Drought Monitoring during 2015 Major Rice Season in Central Plain Thailand

El-Niño- induced drought hit central plain Thailand during 2015 major rice season. Cumulative rainfall for Suphan Buri was at the record low during the first 3 months of the season (Figure 1). This was consistent with the ground observation by Thailand RIICE team capturing photos from drought affected rice fields in Plai Na and Wang nam Sap districts in Suphan Buri province (Figure 1). This early season drought in the central plain caused delay in rice planting in the area which consequently also cause delay in harvesting of rice in the central plain, allowing it to overlap with rice harvesting season of the North Eastern Thailand. Due to relatively similar timing of rice maturity and large rice area in the North Eastern Thailand, rice fields in this area typically required large number of combine harvesters including service providers from the central plain. The unfavorable situation in the central plain in 2015 major rice season resulted in shortage of combine harvest services providers to help with harvest operation in the North Eastern Thailand (Intrman, personal communication). Delays in rice harvesting especially for the Jasmin rice in the North Eastern Thailand can have an implication on the market price due to reduction in quality. Therefore the incident in 2015 major season in the North East Thailand was very unfortunate for the local rice farmers and stakeholders along the rice value chain. The RIICE project SAR processing technology effectively detected the spatial extent of this early season drought phenomenon in Central Plain Thailand (Figure 2). The detection indicates the exact areas where droughts only prolong during the month of May whereas other (majority of the cases) with drought prolongs through June 2015.

Remote-sensing technology can provide large scale information on timing or rice harvest which can help decision maker to make critical policy decision. A separate dedicated project will be carry-out thought Thai Rice Department and IRRI collaboration initiative to bring the results of the RIICE project further for the specific application of providing rice harvesting schedule advisory in the Central Plain and North Eastern Thailand. Such project will provide dedicated funding to vary out essential ground information and in depth study to establish the advisory system in place. The proposed activities will produce rice harvesting information that includes:

- Mid Season forecast
- End of Season status
- Maps and tabulated data per district

This initiative will embark on the on-going RIICE project. Within the RIICE project information on rice area and start of season will be made available in the form of high resolution (20-m) maps. Earth observation products with different spatial temporal distribution will be used in these proposed activities particularly for detecting start and end of season. This will include rice seasonality information derived from low spatial resolution (500 m) NASA MODIS (Moderate Resolution Imaging Spectroradiometer) multitemporal data and high spatial resolution (20 m) Synthetic Aperture Radar (SAR) data. Whereas the ultimate product of end of rice season forecast information will be derived from the high spatial resolution SAR data, the low spatial resolution optical data will provide complementary remote-sensing data during the development of the prediction system.

