Idea: Rice is the main staple crop for many West African countries, yet despite adequate water and agro climatic conditions, production fails to meet increasing demand due to poor crop management techniques and water management practices. Real-time crop forecasting can help farmers improve yields, manage resources more effectively, and improve food security and poverty in this region. **Using weather data and crop modeling, developing week-to-week management guidance from rice production experts based on changing conditions, and coordinating advice to farmers through existing extension and advisory services and the use of innovative smartphone-based teaching approaches, this pilot study will achieve improvement in rice production in Sierra Leone.**

In order to obtain weather data, a weather station will be procured and set up in Njala University in Sierra Leone. A new smartphone-based agricultural extension app that the University of Illinois at Urbana-Champaign (UIUC) is developing will complement the data. The app has "push-pull functionality", meaning it can be used to collect farm-level data for use in crop modeling while also being a platform for displaying/sharing educational videos, audio recordings, or written materials with farmers.

The study will combine the technical expertise of the University of Illinois and the International Food Policy Research Institute. The effort will be led by UIUC professor, Dr. Paul E McNamara in the Department of Agricultural Consumer Economics and core members are Dr. Eric Sacks in Crop Science, Dr. Richard Cooke in Agricultural Engineering, and IFPRI research fellow Dr. Ricky Robertson. In-country partners include the Ministry of Agriculture (MoA) in Sierra Leone, and the Food and Agriculture Organization (FAO) in Sierra Leone and they will provide necessary data and support. Field partners include Africa Rice, Njala University in Sierra Leone for implementation and logistical support.

Implementation Plan: The approach consists of the following activities:

1. Procure and set up a weather station on Njala University campus (October - November 2017). Daily data collection will start immediately. Data will be transferred to computers and processed by the Institute of Geography of Njala University before being made publicly available.

2. Identify 6 swamps suitable for rice production in Moyamba district, Sierra Leone (October 2017). Njala University has its campus in the district and its faculty members in the School of Agriculture, together with Dr. McNamara and Dr. Cooke, will create the list using their local network. The MoA and FAO will also help to provide necessary information (e.g. district-level agricultural activities, management structure of swamps and ongoing interventions).

3. Visit all the 6 swamps and conduct a baseline household survey (November 2017). The team and the field partners will visit all the 6 swamps, their surrounding villages and households in the village (20 households/village) for field data collection and baseline survey using the extension app. Data on yield, household income and agricultural activity and topography will be collected. Based on the data, participants will be targeted with criteria including local interest, agro-climatic conditions, farming activity, and proximity to Njala University. Based on the survey result, 6 villages will be divided into two paired groups based on similar characteristics. Three treatment groups will receive the intervention to measure differences between their agricultural output with the output in the control groups.

4. Coordinate key stakeholders (November- December 2017). The team and partners will coordinate local key stakeholders such as NGOs, village chiefs, etc. to define land agreements and water management systems.

5. Run crop modeling, make recommendation and select cultivar (December 2017). Local information gathered by the app will be used to set up crop model runs and perform rapid assessment of various

management strategies. The simulations will undergird the recommendations made to the treatment groups. Improved cultivars that can take advantage of the growing conditions will be selected.

6. Provide agricultural extension advisory services to farmers and monitoring (January– September 2018). District-level agricultural extension workers will provide guidance to farmers derived from the crop modeling. On-demand trainings will occur on topics including irrigation and water management, application of fertilizer, pest control, and soil quality management. To maximize the use of swamps, vegetables will be grown as a source of income for farmers during the dry season (January-March) until rice planting starts in April. Extension workers will visit farms bi-weekly, monitor progress, and report using the app to field partners. The weather station data along with other historical data will be used to provide weekly-updated crop modeling projections of final yields along with the simulated results of management adjustments.

7. End line household survey for evaluation (October 2018). An endline survey will be conducted in the final month of this study. Yield, income and household level data will be generated from treatment and control groups. In addition to the questions used in the baseline survey, endline survey questions will assess adoption of the technology provided through the advisory services, farmers' perceptions of the services, and the performance of the crop modeling.

Budget: Total amount: $98,788 will be used as table below:

Project implementation	Unit cost	Amount	Justification
Agricultural inputs	$ 100	$ 6,000	Input suppply (fertilizer, seed etc.) for farmers 60 farmers
Swamp improvement	$ 2,000	$ 6,000	3 target swamps
Extension workers and enumarators	$ 50	$ 5,700	6 Extension workers and 6 enumarators, $50/day
Training	$ 400	$ 2,400	3 for extension workers and 1 for rnumarators
Weather station maintanance	$10,000	$10,000	Station ($8,000) and maintanance ($2,000)
Computer	$ 1,000	$ 1,000	To process weather data
Miscellaneous	-	$ 3,500	Publication, communication etc.
Travel			
Domestic	$ 50	$ 1,000	Local researchers' in-country travel
Foreign	$10,449	$20,898	International travel, 2-week for 2 times
Personnel			
IFPRI research fellow	-	$10,000	Ricky Robertson, 3 weeks
Njala Researchers	50	$ 4,000	2 Njala researchers, 40days each
UIUC coordinator	-	$ 6,098	Hitomi Ho, one month
Direct cost		$76,596	
Indirect cost		$22,192	28.60%
Total		$98,788	

Expected Data Generated: Weather data will be gathered and made available for a region that is typically data scarce. Empirical evidence of impact of the intervention on rice production improvement including household-level yield, technology adoption, and household data from baseline and endline survey in Moyamba district in Sierra Leone will be obtained.

Next Steps: Following a successful pilot, the approach will be scaled-up and implemented in other districts in Sierra Leone and/or in Liberia. Scaling up can allow the benefits of this approach to reach many more regions and rural communities.