

Participatory Integrated Climate Services for Agriculture (PICSA) as part of Rwanda Climate Services for Agriculture:

Findings from quantitative evaluation of 2016/17 PICSA implementation

Working Paper No. 338

CGIAR Research Program on Climate Change,
Agriculture and Food Security (CCAFS)

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RESEARCH PROGRAM ON
**Climate Change,
Agriculture and
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Abstract

The Rwanda Climate Services for Agriculture project aims to provide climate services across Rwanda. This report provides findings from the first year of implementation of the Participatory Integrated Climate Services for Agriculture (PICSA) approach. A core team of national experts in PICSA were trained before cascading the approach to farmer groups through the Twigire Muhinzi system of Farmer Promoters. Training of the first groups of Farmer Promoters took place in 2016.

This document reports on a quantitative survey of 215 randomly selected trained farmers. These were selected from a sample of 2,631 farmers trained across four districts. The quantitative evaluation took place in March 2017 after the season had finished and respondents had been able to harvest.

Results from the quantitative survey show that almost all of the farmers were trained on the PICSA elements that are implemented 'long before the season'. 97% of respondents were trained in the seasonal forecast and 86% received short term forecasts during the season.

93% of farmers had made changes in their farming or other livelihood activities as a result of PICSA training. More farmers made changes in crops (90% of respondents) than livestock (24%) and other livelihoods (17%). On average respondents each made 2 changes.

The most popular types of changes made in crops were growing a new crop (34%), growing a new variety of a crop they already grow (26%); and changing the management of land (23%). The most popular change in livestock enterprises were starting a new enterprise (14%), followed by increasing the scale of a livestock enterprise (6%); and changing the management of a livestock enterprise (4%). Regarding other livelihoods 9% of respondents had started a new enterprise and 7% had changed management of livelihood enterprises.

Regarding the effects of the changes farmers had made as a result of the PICSA training, 85% of farmers reported that the decisions they had taken had improved their household food security. 81% reported that they had improved household income, 84% that they had been better able to provide for family healthcare and 75% that they had found it easier to pay

their children's school fees. Respondents reported that as a result of the PICSA training and the effects of the changes they had made that they are more confident in planning and decision making (96%), better able to cope with bad years caused by the weather (93%) and had improved their social standing within their households (93%) and within their wider community (93%).

The results of this evaluation show that the first implementation of PICSA in Rwanda has been effective at scale across the first four districts. As the project scales the approach over the remaining districts in Rwanda it is vital to maintain quality in training and implementation. This success is due to PICSA being an integrated approach that enables farmers to assess their own individual farming systems and to evaluate and plan appropriate options in the context of their local climate and weather.

Keywords

Agriculture; livestock; land management; food systems; food security.

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1. Background and context

1.1 Participatory Integrated Climate Services for Agriculture (PICSA)

[PICSA](#) is an approach that seeks to build resilience at the farm level by supporting decision-making through the integration of information on location-specific climate, crops, livestock, and livelihoods. It emphasises practical hands-on methods that can easily be used and understood by farmers by integrating livelihood alternatives to those on-farm. PICSA is led by the University of Reading (UoR) based in the UK and has been supported by the CGIAR Research Programme on Climate Change, Agriculture and Food Security (CCAFS).

Climate and weather information in accessible forms is presented in collaborative and participatory forums, for use by groups of smallholder farmers. Empowered to analyse and interpret the data, farmers are able to identify the variability of local climatic patterns amongst other factors so as to consider their implications for crop and livestock production. By gaining access to new and enhanced climate information and using participatory decision-making tools, supplemented with the farmers' own experiences, farmers are better able to assess their crop, livestock and livelihood options and identify those most suited to their environments. Better informed decision-making is enabling farmers to manage risk and adopt farming practices more resilient to variable climatic conditions.

1.2 PICSA as part of the Rwanda Climate Services for Agriculture project

In the Rwanda Climate Services for Agriculture project the PICSA approach is being implemented through 'Farmer Promoters'. Farmer promoters are part of the Twigire Muhinzi system of extension that the Rwanda Government has developed alongside One Acre Fund. This requires a training approach that cascades PICSA through a series of different training workshops. Firstly, an expert training of CIAT (The International Center for Tropical Agriculture) staff, alongside Rwanda Agricultural Board (RAB), Meteo Rwanda and a range of NGOs was conducted before these expert trainers then train farmer promoters to go on and train their fellow farmers.

