

Application of a crop yield forecasting tool for cereal crop production in Nepal to strengthen early warning and planning for agriculture and food security

Dhiraj Raj Gyawali¹, Damodar Kanel¹,
Kurt Burja¹, Paresh B. Shirsath²

*¹United Nations World Food Programme, Country Office, Lalitpur, Kathmandu, Nepal;
²CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS)
/International Maize and Wheat Improvement Center (CIMMYT), New Delhi, India*

BACKGROUND

Crop yield forecasting in Nepal

- The CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS) has developed the Regional Agricultural Forecasting Toolbox (CRAFT), customized for the South Asia region, to provide reliable forecasts prior to the harvest of the main cereal crops.
- CRAFT is being implemented as part of the Nepal Food Security Monitoring System (NeKSAP), the Government of Nepal's nationwide food security monitoring system currently being implemented by the Ministry of Agricultural Development (MoAD) and National Planning Commission with technical support from the United Nations World Food Programme (WFP).

OBJECTIVE

Crop yield forecasting in Nepal

- To support the Government of Nepal to make early agricultural production forecasts for two cereal crops, paddy and wheat, to strengthen early warning and planning for agriculture and food security.

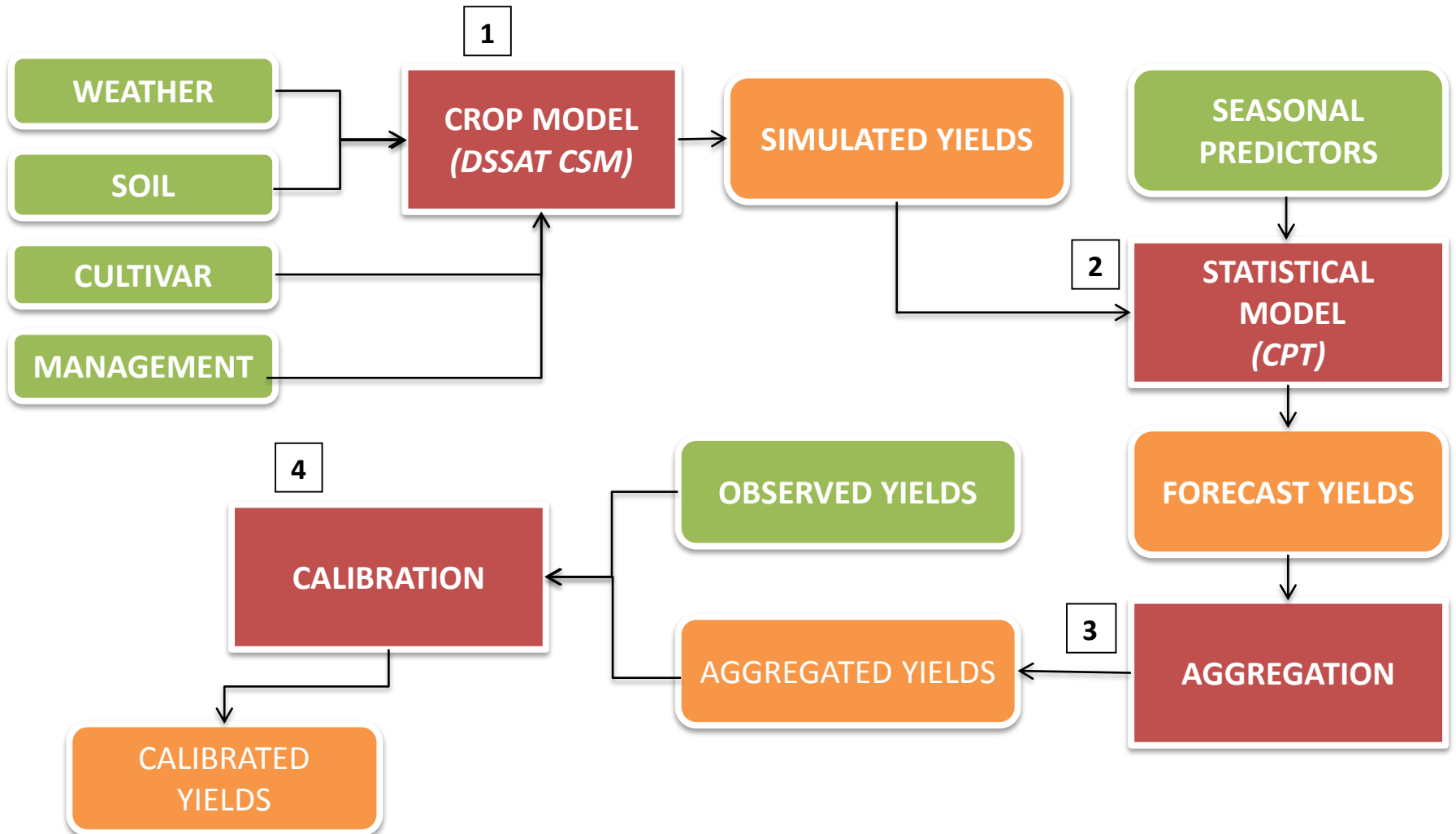
Reliable, scientific, timely and precise crop yield forecasts are relevant to Nepal where cereal crop production estimates are based on traditional, resource intensive methods and usually available only after crop harvests.

