

Info Note

Impact of climate services on Rwandan farmers

Summary of findings from the Rwanda Climate Services for Agriculture Project

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Key messages

- Experience in Rwanda shows that well-designed climate services are an effective way to improve the wellbeing of smallholder farmers.
- Climate services provided through participatory channels increased productivity and profitability of farms and food security of households.
- Participants perceived improved confidence as farmers, coping capacity, family healthcare, children's schooling, and social standing.
- Participatory communication overcame a gender gap and empowered women in their homes and communities.
- Farmer-scientists demonstrated large yield and income benefits through a network of field trials.

Through the Rwanda Climate Services for Agriculture (RCSA) project, a consortium of national and international partners worked from 2016 to 2020 to strengthen the contribution of climate services to Rwanda's farmers and agriculture sector. The project used a combination of communication channels to support farmers' use of climate services. It adopted the Participatory Integrated Climate Services for Agriculture (PICSA) approach, developed by the University of Reading, to support farmers' use of historical and forecast seasonal climate information. PICSA combines the use of local climate information with participatory resource mapping, activity calendars and budgeting activities. The participatory process was implemented at an unprecedented scale by training 2,111 local agricultural extension staff and volunteer Farmer Promoters within the *Twigire Muhinzi* agricultural extension system, who in turn trained and facilitated 112,767 farmers to use climate services.

The project partnered with Radio Huguka – a community radio network with an estimated listenership of 3.1 million farmers – to develop climate service programming in several standard and interactive formats. Radio Listeners Clubs (RLCs) were piloted that combine the reach of broadcast media with the power of participatory processes. Building on existing PICSA groups, 225 Farmer Promoters were trained to lead their village groups in weekly meetings to listen and discuss climate service radio programs, participate in live call-in shows, share and record their plans to act on what they learned, and share the information with other farmers.

Evaluation methods

The effectiveness and perceived benefits of early PICSA implementation were assessed using questionnaires administered to 215 participant households randomly sampled from 4 pilot districts in 2017, and 502 households in 10 districts in 2018. A final project evaluation used a mix of quantitative and qualitative analyses to assess the influence of the RCSA interventions – in particular PICSA and Radio Listeners Clubs (RLCs) – on farmers' use of climate information and resulting welfare impacts.

The quantitative evaluation was based on a survey of 1,525 farmers from 15 districts. Sampling aimed to provide balanced representation by sex (51.0% men, 49.0% women) and across provinces and districts. A 2×2 factorial sampling design allowed the influence of PICSA and RLCs to be compared, alone and in combination, with the control (Table 1). ANOVA showed that observed differences were due to interventions rather than random variability among farmers. Although the sampling strategy and analysis controlled for potential location bias, there is a possibility of self-selection bias – which results when participant farmers are different, on average, than farmers in the control group in ways that affect measured impact.

For the PICSA sample, self-selection bias is expected to be small, as nearly all farmers in selected *Muhinzi* Groups participated in PICSA. The risk of self-selection bias is greater for RLCs, as weekly participation placed greater demands on farmers' time and hence may have favored farmers with greater motivation or fewer time constraints.

Table 1. Quantitative survey sample design.

	+ PICSA	– PICSA	TOTAL
+ RLC	182	321	503
– RLC	395	627	1,022
TOTAL	577	948	1,525

The qualitative evaluation used gender-disaggregated focus groups (32 total) and key informant interviews (24 total) to deepen understanding of how women and men have accessed, used and benefitted from climate services through PICSA and RLCs.

A network of 120 farmer-managed field trials served both as a demonstration to farmers and a robust comparison of climate-informed crop management options that were identified during the PICSA process, and farmers' normal practices. The trials were implemented over four growing seasons: for maize in September-December 2017 and 2018, and beans in March-May 2018 and 2019.

Farm productivity and profitability

PICSA participation significantly increased the farmgate value of crop production by an average of 24% (from a mean of \$165 for the control sample), and net income from crops by 30% (from a control sample mean of \$115), relative to non-participating communities (Figure 1). The combination of PICSA and RLCs was associated with a 47% average increase in the value of crop production, and a 56% increase in income from crops.