In the first year of the USAID Climate Services in Rwanda project, the PICSA approach has been implemented in four districts (Burera, Ngororero, Nyanza and Kayanza). This process began with Meteo Rwanda and CIAT experts preparing historical climate products for various stations (training for this process was initiated at the UoR). There was an initial 'expert trainers' workshop where 31 senior staff from Meteo Rwanda, Rwanda Agriculture Board, CIAT and a series of NGOs (Rwanda Development Organisation, Radio Huguka, OTP, Send a Cow Rwanda, DERN, IMBARAGA and Rwanda Farmers Association) were trained in the Participatory Integrated Climate Services for Agriculture (PICSA) approach. The aim of this training was to prepare a core team of PICSA trainers who could train agricultural field staff in the PICSA approach in the following four years of the project and beyond. This initial training was followed by two parallel sessions (covering the four districts) in which a combination of CIAT staff and 'expert trainers' trained 48 farmer promoters in the PICSA approach (supported by UoR). Following this training the farmer promoters rolled out the PICSA training with 2,631 farmers in the four districts. Of these farmers, 48% (1,254) were women. To learn about the process and impact of this roll out a quantitative survey was carried out with trained PICSA farmers.

2. Objective

This report provides the results of a quantitative survey undertaken in March 2017 and the initial implementation of PICSA in Rwanda under the USAID funded Rwanda Climate Services for Agriculture Project. Insights and lessons from this survey informed the further scaling of PICSA across the whole of Rwanda as part of the subsequent activities of the project. The results include evidence on the understanding and use by farmers of the information and tools included in PICSA; the response of farmers with regard to changes in practises that they attribute to the training; the associated effects on their households, their attitudes and their social status and whether or not they shared the information and tools with their peers.

3. Methodology and sample

The quantitative survey covered 215 households (survey N = 214 as one household opted not to take part) in four districts in Rwanda. It was carried out in March 2017 by a team of ten trained enumerators using tablets and Open Data Kit software to complete the survey over four days (following a pilot to test the questionnaire). The questionnaire was carefully designed to understand how households reacted to the concepts and tools introduced during the PICSA trainings (see Clarkson et al. 2019 for full explanation of the tool which was then adapted for use in this study). The questionnaire included sections on the training and the individual elements of PICSA (including use of images on the tablet to see if farmers recognised and had been trained in different elements of PICSA), the changes that participants have or haven't made as a result of the training and of the information shared and an indication as to the effect of those changes on the household. The questionnaire mostly consisted of multiple choice and Likert style questions to assess the training and consider the farmers' plans and decisions made as a result of the training. There were also opportunities for the farmer to go into more detail through open-ended questions.

Results in this report will be split by three different variables: gender and wealth of respondent (through their PPI score). As stated above, there were four districts involved in the PICSA roll out during the first year of the project: Burera, Kayonza, Ngororero and Nyanza (figure 1). These districts were selected based upon the availability of station based historical climate data.



Figure 1: Map of Rwanda

Within these districts, households were randomly selected from lists of trained PICSA households. More than half (56%) of those who participated in the survey were women and there were a range of ages (as shown in figure 2); the youngest being 22 and the oldest 80.

