Success Story

1. Title

"Phule Irrigation Scheduler" mobile and web-based applications

2. Category

ICT based applications for natural resource management

3. Challenge

In State of Maharashtra, about 17% of the total cultivated area is irrigated. It is estimated that the irrigated area may reach to 30% if we use all the water resources of the state through construction of new irrigation projects. However, historically as we have harnessed easily and cheaply available water resource, the cost of creating new water resource is high and often not technically feasible. The environmental and social reasons also limit creating additional water resources. Thus due to technical and social reasons and environmental concerns, it is increasingly difficult to create new water resources. Therefore, the feasible option is to use the available water efficiently so that we can increase the area under irrigation. Moreover by using water efficiently it is possible to save water and water saved is nothing but water created.

There are several means of utilizing water efficiently. These include: adoption of water saving irrigation methods such as sprinkler and drip, optimal allocation of land water resources, canal lining, reservoir delineation, afforestation of catchment area, proper irrigation scheduling (applying water to different crops according to their water requirement). These options are not alternatives to each other but complimentary to each other. Most of these options call for the exact estimation of water requirement that varies with crops, their growth stages, climate etc. The knowledge of water requirement is further necessary to match spatial and temporal distribution of water demand with water supply so that water resources are used efficiently.

The water is applied through surface, sprinkler and drip irrigation methods. All these methods need water to be applied accurately to minimize the wastage of precious water, enhance the agricultural productivity, maintain and improve the soil health, reduce the environmental hazards and use the available water on sustainable basis. The sprinkler and drip methods of irrigation are being promoted especially for their important characteristic of efficient utilization of water. Efficient utilization of water primarily calls for the estimation of irrigation water requirement that varies as per crops, their crop growth stages, soils, weather and characteristics of the irrigation system being used. However, as often the location specific information on these parameters that vary during

the crop growth period; especially weather information is not available, farmers need to relay on the ad-hoc values of the water and irrigation requirement. Hence farmers schedule irrigation on ad-hoc basis or based on their experiences. However these are subjected to many errors and hence if adopted do not results into appropriate irrigation scheduling. Hence the challenge is to provide the farmers with the information on water and irrigation requirement that depend on varying weather conditions, crop growth stage, soils and specific irrigation systems used by farmers and; the information should be farm specific for reliability and enhancing the adaptability.

4. Initiative

The irrigation water requirement depends on crop, soils, climate and efficiency of the irrigation system. The irrigation water requirement of different crop is different and for a specific crop it varies over the growth season. The irrigation water requirement for the same crop and soil is different for different regions because of variability in the meteorological parameters that govern the water requirement. The basic information that is required for estimating the irrigation water requirement of the crops is the weather parameters that govern the water requirement (such as temperature, humidity, sunshine hours, wind speed and rainfall) and the crop coefficients that vary with the crops and over their growth season. The weather data estimates the reference evapotranspiration (ETr) and crop coefficient values when coupled with ETr determines the crop evapotranspiration of the specific crop which in turn enables to estimate the irrigation water requirement of the specified crop.

It is also necessary that water should be applied as per the water requirement and the irrigation system be operated according to the water requirement. The application of water according to the water requirement of crop in terms of quantity and time of operation will not lead to under and over application of water thus avoiding the water stress and water wastage. It is also necessary to know the system requirement of water and system discharge in order to match the available supply with the requirement. However there were no tools or means to provide the farm specific information on irrigation requirement and time of operation of the system. Upon several deliberations and discussion with the farmers and extension workers, it was realized that the web based application (for extension workers) and mobile based application (for individual farmers) that will integrate the farm, soil, crop and irrigation system information provided by farmers, real-time weather information from weather data service and scientific information on irrigation scheduling generated by this university and particularly this project would be useful. Hence in this project it was decided to bring this thought in to reality. Therefore, this project developed desktop application named *"Phule Irrigation*

Scheduler" for scheduling the irrigation for different crops by surface, sprinkler and drip irrigation methods in real time.

The desktop application was then converted to mobile application named *"Phule Irrigation Scheduler"* to enable the farmers to use from anywhere. Web based applications are the revolutionary steps to access information anytime anywhere; and was to be useful to the extension workers, KVKs and other agro advisories for discrimination to their target crops. Therefore the desktop software was also converted in web based platform and that too in user friendly interface to use by the different user groups on large scale These applications are more user friendly and easy accessible in online as well as 'offline' mode.

These applications have been prepared in English and Marathi local languages. These applications have been provided to farmers, progressive growers, scientist from SAUs, KVKs, NGOs, Officer from Department of Agriculture for the purpose of testing and validate. The brainstorming sessions and workshops were organized to receive the feedbacks and accordingly these applications were refined. *"Phule Irrigation Scheduler"* desktop and web based applications and mobile application are now available, for use.

