

TerraSphere



Satellite Crop Analytics



Satellite mapping of Blue Gold Polders 2011-2021

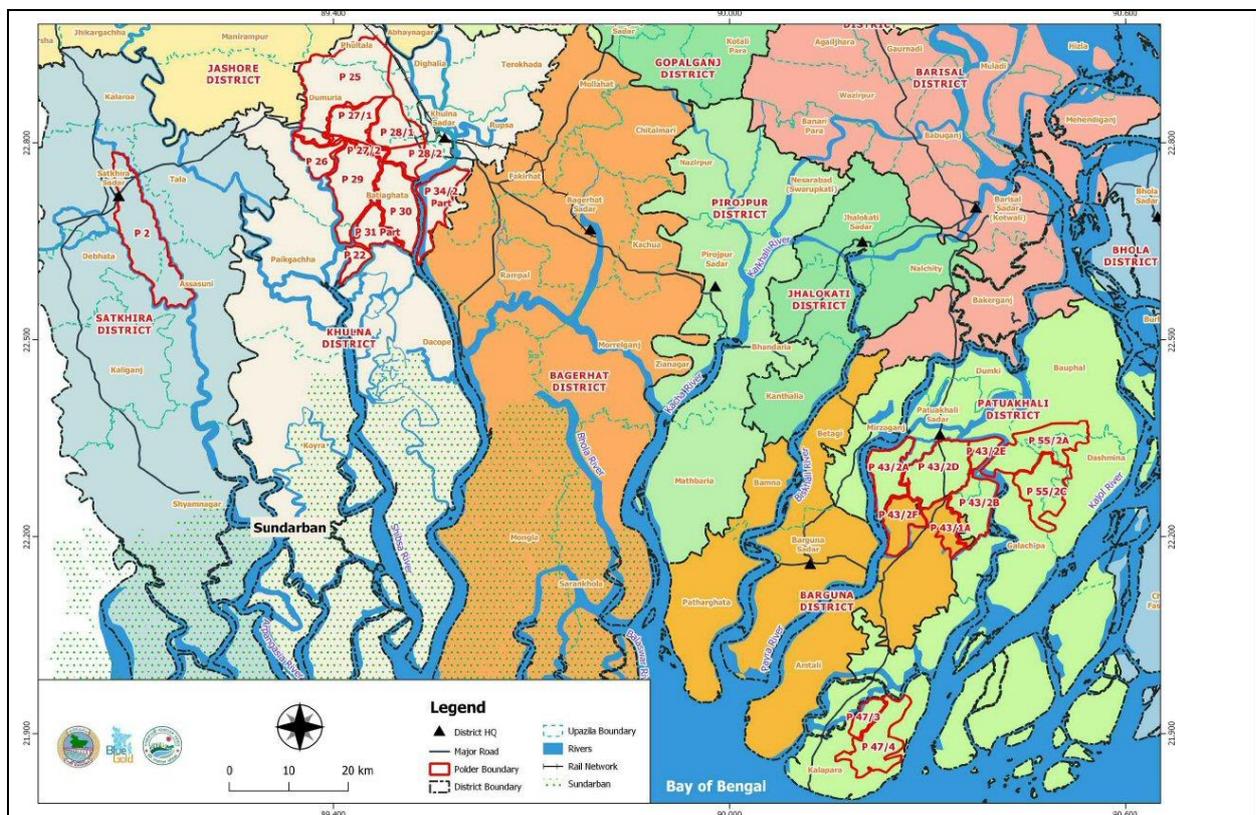
Amsterdam, June 10th 2021

Summary

In April 2021 TerraSphere was contracted by Euroconsult Mott McDonald to perform an analysis of landuse changes in a selection of polders in Bangladesh using satellite data within the scope of the Blue Gold program. This report describes the results of the work done within this contract.

Background

A project entitled "Earth Observation for monitoring and evaluation of Blue Gold interventions" was performed by Satelligence in 2019 and created 1) a baseline for agricultural productivity (2011-2015), 2) show changes in agricultural productivity in 2017 and 2018 and 3) make agricultural productivity information accessible and understandable for the BGP (Blue Gold Program) technical team to use for further (intervention) planning. Blue Gold has contacted Rob Verhoeven for additional mapping services for the areas as shown in the figure below (red polygons). As Rob is no longer working for Satelligence and they have indicated that the work is no longer their core activity, therefore the request is forwarded to TerraSphere (where Rob Verhoeven is now employed).