The mean impact measured in the evaluation survey translates to an estimated \$3.87 million per year increase

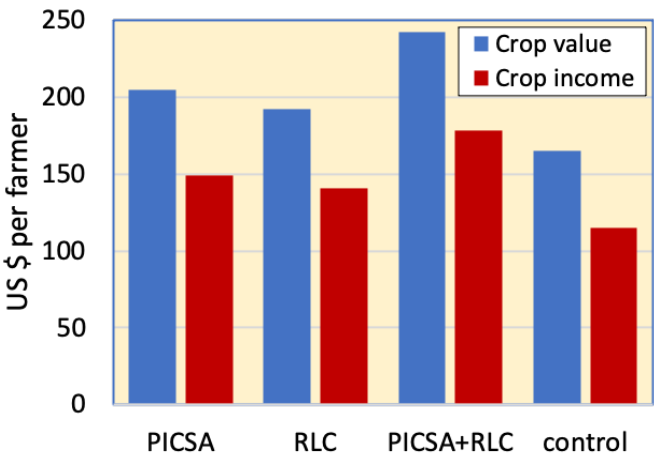


Figure 1. Average crop income and value for participant and non-participant farmers (Birachi et al., 2020).

in net income from crops, and \$4.54 million per year farmgate value of crop production, aggregated across the 112,767 farmers who participated in PICSA. This likely underestimates total benefit to farmers and the economy, as it does not consider impacts of livestock or other livelihood management responses. The survey sampled participants across enough of the districts where PICSA was implemented to allow impacts to be aggregated with a reasonable degree of confidence. The impacts of RLCs, alone or in combination, are more difficult to estimate due to fluctuating and uncertain numbers of farmers who participated in RLC meetings.

Household food security

Participation in PICSA and RLCs significantly extended the amount of time farmers' primary cereal and pulse crops met their household subsistence needs (Figure 2). The difference from the control group was greatest (47% increase from mean of 3.0 months for the main cereal, 48% increase from 3.1 months for the main legume) for RLC participants. Participation in PICSA and RLCs was also associated with modest but statistically significant increases in Household Dietary Diversity (HDD) score. As with crop value and income, impact of PICSA and RLC participation in combination (15% increase from mean of 4.1) was greater than the impact of either intervention alone on HDD increase from mean of 4.1) was greater than the impact of either intervention alone on HDD.

Perceived wellbeing

Participating households reported using their increased agricultural incomes to make a range of long-term investments, particularly school fees, and health insurance. In PICSA monitoring in 2016/7 and 2017/8, the majority of participants reported that, as a result of the training they received, they had greater confidence in their farming decisions, ability to cope with adverse weather conditions, ability to provide for family healthcare and pay for children's school fees, and social standing within their households and communities.

Empowerment of women

The qualitative study showed that participation in project PICSA and RLC interventions largely eliminated a gender gap in the use of weather and climate information for management that is apparent in the control sample. It also diminished gender inequities in overall investment in their farms, coping capacity, and confidence in planning. Women who had participated in PICSA and RLCs reported greater ability to cope with adverse weather conditions and confidence in planning compared to women who had not participated in the interventions. A subsequent gender-focused analysis of the quantitative survey confirmed that RLC participation eliminated significant disparities in awareness, access and use of