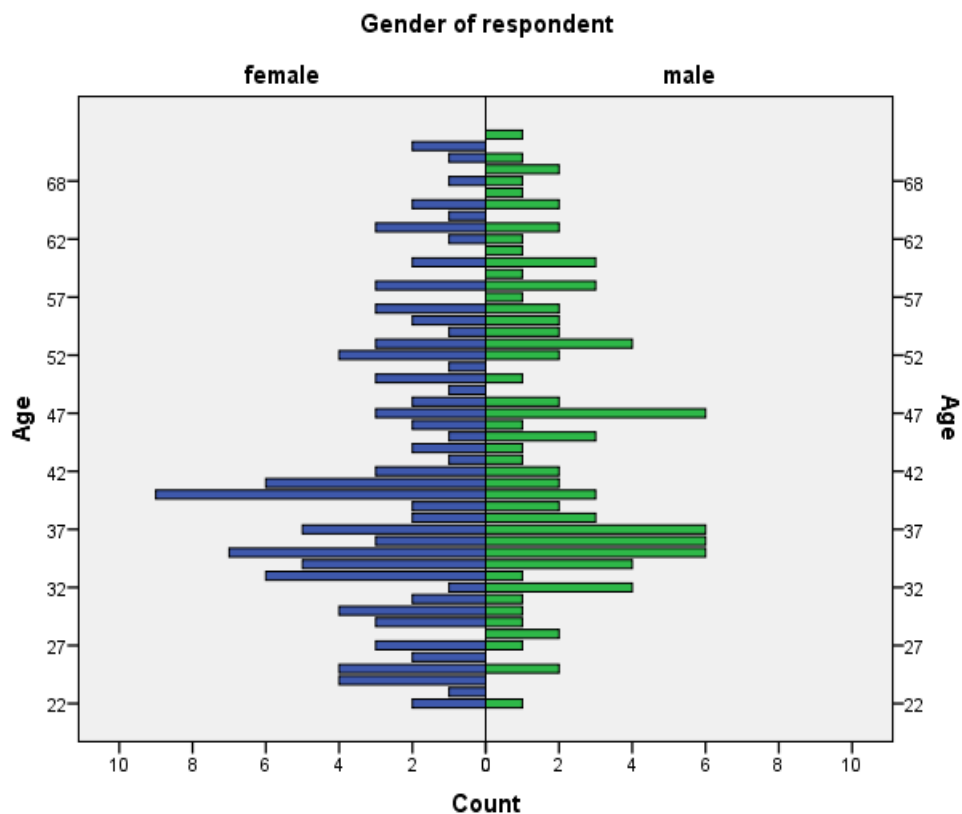


Figure 2: Graph showing gender and age of survey respondents

The quantitative survey included standard questions from the Rwanda Progress out of Poverty Index (PPI). Each respondent was given a PPI score based upon these questions. Individual PPI scores ranged between 3 and 93 suggesting that the sample represents a wide range of wealth in Rwanda. In order to split the sample by wealth the respondents were split into quartiles based on their PPI score (table 1).

Table 1: PPI ranges and wealth groups

Wealth group	PPI score range	All %	Men %	Women %	Poverty likelihoods*
Least wealthy	3-31	25.7	24.2	26.9	76-100% (86.6%)
Lower middle	32-43	26.2	21.1	30.3	51-75% (62.1%)
Upper middle	43-56	23.4	30.5	17.6	18-50% (30.5%)
Wealthiest	56-93	24.8	24.2	25.2	0-17% (7.5%)

*Poverty likelihood: the % chance that someone with a PPI score of x would be under a \$1.25 per day threshold.

The large majority of respondents in the least wealthy group are likely to be living on less than \$1.25 per day and only a small proportion of those in the wealthiest group are likely to

be in the same situation. This means that we can be confident that the PPI groups show a reasonable contrast with regards to the wealth of different households.

With regards to gender, the wealthiest and least wealthy groups were evenly split between men and women respondents. The two middle ranked groups were skewed one way or another. A larger proportion of women respondents were in the lower half of the PPI scores and men in the upper half.

4. Results

4.1 How did the respondents react to the different elements of the PICSA approach?

For the purpose of the questionnaire, the PICSA approach was split into eight different elements based around the different PICSA tools/steps that the respondents were expected to have been trained in. Respondents were asked whether or not they had received training on the specific tools/steps after being shown a familiar prompt (an image) from the training that identified each of them (table 3). They were then asked whether or not they felt the element had been useful in their planning and decision making for the coming season.