Products

BGP has requested to establish changes for the 22 polders (red polygons in figure below), between the pre-project situation (before 2012/2013) and the situation now (around 2020/2021). The following items are assessed:

1. Extent of waterlogged areas.

Distinguish open water in polders and fish ponds (ghers). Monsoon period (June – October), Aug 2012 – Aug 2020, preferably at approximately the same dates. No fine resolution is required.

2. Increase of rabi crop area.

Winter period, January. Fine resolution is required as fields may be small. Planting date of rabi crops varies over the area as this depends on drainage of land.

3. Area used for perennial ghers (fish ponds).

Imagery from January - when there is no rainfall and the open water areas will be mainly confined to the lowest lands. Thus perennial ponds should be most visible, but since they will be relatively small, a fine resolution will be required.

Satellite Data used

Due to the time-frame of the required change detections as well as the nature of the different products, multiple satellite sensors have been deployed. Optical satellite data (Landsat-5 TM & Landsat-8 ETM+) have been used for the dry season to produce the extent of Rabi crops and perennial ghers. Radar (SAR) satellite data (Envisat ARAS & Sentinel-1) has been used to map the waterlogged areas during the wet season. The table below shows a summary of all data used to produce the maps.

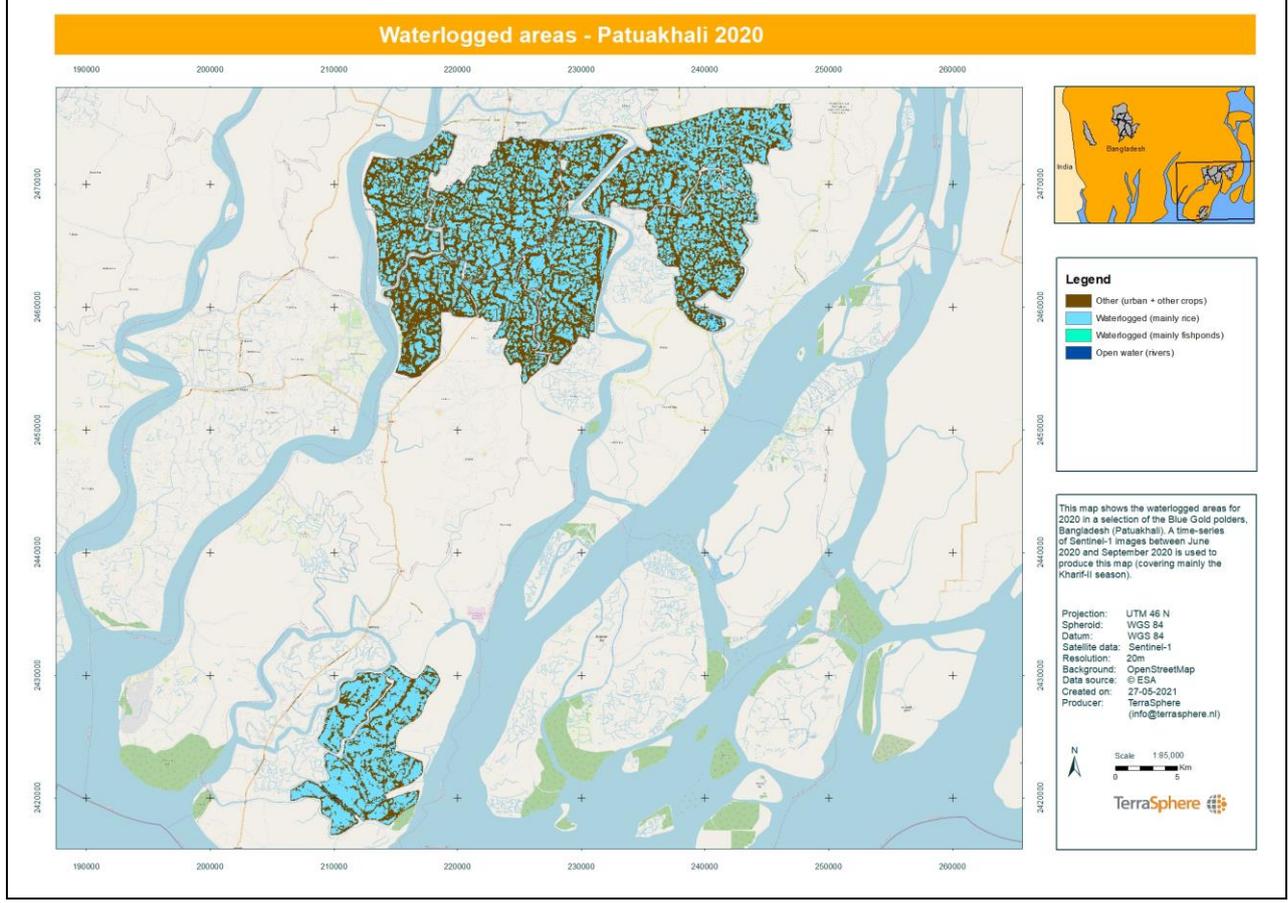
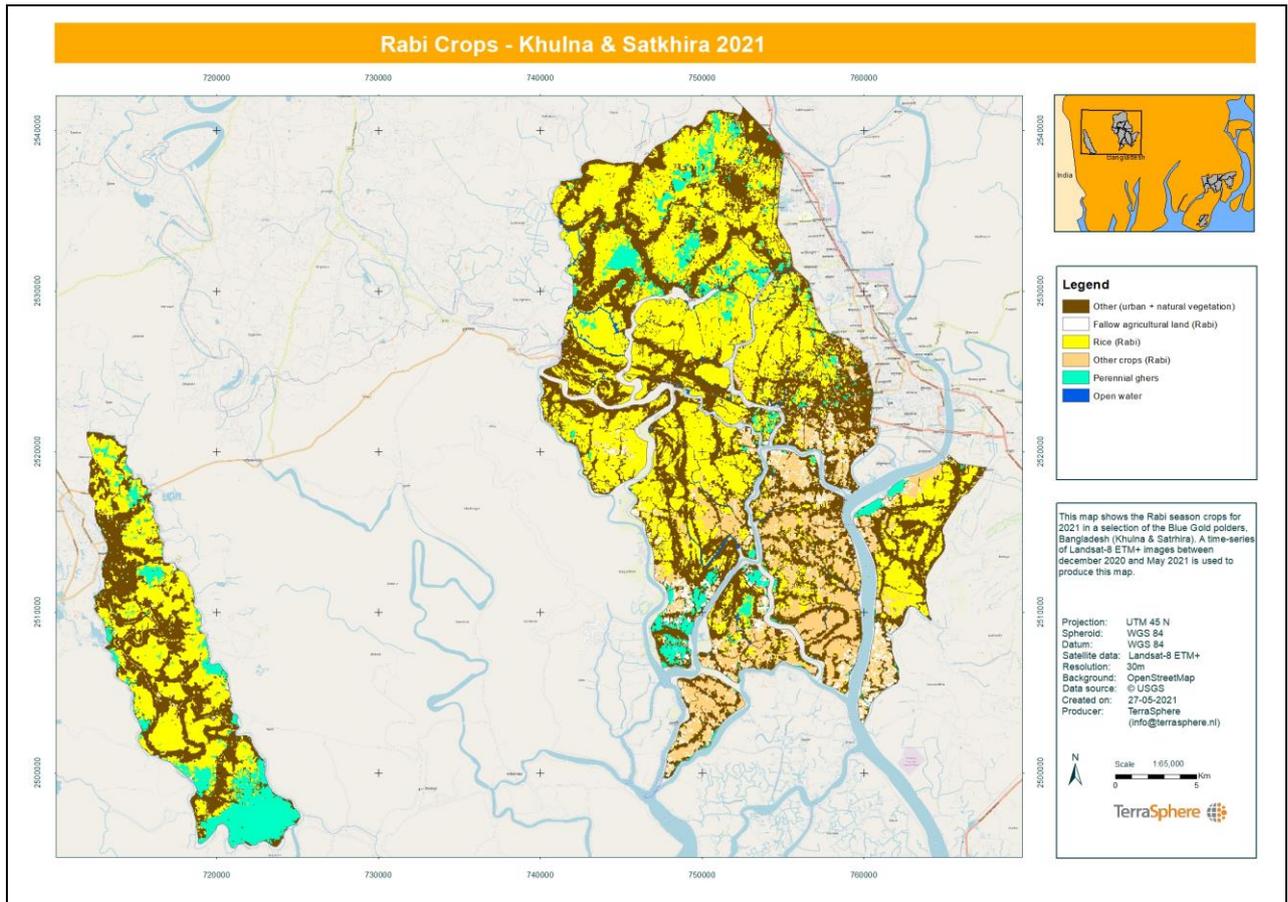
ENVISAT ASAR	Sentinel-1 (A&B)	Landsat-5 TM	Landsat-8 ETM+
Waterlogged areas	Waterlogged areas	Rabi crops & perennial ghers	Rabi crops & perennial ghers
23-06-2011	09-06-2020	16-12-2010	02-12-2020
01-07-2011	21-06-2020	23-12-2010	27-12-2020
04-07-2011	03-07-2020	24-01-2011	03-01-2021
23-07-2011	15-07-2020	02-02-2011	04-02-2021
31-07-2011	21-07-2020	13-03-2021	13-02-2021
03-08-2011	27-07-2020	07-04-2011	17-03-2021
30-08-2011	08-08-2020	30-04-2011	24-03-2021
02-09-2011	20-08-2020	09-05-2011	02-04-2021
21-09-2011	01-09-2020		18-04-2021
29-09-2011	13-09-2020		25-04-2021
	25-09-2020		