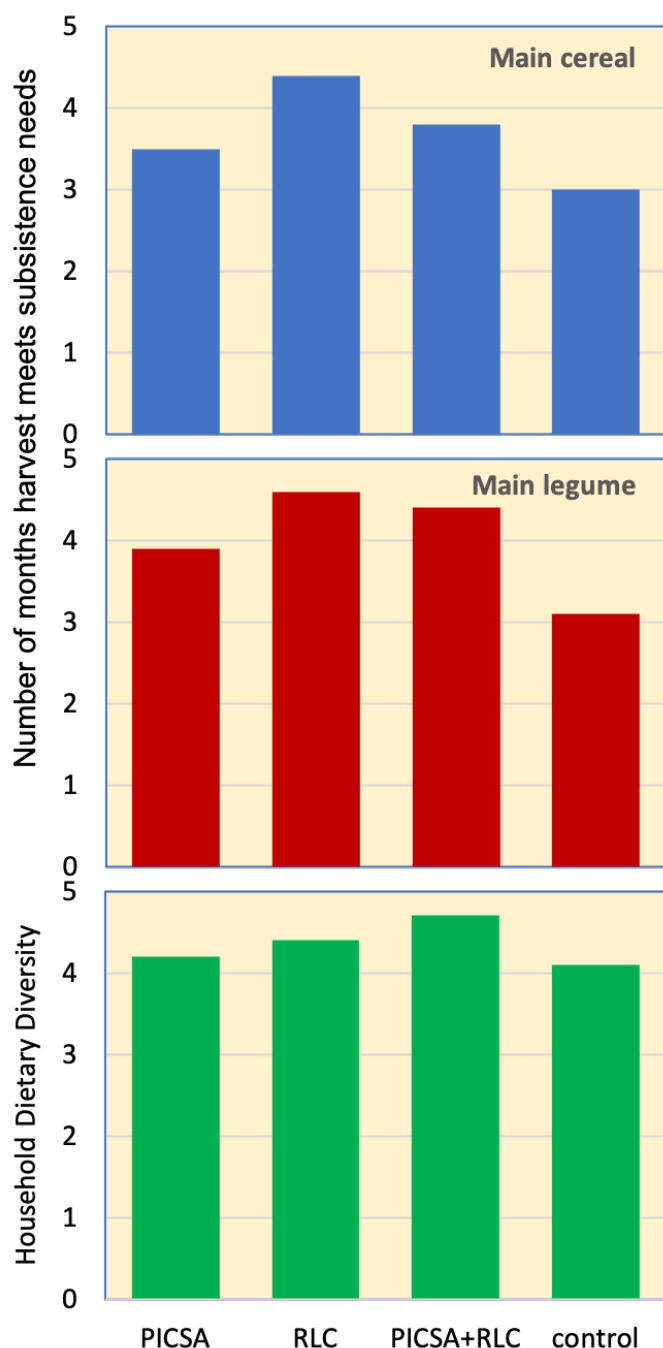


Figure 2. Average period that harvest meets subsistence needs, and dietary diversity index, for participant and non-participant households (Birachi et al., 2020).

climate information that exist between women and men smallholder farmers in the control sample.

Results also show benefits related to women's empowerment, in the form of increased participation in household decision making and increased social standing in their communities. Focus groups of women RLC participants in Northern and Southern Province referred to "talking with actions" to describe how gaining new knowledge, and using that knowledge to improve their farms' performance, enhanced their husbands' confidence in their advice and hence their participation and influence in decision making.

Farmer-scientists demonstrate yields and income benefits

A network of field trials engaged farmers to compare the yields and net income that they could achieve from climate-informed crop management options identified through the PICSA process, with the performance of their normal practices. The climate-informed management practices increased yields by 47% for maize and 53% for beans, averaged across all participating farmers and two seasons (Figure 3). The average improvement was even greater for net income per unit area: 52% for maize and 66% for beans.

Conclusions and policy implications

The evaluation results summarized here contribute to a growing body of evidence that well-designed climate services are an effective way to improve farmers' yields, income and well-being. Factors that enabled these impacts, at scale, in Rwanda included (a) balanced investment in capacity to generate, communicate and use climate information for agriculture; (b) climate science solutions that enabled the National Meteorological Service to provide high-quality, localized information tailored to farmers' needs; (c) a strategic combination of digital, broadcast media and institutional communication channels; and (d) participatory communication processes scaled up by a strong agricultural extension service.

Further Reading

- Birachi E, Hansen J, Radeny M, Mutua M, Mbugua MW, Munyangeri Y, Rose A, Chiputwa B, Solomon D, Zebiak SE, Kagabo DM. 2020. Rwanda Climate Services for Agriculture: Evaluation of farmers' awareness, use and impacts. CCAFS Working Paper no. 304. Wageningen, the Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).
- Gumucio T, Hansen J, Nsengiyumva G, Birachi E, Kagabo D, Rose A, Munyangeri Y. 2020. Rwanda Climate Services for Agriculture: Qualitative Evaluation through a Gender Lens. CCAFS Working Paper no. 315. Wageningen, the Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).
- Hansen J, Kagabo D, Clarkson G, Furlow J, Fiondella F. 2021. Climate Services for Agriculture: Empowering Farmers to Manage Risk and Adapt to a Changing Climate in Rwanda (Final Project Report). Wageningen, the Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