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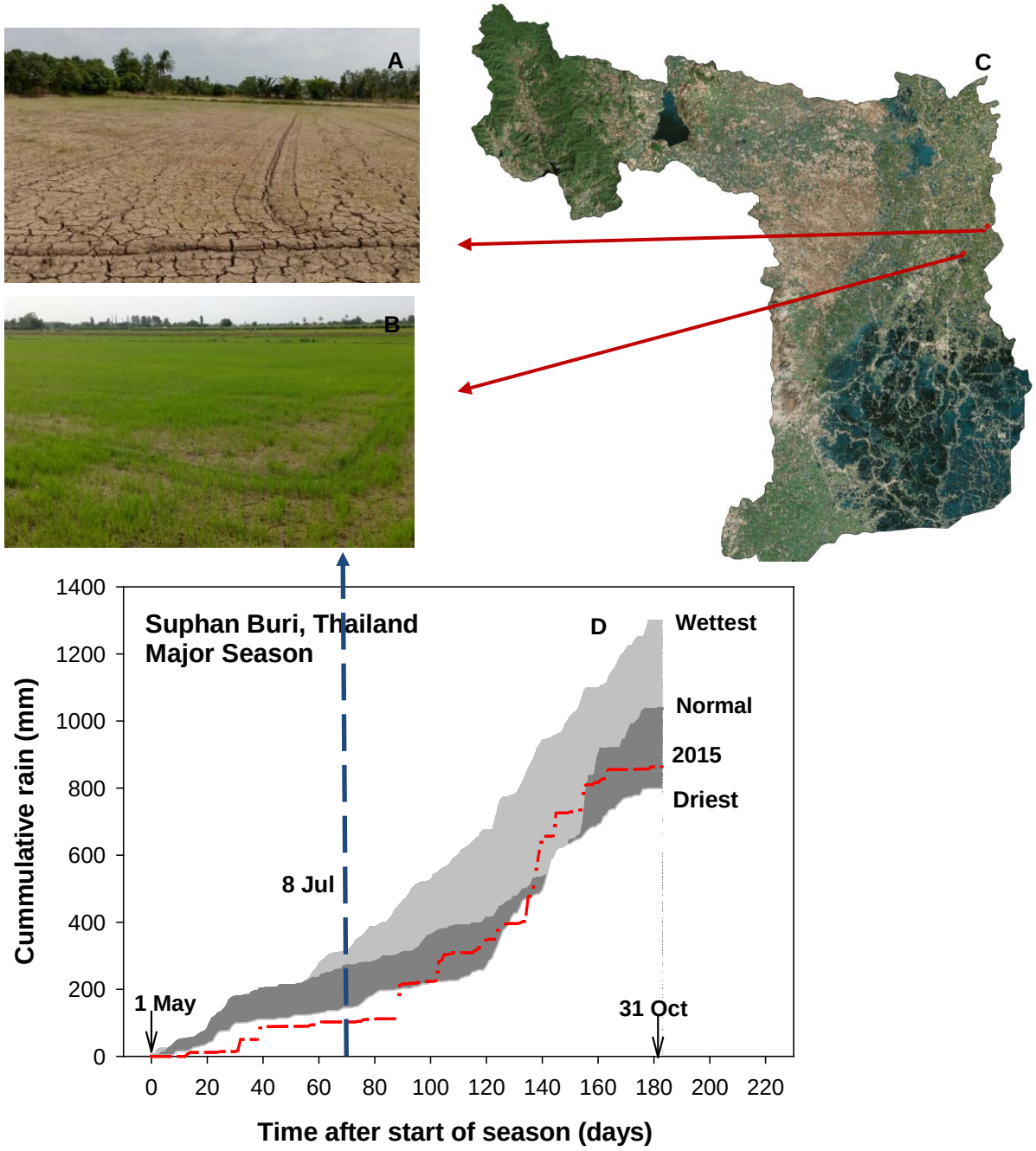

Figure 1. Drought phenomena monitored in rice fields in Plai Na (A) and Wang Nam Sap (B) districts in Suphan Buri province (C) on 8 Jul 2015. The major season in 2015 in this province is marked by long drought spell in the beginning of the season (D) which caused delay in rice planting in the area. The cumulative rainfall data for year 2015 in panel D are shown with the background rainfall condition (wettest, normal, driest) based on historical data from 1981-2014. Rainfall data were obtained from CHIRPS dataset (Funk et al., 2015).