Maps

The following (PDF) maps have been produced and delivered to Blue Gold:

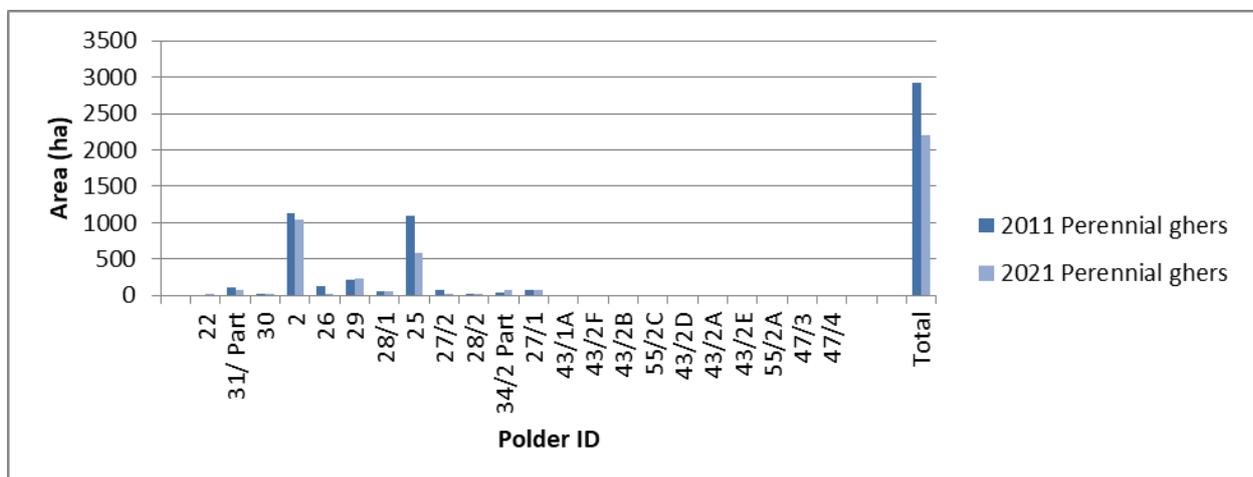
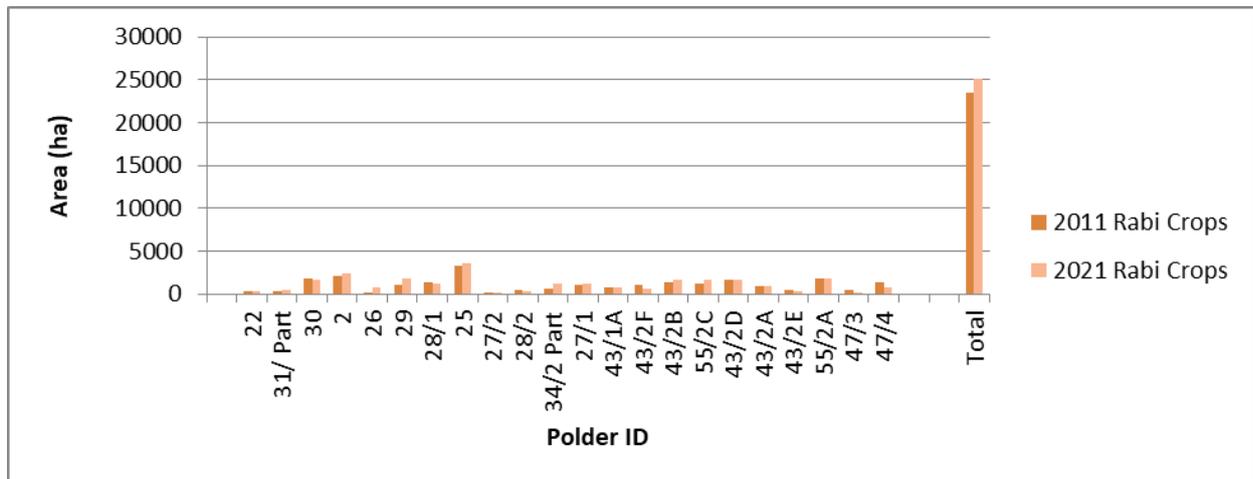
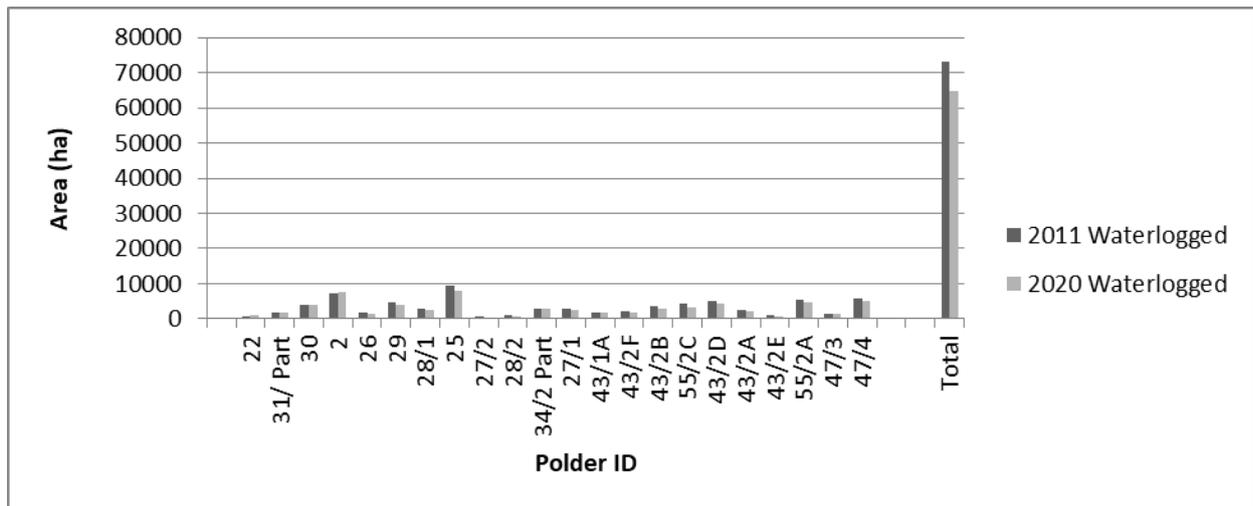
- 6 maps of waterlogged areas and fish ponds: around Aug 2011 & Aug 2020 & change map 2011- 2020 (3 maps for Khulna/Satkhira; 3 maps for Patuakhali)
- 6 maps of Rabi crops: around Jan 2011 & Jan 2021 & change map 2011-2021 (3 maps for Khulna/Satkhira; 3 maps for Patuakhali)
- 5 maps for Perennial ghers: 2011, 2020 and change map 2011-2020 (3 maps for Khulna/Satkhira; 2 maps for Patuakhali, as there are no perennial ghers observed).

