



MONITORING THE PROGRESS OF RABI CROPS HARVESTING IN PUNJAB USING SATELLITE REMOTE SENSING DURING 2020 IN THE WAKE OF COVID-19 LOCKDOWN

Summary Report (v.1) for Punjab State

- In the wake of COVID-19 pandemic spreading across globe, the Government of India (GOI) implemented a hard lockdown across country on 23-March-2020 continuing in phases till 31-May-2020 to prevent the spread of COVID-19 virus among the population. This was also the period when the *rabi* season (October-April) crops were nearing maturity and subsequent harvesting. The GOI issued guidelines providing some relaxation to farmers and allied sector to undertake agricultural operations in order to provide opportunity to farmers to harvest their crop and sell them in markets. Given the uncertainty in movement of machinery and people, we undertook a preliminary study to monitor the progress of crop harvesting in rabi season of 2020 using satellite remote sensing technology in the northern state of Punjab.
- Punjab state mostly lies in the fertile plain and is the food basket of India with high level of mechanization in agriculture. It has net sown area of about 4.2 million hectare which is 84% of its geographical area. During rabi season about 3.5 million hectares of crop area is sown under spring wheat in Punjab which is about 99% of total rabi crops sown area. The rabi crop harvesting season commences from start of April month but generally picks-up from 15th April and continue upto 20th May. The harvesting is carried out mechanically using combine harvesters.
- For this study temporal Sentinel-2 MSI sensor multi-spectral images were used for identification of rabi crop area and progress of crop area harvested (fig 1). The 10m pixel size level-2A image products were used for classification by following hierarchical decision rule based algorithm. The cloud free images on 23 and 28 March 2020 were used for delineating rabi crop area while 22 April, 27 April and 7 May cloud free images were used to delineate the crop harvested and non-harvested area by each of the dates.

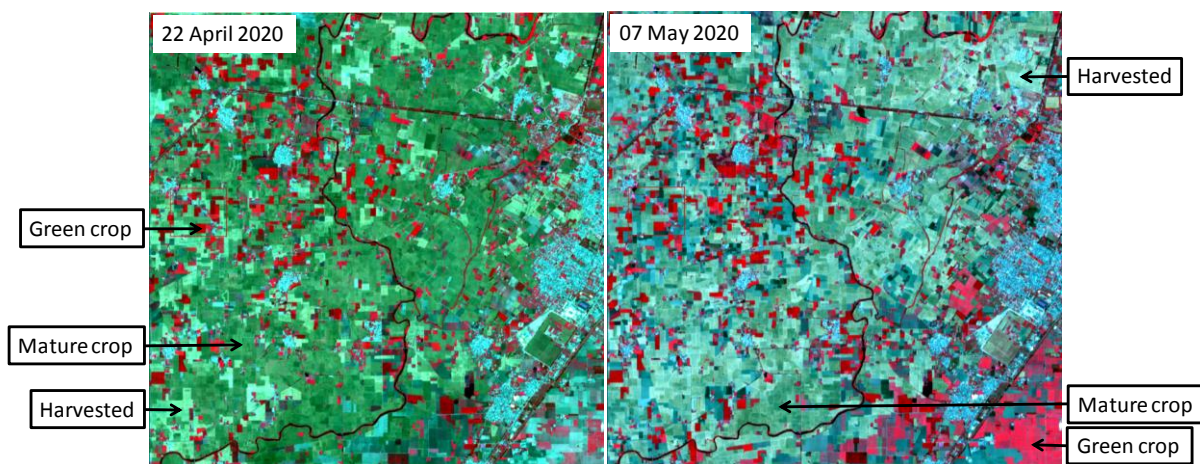


Fig 1. The Sentinel-2 MSI false color composite images (R8:G4:B3) of an area on 22-Apr-2020 and on 07-May-2020 showing signatures of green crops, mature crops and harvested fields.

