

Supplementary Information

The role of soil moisture information in developing robust climate services for small-holder farmers: evidence from Ghana

Samuel J. Sutanto^{1,2,*}, S. Paparrizos¹, G. Kranjac-Berisavljevic³, B. M. Jamaldeen³, A. K. Issahaku³, B. Z. Gandaa³, I. Supit¹, E. van Slobbe¹

¹ *Water Systems and Global Change Group, Wageningen University and Research, P.O. Box 47,*

6700 AA, Wageningen, The Netherlands

² *Institute for Marine and Atmospheric research Utrecht, Utrecht University, Utrecht, the Netherlands*

³ *West African Centre for Water, Irrigation and Sustainable Agriculture (WACWISA), University for Development Studies, Tamale, Ghana*

The Supplementary Information comprises questionnaire that was used during interviews and forum group discussion as follows.

SECTION 1: DEMOGRAPHIC INFORMATION OF FARMER

Community: Date of interview: / /

Enumerators name: Number:

Farmer name: Number:

Q1. Age: [0] under 25 [1] 25-34 [2] 35-44 [3] 45-54 [4] 55-64
[5] above 65

Q2. Gender: [0] Female [1] Male

Q3. What is your household size? [0] 2-5 [1] 6-9 [2] 10-13 [3] 14-17
[4] 18-21 [5] 21+

Q4. Educational background: [0] No formal education [1] Basic [2] JHS
[3] SHS/ technical /vocational [4] Tertiary.

Q5. Are you the land owner? [0] No [1] Yes

Q6. Are you into animal production? [0] No [1] Yes

If Yes, please specify:

Q7. Are you engaged in any non-farm employment (off-farm work)? [0] No [1] Yes

If Yes, please specify:

Q8. Number of years in farming:

SECTION 2: AGRICULTURAL INFORMATION

- Q1. Do you have access to any agricultural information that play a role in your farming decision making? [0] No [1] Yes
- Q2. How do you access agriculture information now? [0] TV [1] Radio
[2] Newspaper [3] Phone (sms, voice call, app:) [4] Peer farmers [5] Extension officers
- Q3. What kind of information do you receive? (0) water availability (1) seasonal weather forecasts (2) input prices and availability (3) crop/variety selection (4) disease control (5) market prices (6) soil moisture
- Q4. How often do you receive this information? (0) not often (1) often (2) most often (3) very often
- Q5. How much do you depend on water information for agricultural decision-making? [0] Almost always [1] Often [2] Sometimes [3] Rarely [4] Never
- Q6. How much do you depend on weather information for agricultural decision-making? [0] Almost always [1] Often [2] Sometimes [3] Rarely [4] Never
- Q7. How would you rate the quality of information you receive in each case?

Information type	Quality rated				
	Excellent	Good	Acceptable	Poor	Very poor
water availability					
seasonal weather forecasts					
input prices and availability					
crop/variety selection					
diseases control					
market prices					
soil moisture					

- Q8. How would you rate the significance of information you receive in each case?

Information type	Rate				
	Least important	Less important	Important	More important	Most important
water availability					
seasonal weather forecasts					
input prices and availability					
crop/variety selection					
diseases control					
market prices					
soil moisture					

SECTION 3: SOIL INFORMATION

Q1. Are you aware of the concept of soil moisture? [0] No [1] Yes

If No, please specify why.....

Q2. Do you have an alternative name for soil moisture in your area?
.....

Q3. Do you examine soil moisture by hand feeling? [0] No [1] Yes

Q4. Do you examine soil moisture by smell? [0] No [1] Yes

Q5. Is the soil color important to you? [0] No [1] Yes

Q6. Do you measure surface soil moisture/water (upper 5cm) or root zone soil moisture/water (upper 100cm of soil)? [0] Surface [1] Root zone

Q7. What are the instruments that you currently employ in determination of soil moisture/water content?.....

Q8. What methods do you use to measure soil moisture/water content?

Q9. Do you use soil moisture information as an indicator for agricultural decision-making?
[0] No [1] Yes

Q10. In which decisions of the following do you take soil moisture into account?

Variable	Least important	Less important	Important	More important	No Idea
Land preparation					
Sowing					
Fertilizer application					
Weed control					
Pest control					
Harvesting					
Rice varieties					
Which other decisions do you consider soil moisture					

Q11. Do you receive soil moisture information from any other source? [0] No [1] Yes

If Yes, from where/which organization?.....

If Yes, what kind of data e.g. real time or forecasts?

SECTION 4: INFORMATION NEEDS

Q1. How would you rate your understanding of local weather? [0] Excellent

[1] Somewhat [2] Poor

Q2. Do you think that weather information is important to make agricultural decisions?

[0] Strongly agree [1] Agree [2] Undecided [3] Disagree [4] Strongly disagree

Q3. How advanced information should be for rice crop related decision-making?

- [0] Real-time [1] 1-day in advance [2] 2/3 days in advance
 [3] 1-week in advance [4] 2-weeks in advance [5] 1-Month in advance
 [6] 3-Months / seasonal forecast

Q4. What kind of information do you need to make agricultural decisions? (multiple answers could be provided)

- [0] Rainfall [1] Temperature [2] Humidity [3] Storm
 [4] Soil moisture

Q5. Do you currently take decisions based on traditional knowledge/natural indicator forecasts? YES / NO, if yes please provide details:

Indicator's name	Indicator's signal	Month/period	Outcome/prediction