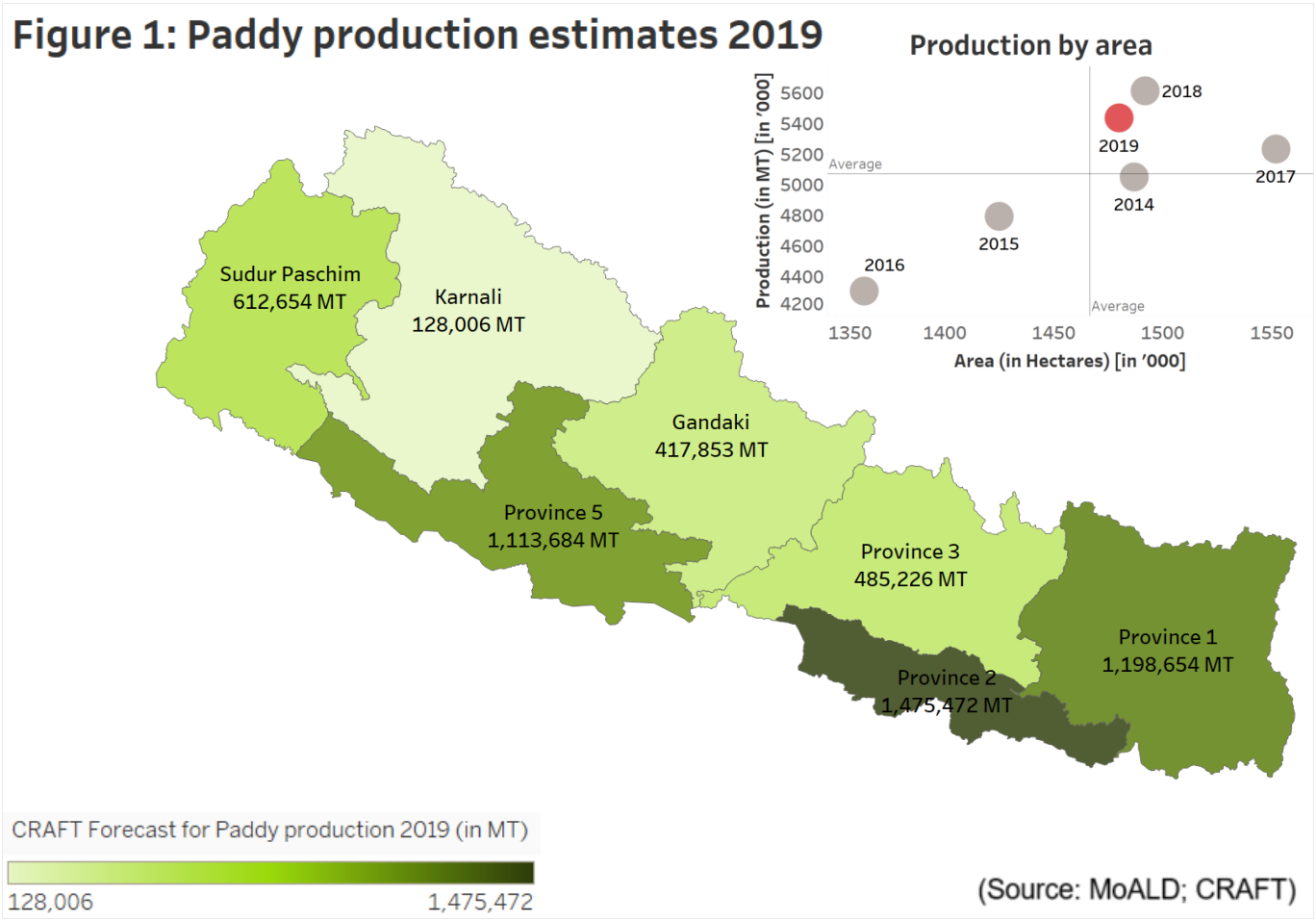
Final Advance Estimate of 2019 Paddy Production in Nepal using the CCAFS Regional Agricultural Forecasting Toolbox (CRAFT)

10 September 2019 (Revised on 26th December 2019)

The total paddy production of Nepal in 2019 is forecasted to be 5,431,549 MT, representing a 1.7 percent decrease compared to 2018 (5.6 million MT). The total area of paddy planted decreased slightly compared to the last year: it was estimated to be 1,480,288 hectares, against 1,491,744 hectares for 2018. However, the forecasted land productivity is estimated to be 3.67 MT per hectare. Yield estimates have a prediction uncertainty of ±7.5 percent.

