UID : 100063

A field-specific agro-meteorological early warning services in Korea

Kyo-Moon Shim, Yong-Seok Kim, In-Tae Choi, Myung-Pyo Jung, Kee-Kyung Kang (National Institute of Agricultural Sciences, Korea)

Introduction

- Climate change and unusual weather cause increase in weather hazard and natural disaster, posing a serious threat to the humanity. Governments around the world always run organizations such as National Emergency Management in Korea.
- Early warning system for agro-meteorological disaster is not a new phenomenon. It started with Global Information and Early Warning System (GIEWS) established by Food Agriculture Organization in 1975 to respond to global food crisis in the early 1970s. Famine Early Warning Systems Network established by USAID and USDS is a similar warning system. It predicts supply and demand status of specific areas or nations, and sends a warning six months before to prepare against food shortage.
- Required improvements in the existing early warning system are as follows; predict faster, improve information accuracy and information delivery method (Internet, mobile phone), provide right information to right people at right time at the right place, and personalized information (with countermeasures)
- In National Institute of Agricultural Sciences (NAS) of Korea, Cooperative Research Program for Agriculture Science & Technology Development (Project title: Implementation of an early warning service for weather risk management in climate-smart agriculture) has been in progress with a 4-year since 2014 in order to develop a risk management solution for individual farms threatened by the climate change and variability.
- In this paper, we'd like to inform our research program and report the intermediate results of our study.

Intermediate Results

- The field-specific service for agro-meteorological hazard early warning produces weather risk indices tailored to the crop species and phenology by using filed-specific weather forecasts and analysis derived from digital weather products of the Korea Meteorological Administration (KMA).
- If the risk is high enough to cause any damage to the crops, warnings or watches are delivered through the growers' mobile phones with relevant countermeasures to help protect their crops against the potential damage.
- Core techniques such as scaling down of weather data to individual farm level and the crop specific risk assessment for operational service were developed and integrated into a web service system(http://new.agmet.kr).
- The system is employed and implemented in a rural catchment of 1000 km^2 with diverse agricultural activities and 530 volunteer farmers are participating in this project to get the user-specific weather information from and to feed their evaluations back to NAS in 2015.
- Likelihood of a disaster is evaluated by the relative position of current risk on the standardized normal distribution from climatologically normal year prepared 840 catchments in Korea.
- A validation study has begun with a 4-year plan for implementing an operational service in Seomjin River Basin, which accommodates over 60,000 farms and orchards.
- Diverse experience obtained through this study will certainly be useful in planning and developing the nation-wide disaster early warning system for agricultural sector exposed to the climate and weather extremes under climate change and climate variability.

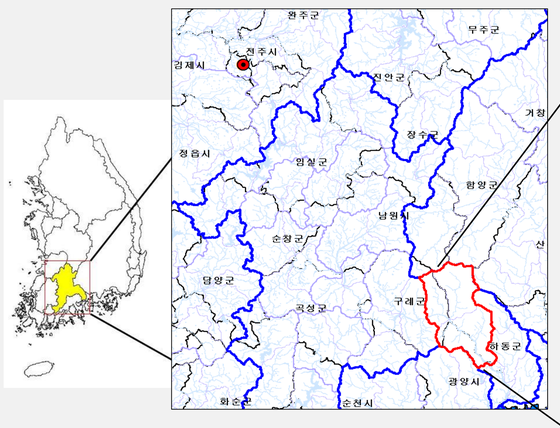

Fig. 1. Location of Seomjin River Basin study area and the countries included this area. The red colored boundary represents the experimental watershed for intensive observation in 2014.

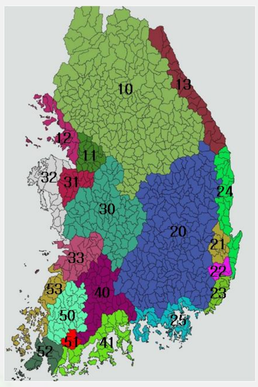

Fig. 2. Watershed classification for the southern part of the Korean Peninsula. The land area consists of 21 river basins indicated by number and color, or 840 water shed.

