Hitachi Innovation Application

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## Summary

*Provide an overview of the research idea /project /technology / venture. Optional video up to 3 minutes that provides a summary of you, your team and idea for a wider audience to vote. (300 words max)*

Over $10 billion dollars’ worth of crops are lost globally to extreme weather events (e.g., heat waves, frosts) every year. This is enough to feed 500 million hungry mouths. While early forecasting of extreme weather events is becoming increasingly sophisticated and accurate, this is not translated into on-farm actions to mitigate the impacts of extreme weather events. There are two key reasons for this, weather forecasts do not convey any indication of the likely level of crop stress and farmers often do not have the time to seek out and interpret weather forecast information and then convert it into actionable information. Our project is removing these two barriers to farmers. Firstly, we do the interpretation converting a weather forecast into a likely level of crop stress that could lead to damage. If there is an event that is likely to cause crop damage a text message or email alert is sent to the farmer via their smart phone. By providing this alert several days prior to the likely stress event, farmers have the time to undertake some preventive action (e.g., harvest early or apply mitigating irrigations) to minimise the damage and hence save their crop. This system is designed to operate autonomously, the only thing a farmer has to do is sign up. By using a range of weather forecasts and data feeds, computation tools and weather and agricultural models we can identify when a particular weather event is likely to result in crop stress. A significant proportion of crop losses are preventable. By ensuring that farmers are warned early enough we can help boost food production, improving their livelihoods and helping feed a growing global population.

## Innovation

*How is your project innovative? Please compare it with current approaches. Only judges and organisers will see this section. (500 words max)*

Current approaches to this problem are to saturate farmers with more and more forecast information and to focus on increasing the accuracy and spatial resolution of weather forecasts. While these efforts are of scientific value and can help manage extreme weather events at a regional level, they do not address farmers' needs for simpler and easy to action information. Our customer discovery process has identified that farmers are saturated with data and information leading to “decision paralysis” and that the time they would be required to spend interpreting this information into something they can make a decision on is prohibitive.

The innovative aspect of our project is that it does the data analytics and interpretation for the farmer and then only alerts them if a crop stress event is likely to occur. Our project is giving growers directly actionable information in a timely manner, instead of them having to invest considerable time in analysing data and information to assess the likelihood of a stress event. We are giving them the time to take actions to save their crops and livelihoods. To do this we are linking a range of weather forecasts and weather models with crop modelling methodologies. To do this, we are using a cloud-computing environment and the open source, community driven “R” statistical programming language. Our analysis identifies not only if a crop is going to be exposed to an extreme weather event but the likely intensity of that exposure. This level of detail not possible to garner from typical weather forecasts, however this level of detail is important as the response required from farmers to a mild stress event is likely to be very different to the response required to a severe stress event. While it might be possible to build a smart phone app to present the alert to farmer, we have chosen a relatively simpler approach as it will function across devices and will also function with non-smart phone devices.

## Impact

*Describe the likely local to global-scale impact of your project being a success. Provide details on the likely time-frame for social impact to occur. Only judges and organisers will see this section. (500 words max)*

In agriculture, the considerable financial investment is made in growing crops along with considerable lead times realising a return on this investment means farmers are exposed to the risk of crop failures. At a local scale our project's impact will lead to greater resilience within farming families and communities. Crop damage/loss due to extreme weather can put a considerable strain on a farmer’s and their community’s resources. Empowering and facilitating farmers to take actions to minimise/prevent crop failures and damage due to extreme weather reduce this financial pressure. This will translate in to more resilient and vibrant communities at a regional level as greater amount of agricultural revenues flow into them. At a global level a reduction in crop failures will increase food supply and food security and is one of the key ways that food production can be increased to feed a growing population. The time scale for this impact should be relatively quick. The enabling infrastructure for this system exist (mobile phone networks).

## Feasibility

*Describe how the idea/solution has a good chance of success. What type of prior knowledge, prototypes or prior insights can you provide to help assess the likelihood of success? Only Judges and organisers will see this section. (500 words max)*

We have an early stage prototype of our solution that proves that the various components of the system can be linked and function together. Associate Professor Adam Sparks, the leader of the summer crops pathology team in the Centre for Crop Health at the University of Southern Queensland (USQ), specialises in crop disease and weather modelling. Previously, while working at the International Rice Research Institute (IRRI) in Los Baños, Philippines, A/Prof Sparks was involved in several projects in developing countries which made use of mobile technology to collect and disseminate data and cloud computing systems like Amazon Web Services (AWS), e.g. the Philppine Rice Information System (PRiSM, <http://www.philippinericeinfo.ph/>). While Dr Keith Pembleton is the leader of USQ’s Agricultural Systems Modelling Research Group and specialises in crop modelling and the design and use of decision support tools in agriculture. These expertise along with the early stage prototype virtually ensure that the technology itself can be implemented. The project has a high chance of having a sizable impact at a local and global level. Seventy-five percent of the world’s population have access to a mobile phone. Our text messaging/email alert system is a low data use system, which removes data cost and speed as a barrier to farmers accessing our solution. Text message systems have been proven to work in natural disaster warning systems in both developed and developing countries, proving this approach to disseminating information and getting it acted upon is viable.