Figure 1: Paddy production estimates 2019



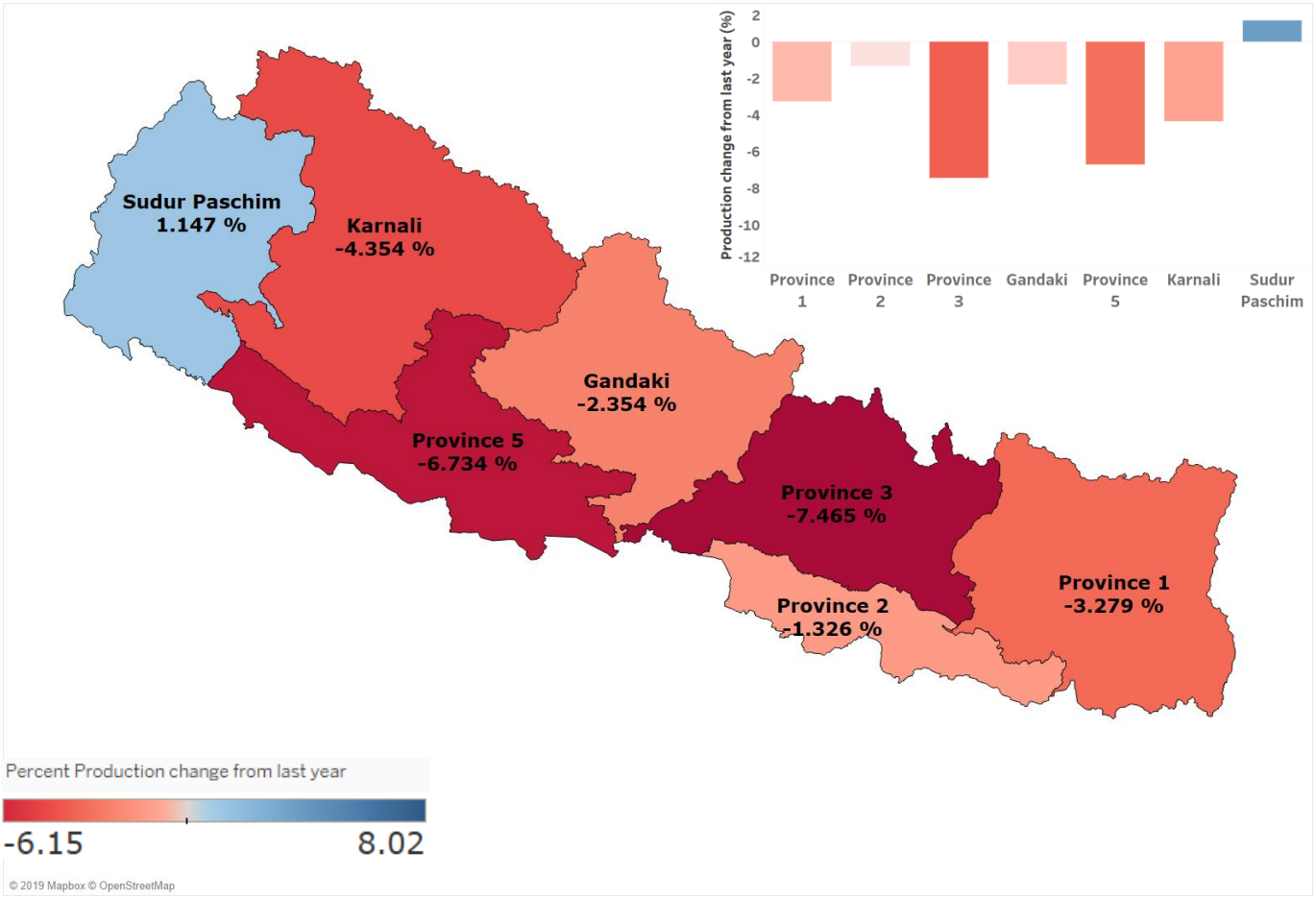
Although the onset of the monsoon was delayed (late mid-June), average rainfall across the country before the onset of the monsoon was close to normal. This ensured adequate soil moisture, critical for the growth of paddy in early stage. However, heavy rainfall across the

country's Terai lowlands on 11-12 July led to extensive flooding, which damaged large areas of cultivation thereby slightly decreasing paddy production.

Table 1: Change in Production and Area (2018-2019)

	Area planted 2018 [Hectares]	Area planted 2019 [Hectares]	Area change [Percentage]	2018 Production [MT]	Craft Forecast for 2019 [MT]	Production change from last year [Percent]	Predicted yield
Province 1	328,728	318,628	-3.07	1,237,952	1,198,654	-3.28	3.76
Province 2	401,906	400,522	-0.34	1,495,044	1,475,472	-1.33	3.68
Province 3	133,842	127,237	-4.93	521,446	485,226	-7.46	3.81
Gandaki	114,282	111,378	-2.54	427,689	417,853	-2.35	3.75
Province 5	307,407	305,387	-0.66	1,188,675	1,113,684	-6.73	3.65
Karnali	38,527	38,554	0.07	133,579	128,006	-4.35	3.32
Sudur Paschim	167,053	177,582	6.30	605,625	612,654	1.15	3.45

Figure 2: Percentage change in production by provinces (2018-2019)