5. Key result/insight/interesting fact

"Phule Irrigation Scheduler" mobile and web based applications estimate the reference evapotranspiration (*ETr)* by the different standardized methods for the specific form by fetching the required input weather data (maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity, wind speed, sunshine hours, etc.) from the "Open weather", weather service provider for the current and 3 days ahead. The crop coefficient values are estimated daily from the crop and crop growth stage specific information on crop coefficient generated in this project based on literature and experimentation. The crop coefficient (Kc) is multiplied by the reference evapotranspiration (*ETr)* rate to determine the crop water use for the specific day. Further by integrating other information on crop and soil, location of farm, irrigation system, the precise irrigation requirement and time of application are estimated.

In these mobile and web based applications, farmer initially need to register the farm by providing information on location of farm, crop, soil and irrigation system that he/she easily has. Then farmer has to access the mobile application/web based application at least once in 3-4 days so that the current weather information is registered in the farm. By entering the previous date of irrigation and the desired date of irrigation, farmer can know the irrigation requirement and time of application immediately and accordingly can operate the irrigation system to provide irrigation water precisely to the farms.

In addition to online information on weather fetched from weather data provider, there is also arrangement to input the own weather data for estimation of evapotranspiration in offline mode. This is particularly important, if the users or farmers have their own data/AWS.

Lot of information is required for estimation of water requirement. This information have been provided based on the literature and experimentation in this project as default values; however the users have the option to change; should they have their own values.

6. Impact

A) Adoption

- "*Phule irrigation Scheduler*" (PIS) mobile and web based applications are used by the researchers in agricultural universities to schedule their irrigations to the experimental plots based on different irrigation levels.
- Researchers from KVKs and NGOs have started using the mobile and web based applications to provide advisories to the farmers of their region.
- Farmers are in increasingly enquiring about PIS mobile and web based applications for use so that they can use on their farms (we are scheduling workshops for this purpose)

B) By way of following the scarce water resources will be utilized efficiently and it is envisaged that at least 5% of water will be saved due to this scientific intervention with equal percentage enhancement in provability.

- Framers will be able to apply the water according to the water requirement of crops (taking in to consideration the climate variability) and manage their irrigation systems efficiently and avoid excess irrigation through micro irrigation, sprinkler and surface irrigation methods.
- Application of water according to needs of crop will lead to saving of water and increasing the productivity of the irrigated agriculture.
- Optimization of water requirement as per crop growth stages.
- Optimized water requirement for protective irrigation as per critical growth stages of crops for rain-fed and dry-land agriculture.
- Due to exact knowledge on application of water to crops, soil pathogen will be controlled and soil health will be maintained especially for perennial orchard crops and sugarcane.
- More than 10,000 farmers can be benefited due to this information and IWRAS.

Currently the default crop and soil database is mostly for the western Maharashtra, generated in MPKV, Rahuri and in this RKVY project. However if scaled up to national level to include the crop and soil database from all the universities and research organizations, its impact will be felt nationally for efficient utilization and scheduling of irrigation water; by covering as many farmers as possible.

7. Lessons Learned

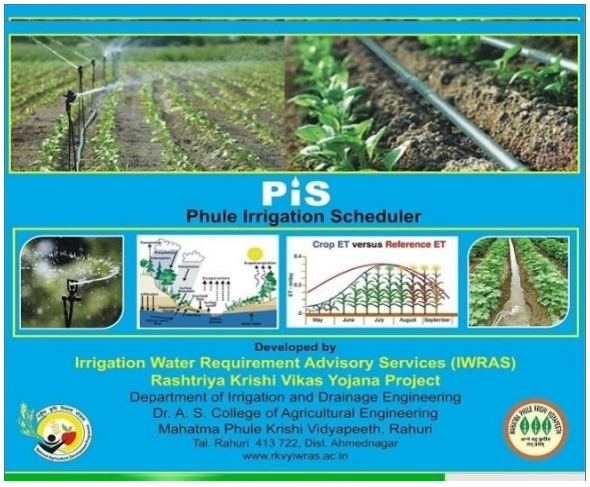
Many-a-times farmers are not able to produce enough agriculture produce with better quality to their potential may be, probably due to some constraints that lead to lack of access to timely and up-to-date information on different agro-advisory including irrigation which would have enabled them to achieve optimal yield from their farmlands. Such highly desired information is made available to them via workshops, media and publications. In this modern day of information technology, the innovative tools such as mobile and web based applications were thought to be appropriate for providing the precise and real time information. We developed these tools for precise irrigation scheduling and disseminated.