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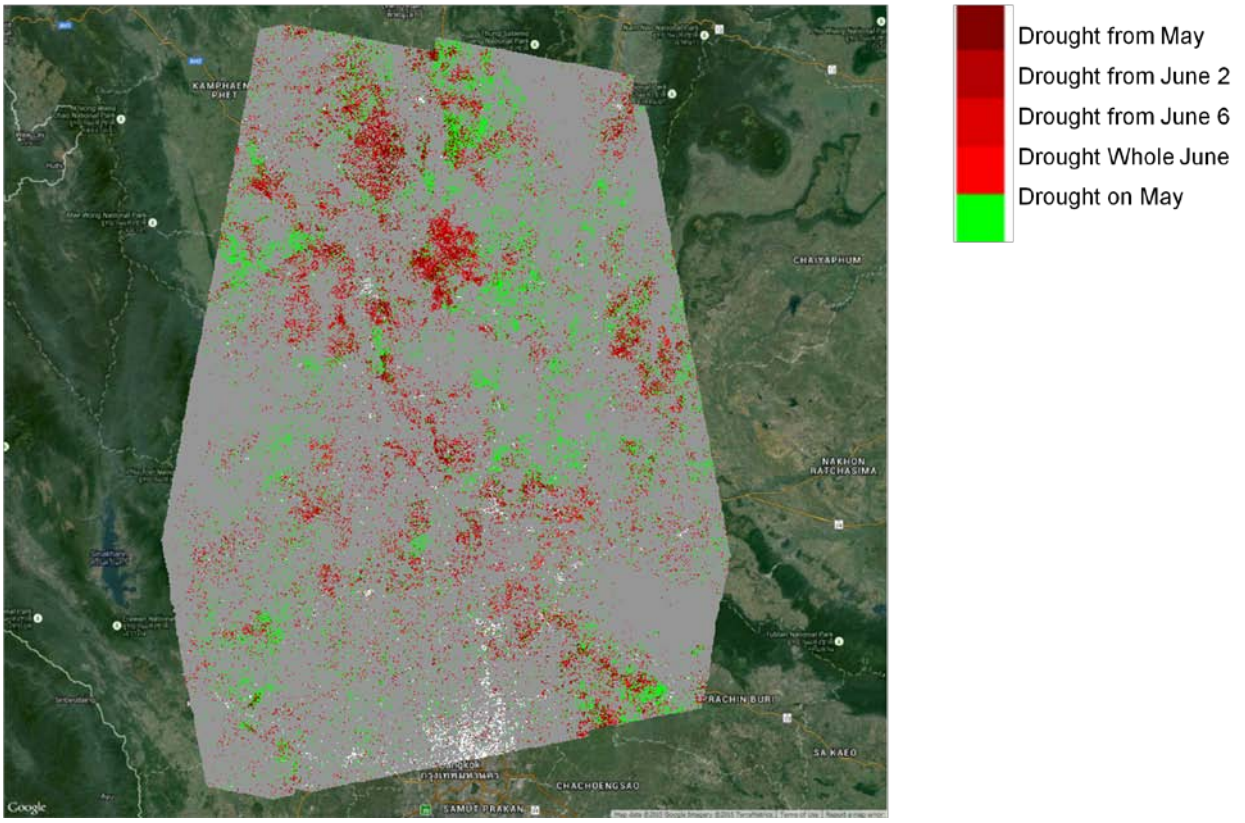

Figure 2. Drought phenomena detected by the RIICE project through analyses of Sentinel 1-A images during the early months of 2015 Major Rice Season in Central Plain Thailand.

High resolution (20 m) rice area maps with planting date information will be derived from the rice seasonality map generated within the RIICE project (Nelson et al., 2014). The maps will be made available within the season and will be used as a base for generating rice maps with forecasted dates of maturity. This proposed project will evaluate various models for prediction rice maturity including phenology module of ORYZA (Bouman et al., 2001) and CERES RICE (Singh et al., 1993) crop growth models and as well as possibility to develop a new and improved model taking into account best available scientific information (Fukai, 1999) and datasets. Weather outlook information will also be key inputs to the prediction system. This effort will be supported with satellite-derived rice maturity monitoring using multitemporal C-band SAR data with VH polarization (retrieved from ESA Sentinel S1A mission). Note that the current methodology of rice map products generation within the RIICE project is so far utilizing VV polarization. The use of VH polarization is considered in this proposed project because such polarization option is most suitable for correlating SAR data with temporal changes of the monitored vegetation (Kasischke et al., 1997) whereas VV polarization has the edge of detecting agronomic flooding events that signify the start of season in the lowland rice system (Nelson et al., 2014).

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A case study on the incident of the delay in rice harvesting during the 2015 major season in Thailand will be conducted within this proposed project. Whereas simulated harvest information data will be generated using a combined optical and radar remote-sensing data, ground data will be deduced based on stakeholder interviews and secondary data gathering. The stakeholder interview will target (1) combine harvest service providers in Central Plain and North Eastern Thailand, (2) farmers and farmers union groups, (3) rice millers and rice milers association groups, (4) relevant rice research center staffs, (5) relevant agricultural extension staffs, (6) other stakeholders identified during the progress of the project. Key information to gather related to the harvesting operation will include combine harvester capacity needed for harvesting service in a given operation area in Central Plain and North Eastern Thailand. Information on economic damage will also be collected as well as report of low quality jasmine rice arrived at rice millers during the 2015 major rice season as indicators of likely impact from the delay in rice harvesting.

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