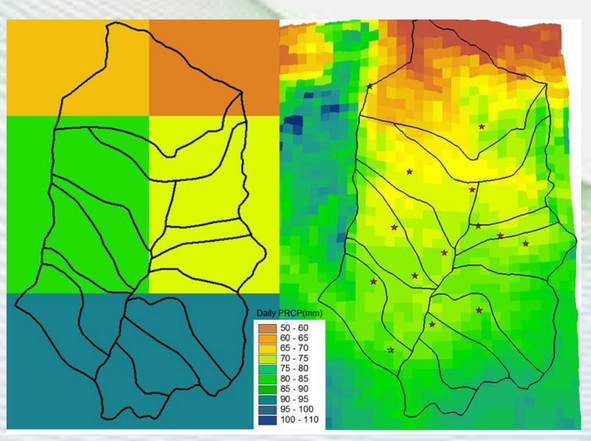

Fig. 4. Higher resolution weather reanalysis products (270m grid cell) for rainfall over the study area (right). 5km cell grids of the Korea Local Analysis and Prediction System are shown for comparison (left).

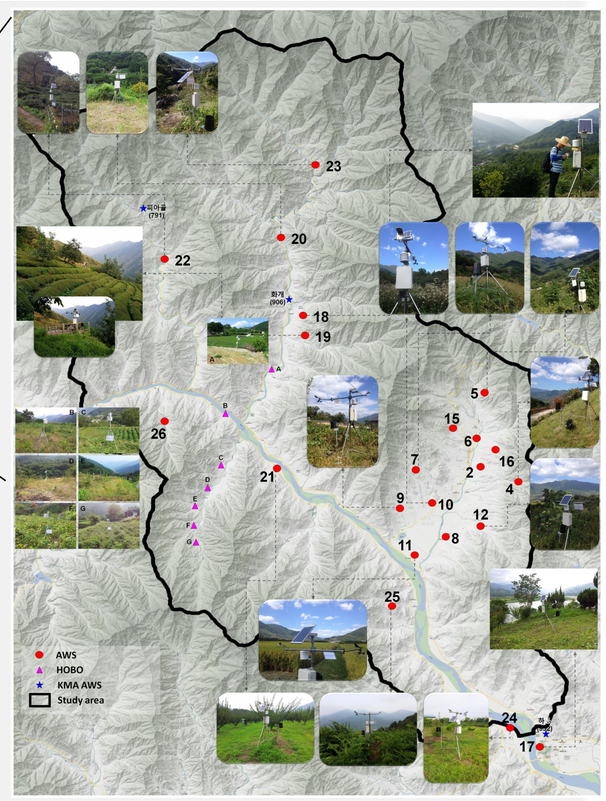

Fig. 3. Location of field validation sites consisting of 22 automated weather stations (AWS) and 7 temperature-humidity loggers (HOBO). Korea Meteorological Administration's unmanned stations (KMA AWS) are also shown for comparison.

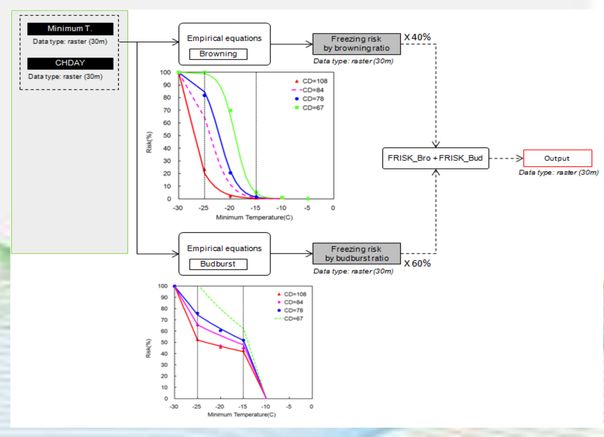

Fig. 5. An empirical freezing risk index, which was derived from the combination of percent browning ratio and percent budburst ratio in peach trees across a range of daily minimum temperatures. Lines indicate the simulated response of peach trees differing in minimum temperature. Symbols represent observed values. (Examples of risk assessment of freeze injury in dormant peach tree)