- To reduce the cost of risk and uncertainty associated with climatic and its impact on agricultural production.

This is a crucial issue in an agrarian economy like Nepal considering the present and anticipated changing climatic conditions in the Hindu Kush Himalayan region.

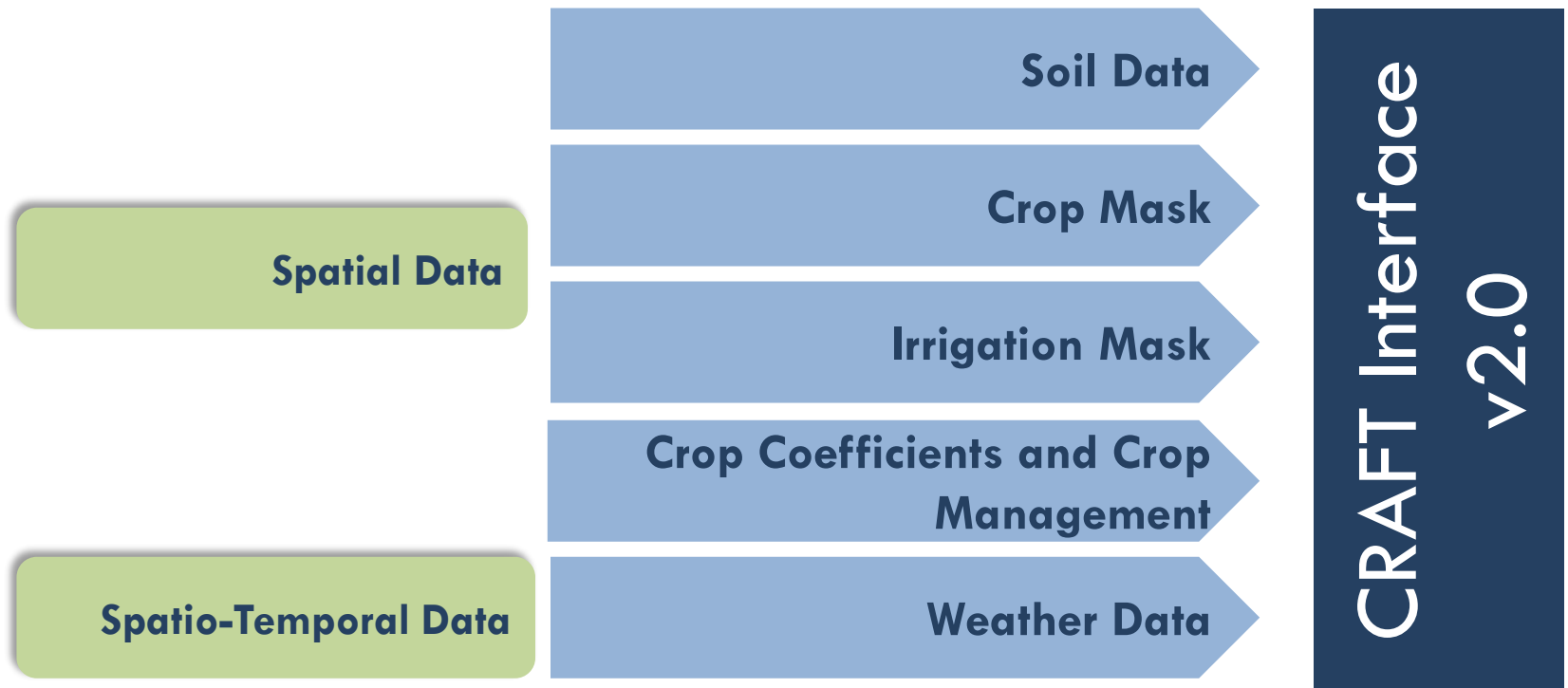
METHODS

Structure and steps in CRAFT



METHODS

Data inputs for CRAFT



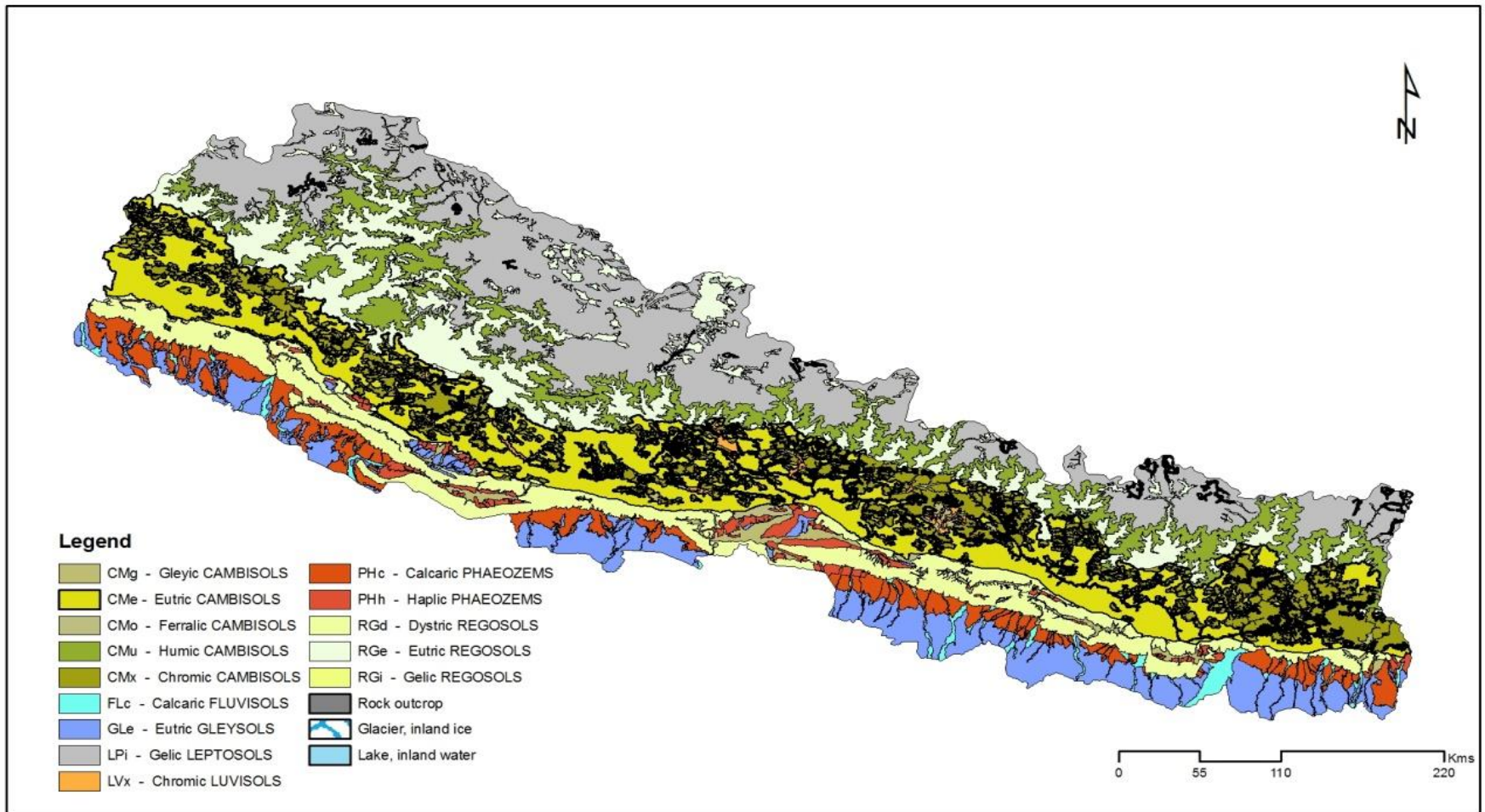
METHODS

Data inputs for CRAFT

Inputs	Description
Soil data	Soil coverage data and properties in DSSAT format. Nepal SOTER database used.