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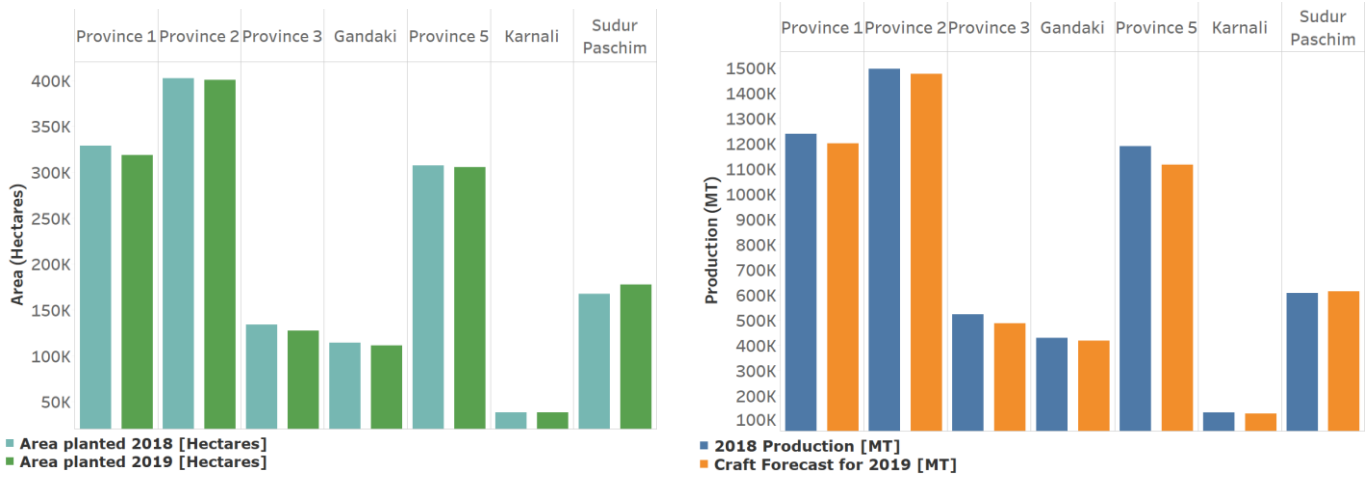
According to the real time stations data provided by the Department of Hydrology and Meteorology, pre-monsoon rainfall exceeded 30-years-of-normal in the eastern and central parts of Nepal while it was lower than average in the Western part of the country. Eastern Terai received above average rainfall during the monsoon period that was mainly concentrated during the mid-July leading to excessive flooding. Central and Eastern regions of Nepal received rainfall lower below their 30-year averages during the monsoon months.

Figure 3: Comparison of area planted, production and forecast (2018-2019)



This is the final estimate for this year.

What is CRAFT?

CRAFT uses historical databases of weather and crop yields and current weather to estimate yields of various crops. The yield forecasting depends on data from various sources such as meteorological data (rainfall, temperature, humidity, bright sunshine hours, wind speed, wet spell, etc.), agro-meteorological data (phenology), soil data (water holding capacity), remote sensing data and agricultural statistics. CRAFT simulates plant-weather-soil interactions in quantitative terms and predicts the crop yield over a given area, prior to harvest, provided no extreme (statistically infrequent) conditions occur. These models are based on a “common sense” assumption that weather conditions are the main factor behind the inter-annual (short-term) variations for the de-trended crop yield series (Gommes et al., 2010).

The workflow in CRAFT starts with management, soil and weather inputs in gridded forms, which are utilized by the crop simulation module under DSSAT to produce yields. The CPT

module then produces seasonal climate forecasts and integrates with the DSSAT simulated yields to provide seasonally forecasted yields for each of the grids. These gridded yields are aggregated to the domain of interest by a GIS module inside CRAFT. The yields are then compared and calibrated externally against observed data to obtain the final yield forecasts.

The purpose of adopting CRAFT is to anticipate the impacts of climate variations on crop production in support of agricultural management and food security decisions. CRAFT provides an information platform to support resilience-building interventions through within-season forecasting of crop production, risk analysis, and climate change impacts.
Under the research theme on Climate Risk Management, the CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) developed a crop yield-forecasting tool customized for the South Asia Region known as the CCAFS Regional Agriculture Forecasting Toolbox (CRAFT). CCAFS is a strategic partnership of CGIAR and Future Earth, led by the International Center for Tropical Agriculture (CIAT), which conducts research to identify and address the most important interactions, synergies and tradeoffs between climate change, agriculture and food security.

Methods

CRAFT incorporates a crop simulation model (DSSAT), a weather and seasonal forecast module (CPT) and a GIS mapping module (Map Win GIS). The tool provides the support for spatial input data, spatial crop simulations, integration of seasonal climate forecasts, spatial aggregation, probabilistic analysis of forecast uncertainty, and calibration of model predictions from historical agricultural statistics, analysis and visualization.

Acknowledgements

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