- The progress of harvest of rabi sown crops for the entire Punjab is shown in figure 2. The map is overlaid with district boundaries and shows the fields harvested upto 22-Apr-2020, between 22-Apr and 07-May, and not harvested. The map clearly shows the pattern that harvesting has been accomplished earlier in Malwa region (south of Sutlej river), followed by Doaba region (between Sutlej and Ravi rivers) and lastly in Majha region (north of Ravi river). Among the three regions, the northern most Manjha region has some area in Tarn Taran and Gurdaspur districts which was still to be harvested by 7-May-2020.

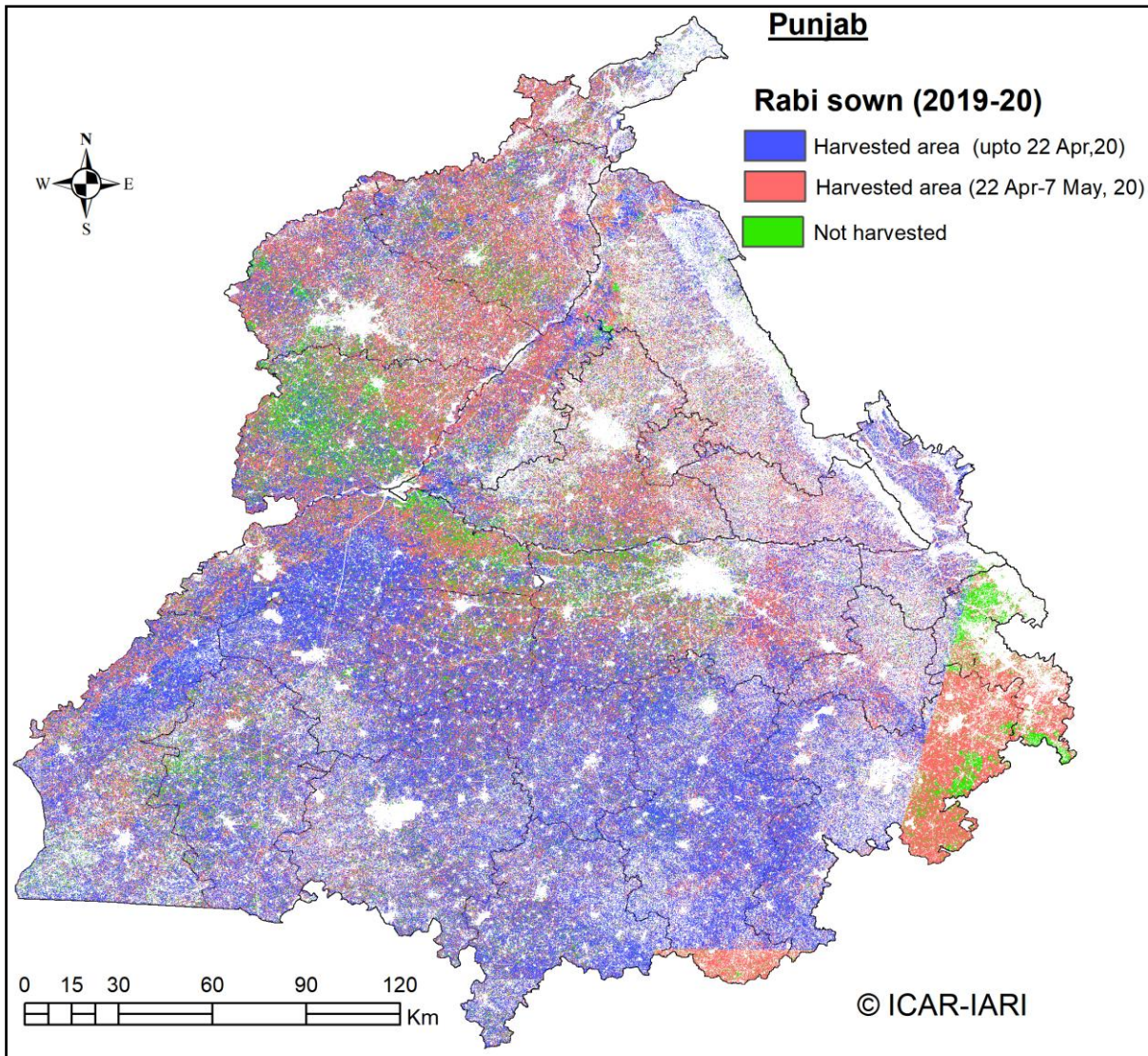


Figure 2 Map showing progress of harvesting of rabi crops in Punjab state in 2020.