Crop mask	Spatial crop specific cultivated area information (MoAD)
Irrigation mask	Spatial irrigated area information (MoAD)
Weather data	Daily precipitation from 163 stations (DHM 1981-2009); RFE 2.0 satellite estimated precipitation (2010-2015). Daily minimum and maximum temperature from 45 stations (DHM 1981-2015)
Crop management	Crop specific recommended practices: cropping schedule, irrigation application, fertilizer and organic manure applications.
Cultivar coefficients	Experimentally calibrated cultivar coefficients (genotype, ecotype, etc.). Cultivars for wheat were RR-21 for the hills and NL-297 for the Terai. Cultivars for paddy were Jumli Marshy for the mountains, Khumal-4 for the hills and Mansuli for the Terai. Calibrated coefficients from NARC.

METHODS

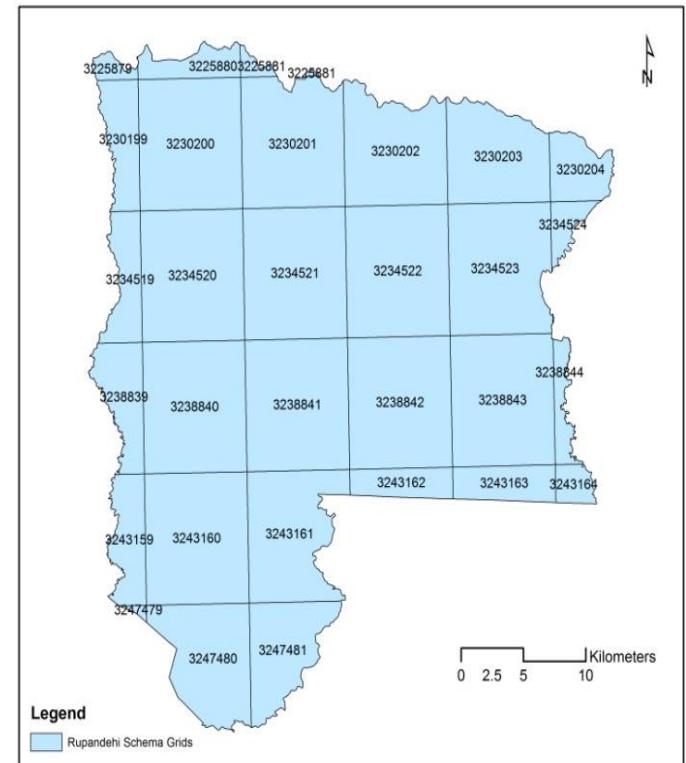
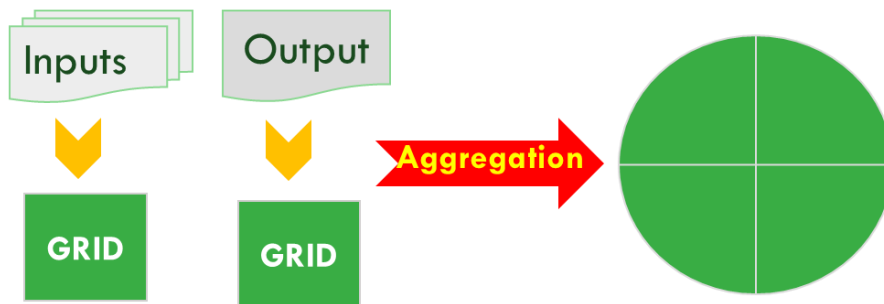
Soil Map of Nepal (SOTER 2009)



METHODS

Data Structure

- ✓ Gridded inputs: 5 min X 5 min (roughly 9 kms x 9 kms)
- ✓ Inputs are provided to each grid and yields are calculated for each of them and later aggregated into a defined boundary of interest.

