

# ***Supplementary Materials of GMIE: a global maximum irrigation extent and central pivot irrigation system dataset derived via irrigation performance during drought stress and deep learning methods***

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## **1. Cropland mask used in this study**

Due to lack to consistent and high-accuracy cropland mask, which is crucial for detect irrigated and rainfed cropland we used synthesized cropland mask integrating 10 existing land cover maps or cropland datasets to delimit the global cropland extent while masking out irrelevant non-cropland pixels for the period of 2016–2018. The detail information for the source of cropland mask can be found in Table S1 and Figure S1. This data was used for supporting crop intensity mapping (Zhang et al., 2021).

Although variations in classification systems among different products exist, a subset of classes of those land cover and cropland layer products were selected to best fit into the cropland definition (Table S1). Spatially, FROM-GLC was selected for Europe, Africa, New Zealand, the majority of Asia, and part of Latin America. GFSAD30 was selected for tropical Asian islands, including Indonesia, Malaysia, and the Philippines (Figure S1). In addition to these two global-coverage cropland extent products, several national or regional datasets, including ChinaCover, CDL, AAFC ACI, NLCD, MapBiomass, CLUM, SERVIR, and INTA, were used because they have been extensively validated by local experts and hence exhibited high accuracies of cropland mapping.

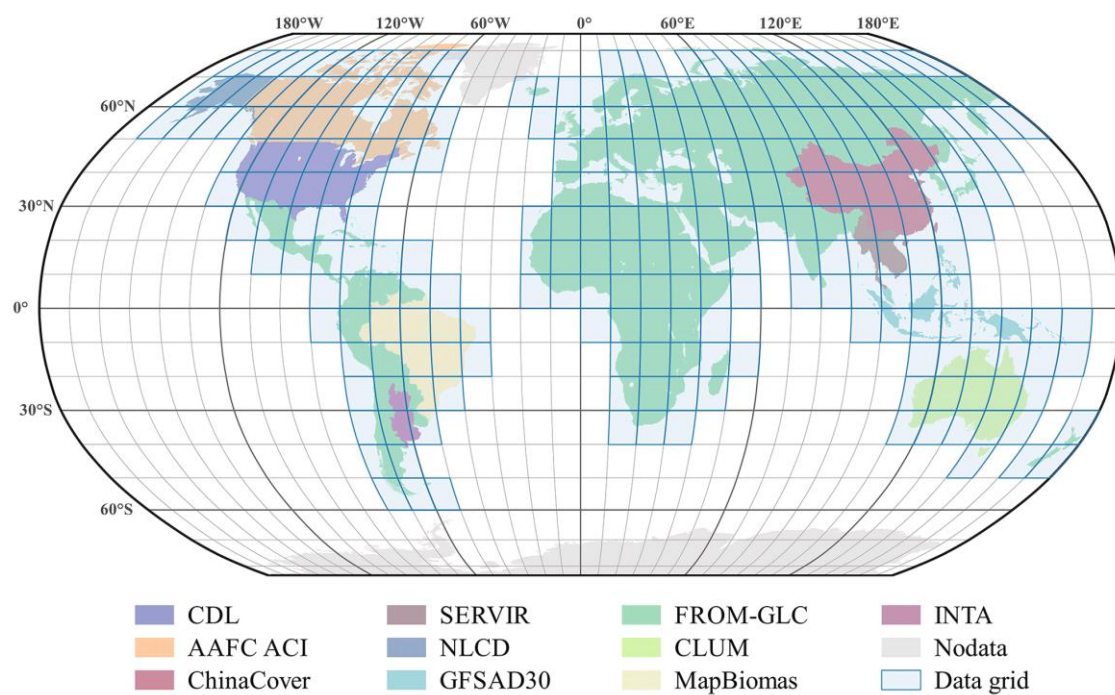


Figure S1 Spatial distribution of the land cover/cropland layer products used for the global 30-m cropland (Zhang et.al 2021 ESSD)

Table S1. Cropland and land cover datasets used for the study

Region	Dataset name	Year	Selected classes	Resolution	Accuracy	Reference
Argentina	Crop type map	2018-19		30	81%	(De Abelleira Diego, 2019)
Australia	Catchment Scale Land Use of Australia	2018	Cropping, Seasonal horticulture, Irrigated cropping, and Irrigated seasonal horticulture	50	92%	(Calderón-Loor et al., 2021)
Brazil	MapBiomass			30		Project MapBiomass, 2019* (Do Canto et al., 2020)
Bhutan	Land cover data of Bhutan	2010	Agriculture	30		ICIMOD, 2011 (Uddin et al., 2015)
Canada	Canada AAFC Annual Crop Inventory data	2009	Seasonal crops and greenhouse	30	85%	(McNairn, H,2009) (McNairn et al., 2009)
China	ChinaCover	2015	Upland and rice field	30	86%	(Wu et al., 2017; Wu et al., 2024)
Mozambique	ChinaCover	2018		10	85%	(Bofana et al., 2020)
Nepal	National landcover for Nepal	2010	Agriculture area	30		(Uddin et al., 2015)
New Zealand	New Zealand Land Cover	2012	Short-rotation cropland	30		NZLRI, 2015
United States	CDL	2009	Class 1~56 and Class 225~254	30	85%-95%	(Boryan et al., 2011),
Zambia	ChinaCover	2018		10	0.87	(Bofana et al., 2020)
Zimbabwe	ChinaCover	2018		10	0.86	(Bofana et al., 2020)
Europe	CORINE land cover	2018				(Büttner et al., 2017)
Central Asia	CA Landcover	2015		30		CASEarth
Africa	FROM-GLC-Africa30	2015				(Liu et al., 2021)
Lower Mekong	SERVIR-Mekong Land Cover	2018	Cropland and Rice	30	0.94	(Saah et al., 2020)
Global	FORM-GLC 2015	2015		30		**
Global	GFSAD30	2015		30		***
*	<a href="https://plataforma.mapbiomas.org/map#coverage">https://plataforma.mapbiomas.org/map#coverage</a>					

**	<a href="http://www.chinageoss.org/tansat/pdf/FROM-GLC.pdf">http://www.chinageoss.org/tansat/pdf/FROM-GLC.pdf</a>
***	<a href="https://lpdaac.usgs.gov/news/release-of-gfsad-30-meter-cropland-extent-products/">https://lpdaac.usgs.gov/news/release-of-gfsad-30-meter-cropland-extent-products/</a>

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## 2. Field survey method for irrigation and rainfed samples

Although it is not easy to identify irrigated cropland on satellite data, irrigation cropland could be identified accurate in field according to irrigation infrastructure, crop type and crop health condition. Even you cannot distinguish them following above characteristics, you could ask local farmer, who will answer this question with hesitate.

- Irrigation infrastructure, some obvious feature was easy to identify, such as canner, irrigation pump and central pivot irrigation system. We display serval photos for this case as below:

	
Irrigation cannel in Xinjiang	Drip irrigation in Hebei province
	
Irrigation pump	Central pivot irrigation system

- Usually, irrigated was applied for certain crop types, such as winter wheat in North China Plain, Cotton in Xinjiang and vegetable and tomatoes in most province, et.al.
- Last but not least, irrigated crops usually appear greener and lush compared with near crops.