- The table 1 gives the district-wise statistics on rabi sown area, area harvested till 22-Apr-2020 and 07-May-2020.
- The study estimated that 3.63 million hectare was the area under rabi crops in Punjab in 2019-20 crop year. Out of this rabi crop area, about 1.83 million hectare was harvested by 22-Apr-2020 and about 3.10 million hectare was harvested by 07-May-2020, which corresponds to 50.32% and 85.39% of total rabi crops area, respectively.
- By 22-Apr-2020 the south-eastern districts of Sangrur and Patiala recorded more than 70% of area harvested, the south-central districts of Bhatinda, Faridkot, Baranahal and Mansa recorded between 60 and 70% of area harvested, while northern districts of Pathankot, Gurdaspur,

Jalandhar, Tarn Taran and Amristar recorded between 30% and 35% of area harvested. The south to north pattern in harvested area is consistent with the general trend followed every year.

- By 07-May-2020 the Faridkot, Barnal, Sangrur, Mansa and Monga districts recorded more than 90% of area harvested. Only two districts of Tarn Taran and Patiala recorded less than 80% of area harvested. Rest all the districts recorded between 80 and 90% of harvested area. Overall, the progress of area harvested was timely.

District	Crop Area (ha)	Harvested till 22 Apr (ha)	Harvested till 7 May (ha)	Harvested till 22 Apr (%)	Harvested till 7 May (%)
AMRITSAR	211588.68	63155.93	176547.96	29.85	83.44
BARNALA	118017.45	77844.41	108538.62	65.96	91.97
BATHINDA	243465.59	146561.64	216511.68	60.20	88.93
FARIDKOT	115905.71	75511.25	106955.34	65.15	92.28
FATEHGARH SAHIB	59522.68	29206.91	47799.50	49.07	80.30
FAZILKA	247443.38	142641.21	217617.04	57.65	87.95
FIROZPUR	244137.68	120185.23	209748.98	49.23	85.91
GURDASPUR	210835.90	66372.58	177994.50	31.48	84.42
HOSHIARPUR	154322.11	63292.32	133697.85	41.01	86.64
JALANDHAR	173577.06	52966.45	143492.70	30.51	82.67
KAPURTHALA	117788.31	42491.08	100655.28	36.07	85.45
LUDHIANA	262489.85	110127.98	210882.27	41.96	80.34
MANSA	162532.79	111133.03	147710.56	68.38	90.88
MOGA	149580.98	77494.92	134700.86	51.81	90.05
MUKTSAR	205123.06	113490.19	183058.95	55.33	89.24
NAWASHAHR	58424.10	23198.67	51357.03	39.71	87.90
PATHANKOT	44055.27	15559.48	37421.11	35.32	84.94
PATIALA	235081.65	165572.42	180680.49	70.43	76.86
RUPNAGAR	59310.57	33135.16	52155.51	55.87	87.94
SANGRUR	280249.33	201565.87	255679.10	71.92	91.23
SAS NAGAR	51937.15	26793.71	44556.06	51.59	85.79
TARN TARAN	221985.54	67149.43	159630.38	30.25	71.91
Total	3627374.84	1825449.87	3097391.77	50.32	85.39

- Based on above facts it can be concluded with confidence that the harvesting of rabi crops in Punjab progressed normal in a timely manner in spite of hard lockdown in the state due to COVID-19 pandemic. The relaxations provided in the lockdown guidelines restoring agriculture and allied activities ensured that the harvesting of rabi crops progressed in a timely manner.

Study Team:

- (1) Dr V.K. Sehgal, Professor (vk.sehgal@icar.gov.in)
- (2) Dr Rajkumar Dhakar, Scientist (rajdhakar.iari@gmail.com)
- (3) Shri Rakeshwar Verma, Chief Technical Officer (rakeshwar.verma@icar.gov.in)