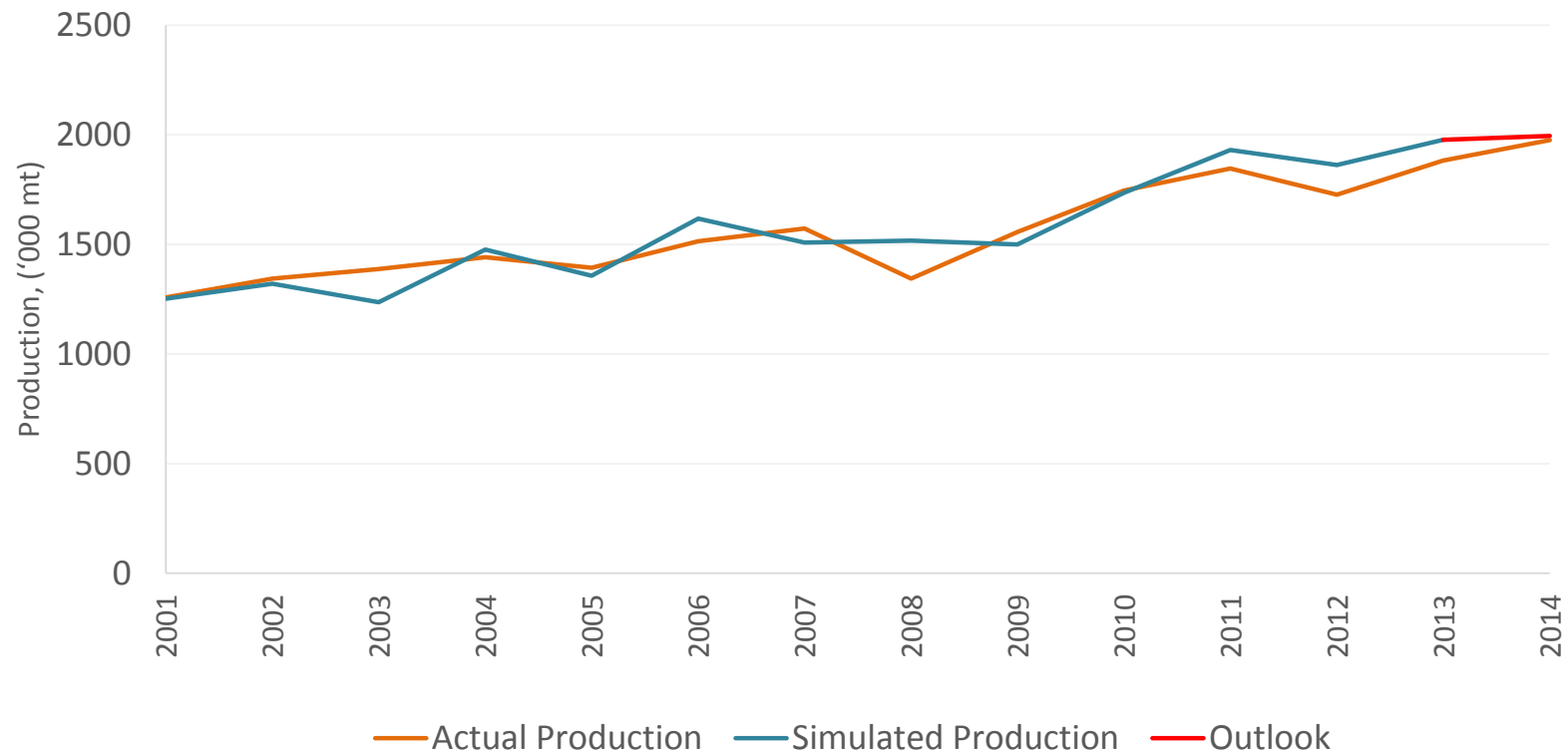


RESULTS

Wheat production forecast (2014/15)

CRAFT wheat production forecast: 1,994,598 mt (03/2015)

MoAD* wheat production estimate: 1,975,607 mt (05/2015)