The particular lesions learned are;

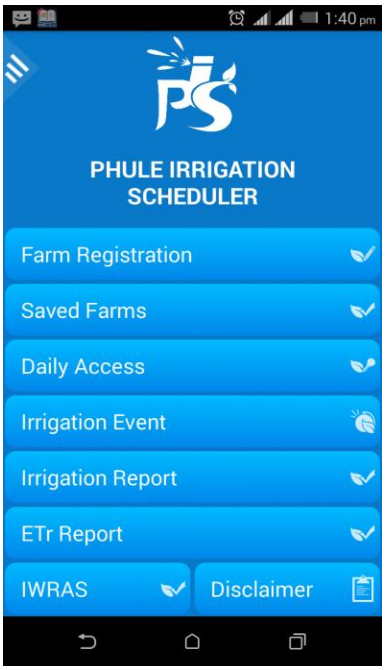
1) We can develop the tools such as mobile and web based applications for providing location specific, precise and real time advisory. This is much useful rather than generating the common advisories and disseminating those in form of several thousand SMS.
2) Farmers are receptive to modern days tools for obtaining the information and knowledge.

8. Supporting Quotes and Images

CDs of *"Phule Irrigation Scheduler"* desktop application

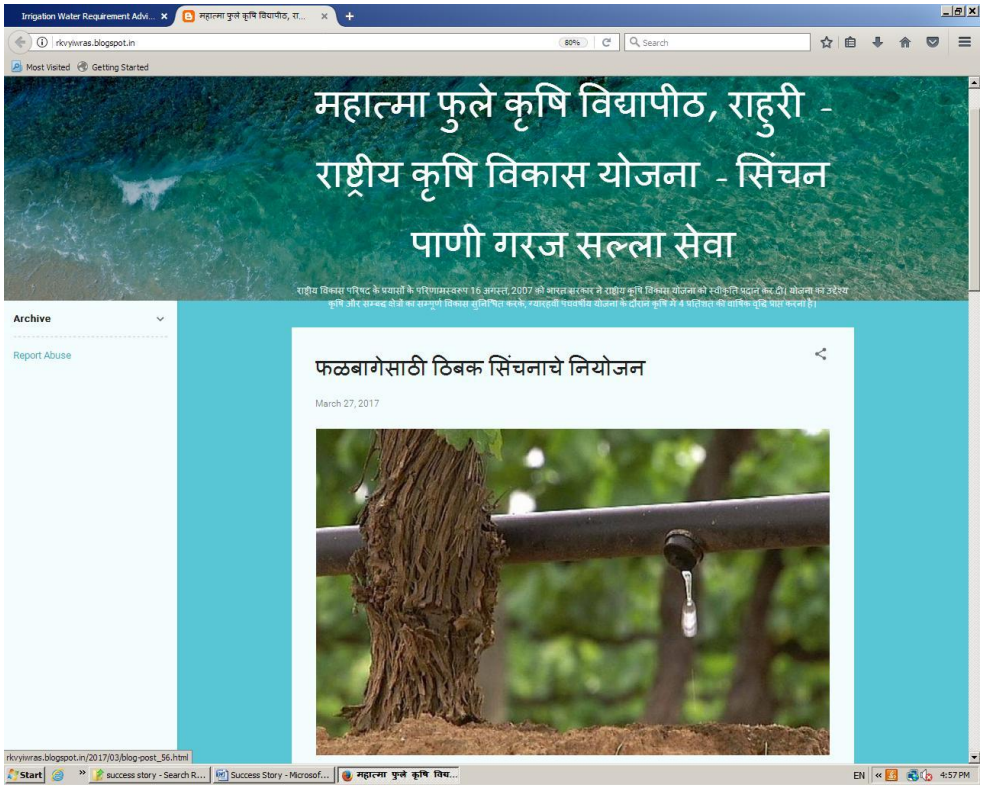


Home screen of *"Phule Irrigation Scheduler"* web based application

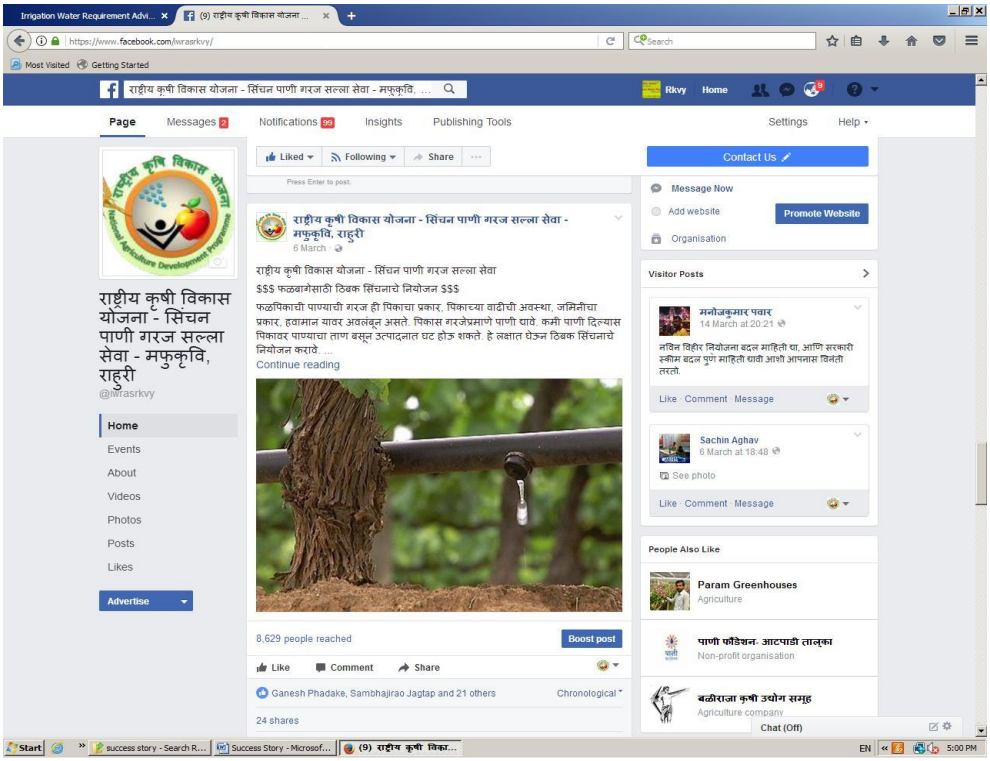


Home screen of *"Phule Irrigation Scheduler"* mobile application

Home screen of official website



Home screen of blog



Home screen of facebook group

9. Additional information

1. List of all project partners and/or donors who supported the work

Investigators

Sr. No.	Name	Designation
1.	Dr. S. D. Gorantiwar	Principal Investigator
2.	Dr. S. D. Dahiwalkar	Co-Principal Investigator
3.	Dr. S. A. Kadam	Co-Principal Investigator

Guidance

Sr. No.	Name	Designation
1.	Dr. K. P. Vishwanatha	Hon. Vice-Chancellor, MPKV, Rahuri
2.	Dr. R. S. Patil	Director of Research, MPKV, Rahuri

2. Links to supporting materials:

1. Link of official website : http://www.rkvyiwras.ac.in/
2. Link of blog : http://rkvyiwras.blogspot.in/
3. Link of facebook group : https://www.facebook.com/iwrasrkvy/

3. Contact person for this story

1. Name : Dr. S. D. Gorantiwar
2. Position : Principal Investigator and Head, Department of Irrigation and Drainage Engineering, Dr. Annasaheb Shinde College of Agricultural Engineering and Technology, Mahatma Phule Krishi Vidyapeeth, Rahuri.
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4. Other information you want to add

1) *"Phule irrigation Scheduler"* has been released in the workshop of "ICT Based Application in Irrigation Scheduling" held on 24th March, 2015 in form of CD's