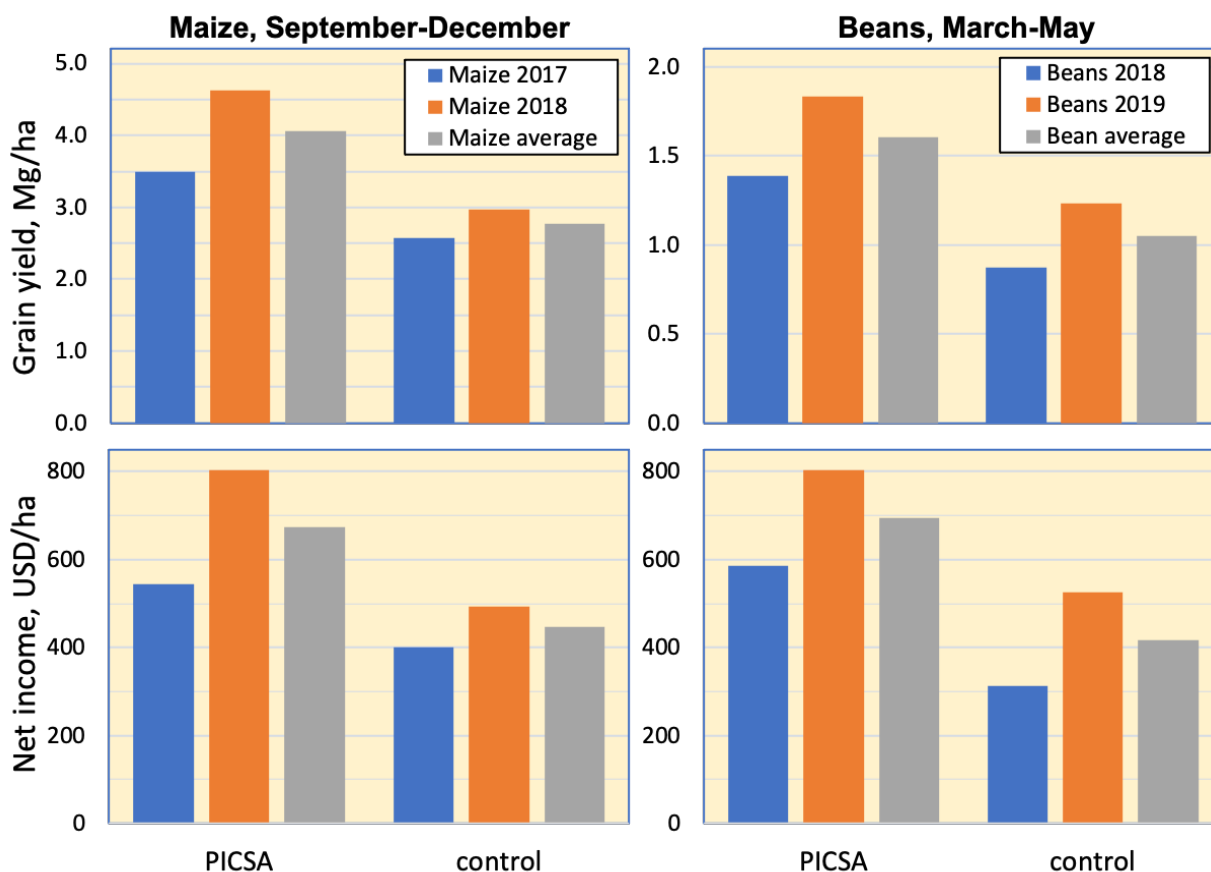


Figure 3. Average yields and net income from farmer-managed plots.

- Hansen JW, Vaughan C, Kagabo DM, Dinku T, Carr ER, Körner J, Zougmore RB. Climate Services Can Support African Farmers' Context-Specific Adaptation Needs at Scale. 2019. *Frontiers in Sustainable Food Systems* 3:21.
- Ingabire C. 2021. Closing gender gaps in farmers' access to climate information: The case of Radio listeners clubs in Rwanda. CCAFS InfoNote. Wageningen, the Netherlands: CGIAR Research Program on Climate Change, Agriculture and Food Security (CCAFS).

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