Less than 1 percent difference between the 2014/15 forecast and estimate

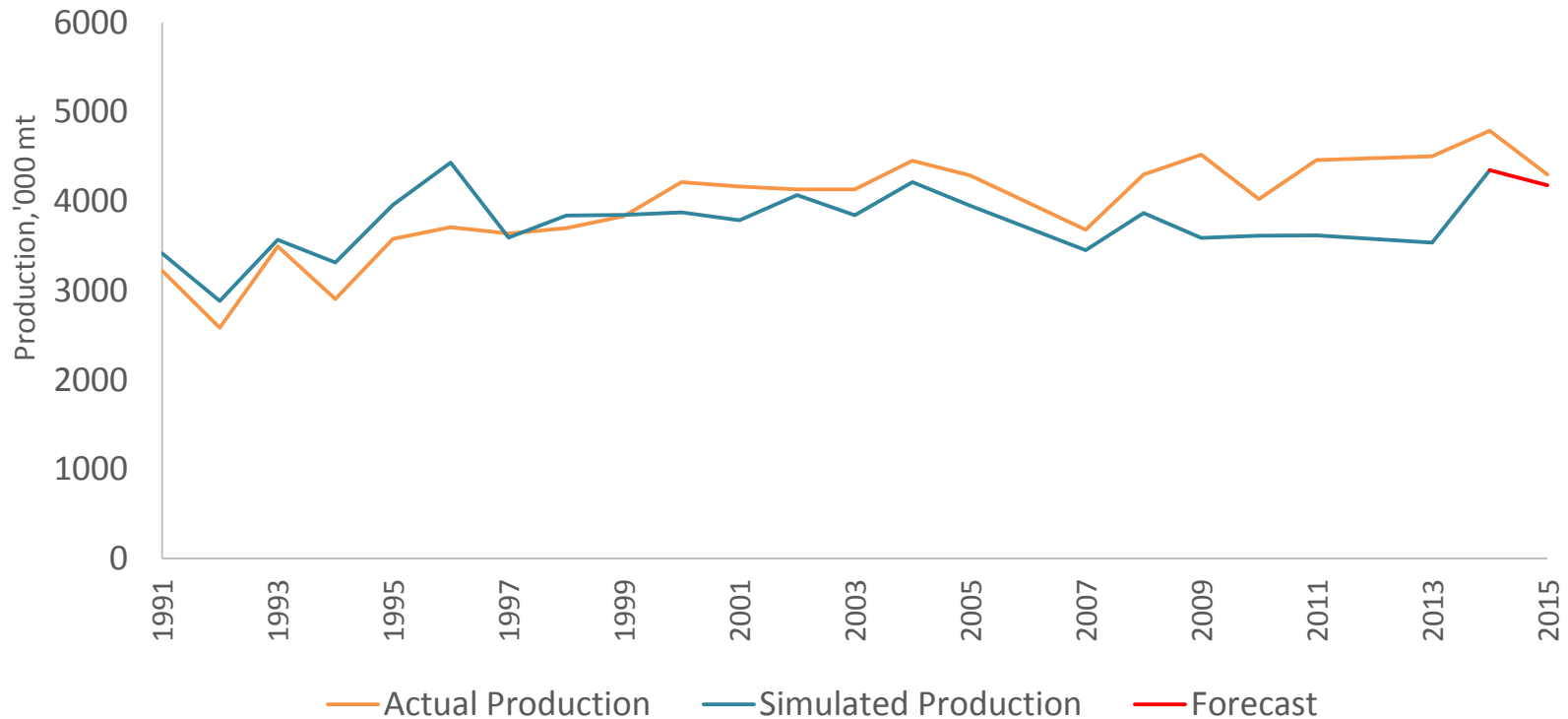
*Source: Government of Nepal, Ministry of Agricultural Development

RESULTS

Paddy production forecast (2015)

CRAFT paddy production forecast: 4,181,298 mt (08/2015)

MoAD* paddy production estimate: 4,299,078 mt (11/2015)



Less than 3 percent difference between the 2015 forecast and estimate

*Source: Government of Nepal, Ministry of Agricultural Development

CONCLUSIONS

- **CRAFT has provided robust early estimates of cereal crop production at the national level** and can complement traditional crop assessment methods and outputs, e.g., crop cuts and field reports.
- **Crop yield forecasts provide advance information to policy makers, allowing them to manage within-season climate risks to agriculture** and guide planning for appropriate agriculture and food security programs.
- **Substantial fluctuations in national cereal production are likely to directly impact the availability of and access to staple cereals**, whether from own production or market purchases, and **this in turn may affect household food consumption patterns and nutritional status** given the high proportion of caloric intake derived from major staple cereals (rice, wheat, maize) for an average household in Nepal.
- **Further research is required to down-scale crop yield forecasts** using CRAFT to the sub-national and sub-regional level.

ACKNOWLEDGEMENTS

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For more information:
www.neksap.org.np
<https://ccafs.cgiar.org>