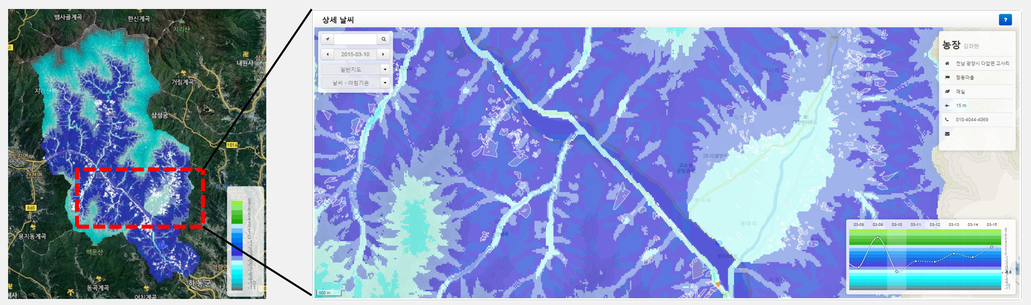

Fig. 6. Farm and orchard boundaries overlaid on the pine resolution temperature map.

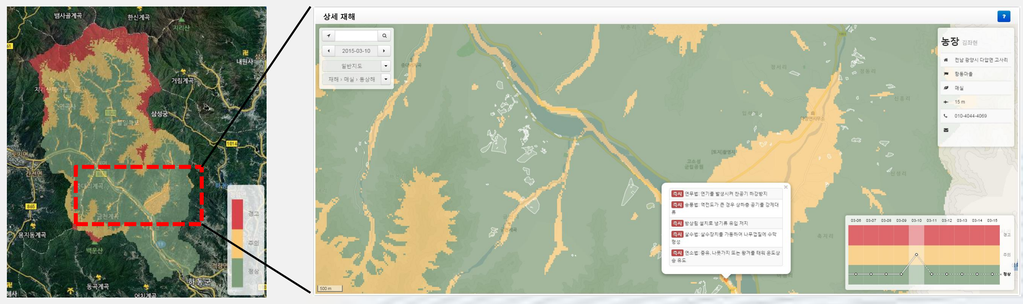

Fig. 7. A field level and the crop specific risk warning map for freezing and frost injury of apricot tree with relevant countermeasures to help protect it against the potential damage.

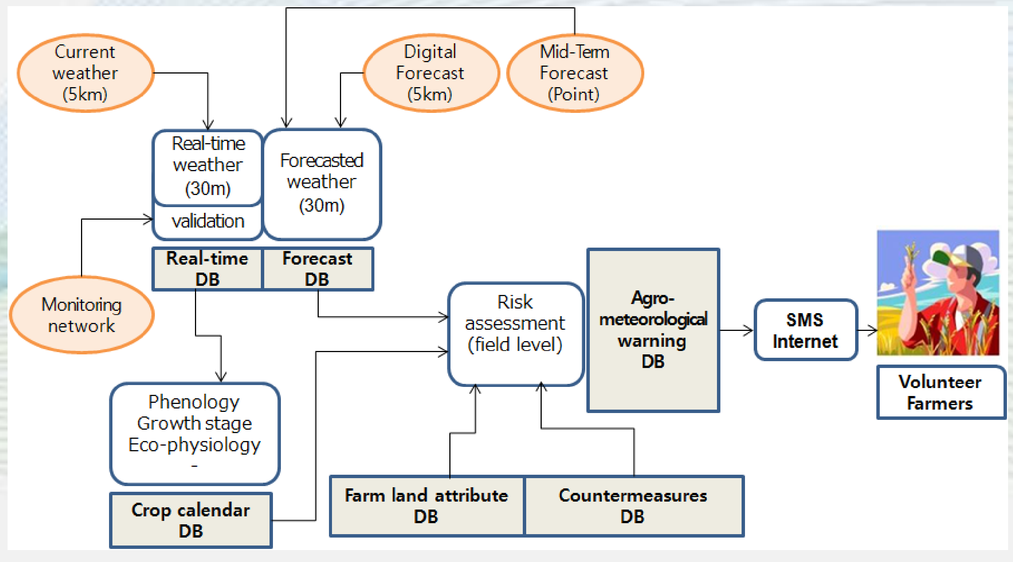

Fig. 8. Information flow of the field-specific agro-meteorological early warning system.