2) A one day workshop was organized at MPKV, Rahuri for KVKs scientist and farmers on 16th March 2017.
3) Hands on training and complete demonstration of this mobile and web based applications has been delivered in PFDCs 'Skill India' Programme.
4) Informative articles on *"Phule Irrigation Scheduler"* were written and already sent to media for publication.

10. Checklist

No.	Question to consider	Yes	No
1.	Is the story interesting to the target audience of the project/activity report?	√	
2.	Does the story explain what new insights the project brings? What is the main lesson learned from this story? Does the story describe a key insight on what works and what doesn't and something that future project could build on	√	
3.	Does the story describe the outcomes the project produced and the people who are benefitting? What changes–in skills, knowledge, attitude, practice, or policy–has the project brought, and who is benefitting from these changes?	√	
4.	Does the story make a compelling point that people will remember? Does the story show how the project makes a difference to improving livelihoods and lessening poverty?	√	
5.	Does the story provide an interesting fact that people will remember? For example, how much yields increased, how many hectares of land could become more productive from this innovation or technology?	√	
6.	Does the story explain what kind of impact this innovation or technology could have if scaled up?	√	
7.	Does the story show which partners contributed and how?	√	
8.	Does the story include quotes from Stakeholders or beneficiaries?	√	
9.	Have I provided links to other media (journal articles, website news, newsletter, blogs, annual reports of other Programme/ project) that also feature this story?	√	
10.	Have I provided the contact details of people who can provide more information?	√	