The maps have been split between two groups of polders so that the data can be viewed in better detail. Polders in Khulna and Satkhira are grouped on a map, and other polders in Patuakhali on another map. Besides the maps, the data is made available as geotiff raster files. Below two examples of the maps that have been produced.



Analysis of statistics

Statistics have been produced by intersecting the polders (shapefile) with the classifications (tiff) for all products for the two years (2011 & 2020/2021). An XLS file has been created and delivered to Blue Gold for review and further analysis. Below is a summary of the main changes per polder for the waterlogged areas, rabi crop area and perennial ghers.



Conclusions

The total **waterlogged area** (including land used for rice and non-perennial fishponds) in all 22 polders combined decreases between 2011 and 2020 (**-11%**), almost entirely caused by a reduction in the area used for fishponds. The total rice area remains almost identical between 2011 and 2020 for all polders combined.

The total **rabi cropped area** (including rice and other crops) increased (**+7%**) between 2011 and 2021 (mainly in Khulna). This is mainly caused by a significant increase of the rabi rice area (+42%), while the area used for other rabi crops decreases (-14%).

The **area of perennial ghers** decreases significantly (**-24%**) between 2011 and 2020 (mainly in Khulna). No perennial ghers are visible in the polders in Patuakhali both in 2011 and in 2020.