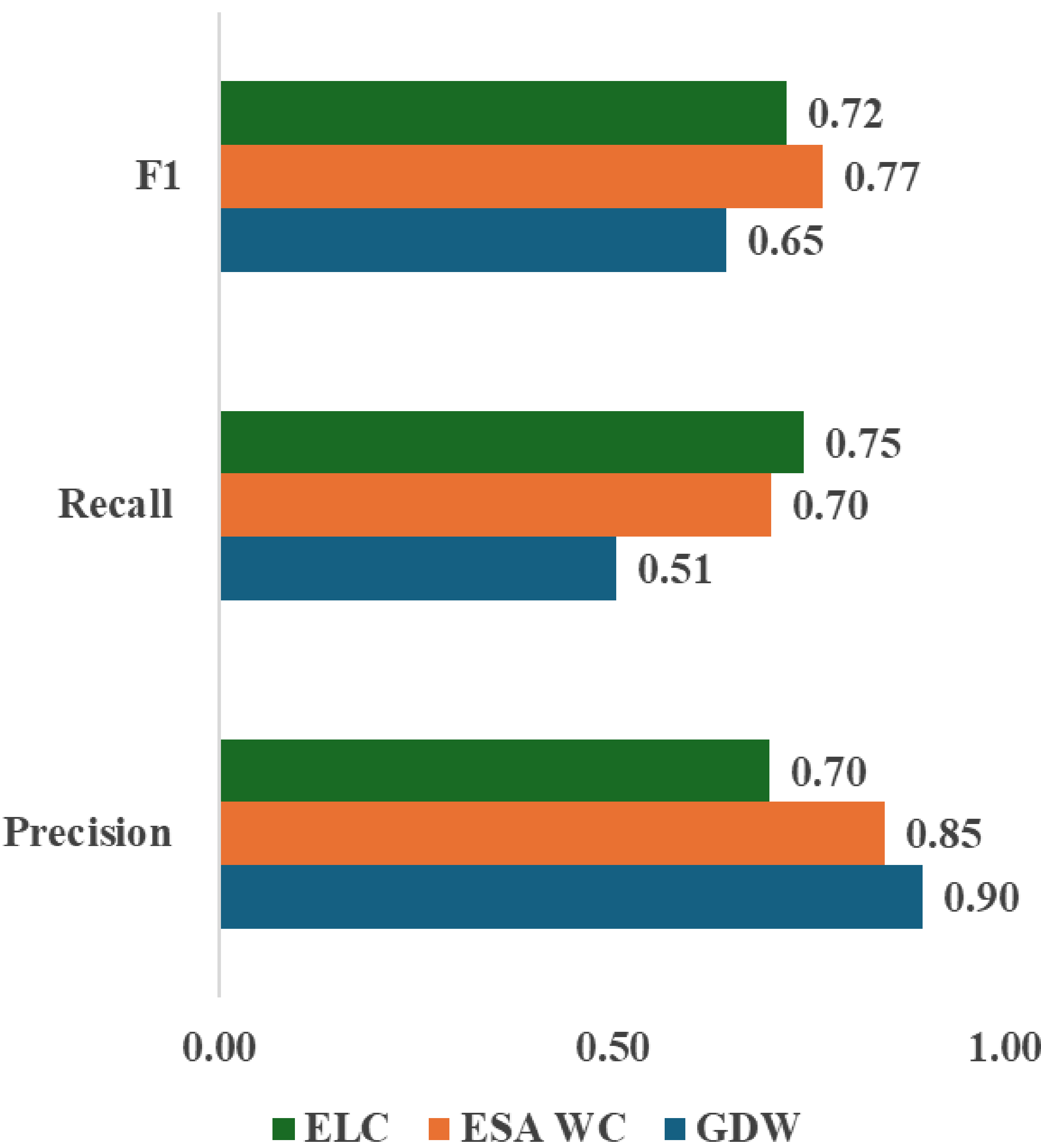


Figure 3. Accuracy assessment of 3 products