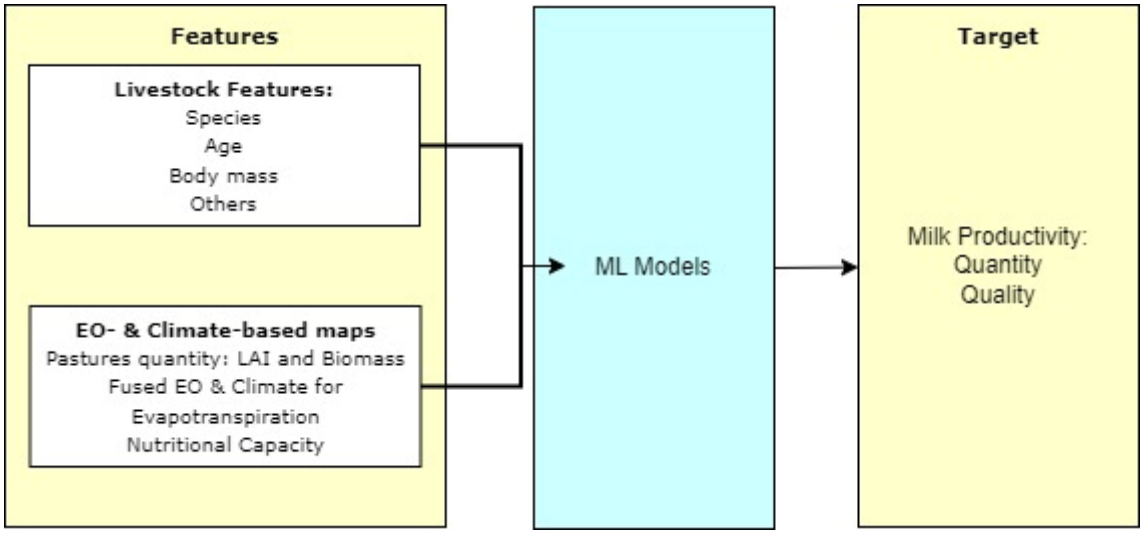
EO-FIN

Milk and Cattle (in weight) Productivity Estimation



Machine learning model to predict milk productivity based on EO data

Product Category

■ Land Use	☐ Natural Disaster	☐ Coast Management	☐ Earth's Surface Motion
☐ Land Cover	☐ Climate Change	☐ Marine	

Financial Domain(s)

■ **Investment management** ☐ **Risk analysis** ☐ **Insurance management** ☐ **Green finance**

User requirements

UN9: Understanding stock levels and monitoring supply chains

Description

Milk and cattle (in weight) productivity have a very strong correlation with multiple factors including pasture quantity and climate data. EO can provide continuous spatial and temporal climatic data such as precipitation, temperature, wind, and evapotranspiration. Also, vegetation indices and biophysical variables derived from satellite data can be used as indicators for pasture quantity. Using machine learning algorithms, EO data can be correlated with historical milk and cattle productivity. Subsequently, these models can be used to predict and estimate productivity using EO data as predictors.

Spatial Coverage Target

Individual farm level

Data Throughput

Rapid tasking	☐ High	■ Low
Data availability	■ High	☐ Low

Product specifications	
Main processing steps	Climate data such as precipitation, temperature, wind speed and direction, pressure, and humidity can be derived from ERA5-land. Potential evapotranspiration can be calculated from data obtained from ERA5-land. Vegetation indices (such as NDVI, REPO, NDMI, NDCI, and PSRI), biophysical variables (such as LAI), and albedo can be derived from Sentinel-2 or Sentinel-3 based on the application. Green biomass data can be derived from LAI and phenology stages as described previously. By using feature selection algorithms, we can identify and select the most correlated features to milk and cattle productivity to be used as inputs to different machine learning models. After training and validation of different models, we can choose the models with the best performance to estimate and predict milk and cattle productivity based on input EO data.

Product specifications	
Input data sources	Optical: Sentinel-2&3 Radar: N.A Reanalysis products: ERA5-land Supporting data: Historical milk and cattle (in weight) productivity
Accessibility	Sentinel-2&3: freely and publicly available from ESA. ERA5-land: freely and publicly available from EMCWF.
Spatial resolution	Sentinel-2: 10 m Sentinel-3: 300 m ERA5-land: 0.1°
Frequency (Temporal resolution)	Sentinel-2: 6 days Sentinel-3: Daily ERA5-land: Daily
Latency	Daily
Geographical scale coverage	Globally
Delivery/ output format	Data type: Raster File format: GeoTIFF
Accuracies	Thematic accuracy: N.A Spatial accuracy: N.A
Constraints and limitations	■ Cloud presence ■ Low spatial resolution of ERA5-land ■ Lack of historical milk and cattle (in weight) productivity data ■ Creating universally applicable methods are challenging due to the variation of livestock and climate conditions.
User's level of knowledge and skills to extract information and perform further analysis on the EO products.	Skills: Essential Knowledge: Essential