Table 2: PICSA elements and their perceived usefulness

PICSA tool / step	Respondents trained (n=214)	Trained respondents who found the tool / step useful in their planning and decision making		
		All	Women	Men
Resource allocation maps	205 (96%)	200 (98%)	110 (96%)	90 (99%)
Historical climate information	211 (99%)	207 (98%)	114 (99%)	93 (98%)
Probabilities and risks	204 (95%)	199 (97%)	106 (96%)	93 (100%)
Crop and variety options	213 (100%)	209 (98%)	115 (97%)	94 (100%)
Livestock and livelihood options	209 (98%)	203 (97%)	111 (97%)	92 (98%)
Participatory budgets	191 (89%)	186 (97%)	101 (96%)	85 (99%)
Seasonal forecast	208 (97%)	202 (98%)	110 (96%)	92 (99%)
Short-term forecast	183 (86%)	181 (99%)	99 (100%)	82 (98%)

The responses to the questionnaire show that almost all of the farmers were trained on most of the PICSA elements (table 3). This is notable as the different elements will have been split across several meetings (a range between one and nine meetings with an average of

four). Overwhelmingly, those who were trained reacted positively to the different tools and found them useful in their planning and decision making. There were no statistically significant differences when respondents were split by gender or PPI.

Likert statements provided evidence on respondents' reactions to the training (figure 3). Overwhelmingly, respondents reported that the training they had received was more useful than other training they had received from the farmer promoters, SEDOs etc... (96%; a larger proportion of men [99%] reported this than women [93%; $p = 0.04$]). A majority of respondents (70%) reported that the training needed to be conducted earlier in the year to give them more time to implement changes. Some respondents reported that they felt the training took too much of their time (28%) and that there were elements of the training that were too difficult to understand (28%). With regards to wealth, a larger proportion of the least wealthy group (PPI1, 38%) reported that they found elements of the training difficult to understand than those in PPI group 4 (21%; $p = 0.04$) and PPI group 2 (21%; $p = 0.05$). A larger proportion of those in PPI group 1 (80%) felt the training needed to be conducted earlier in the year when compared with those in PPI group 1 (62%; $p = 0.04$).

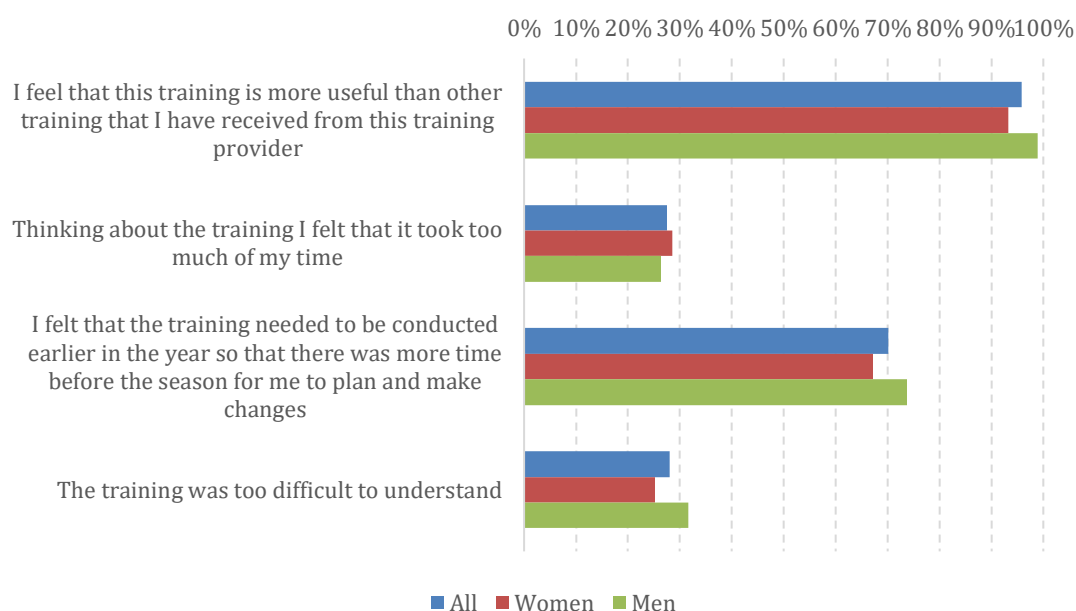


Figure 3: Likert statements evaluating elements of the training process

4.2 Are farmers making changes to their practices following the PICSA trainings?

Following the questions on the different tools / elements of the PICSA approach respondents were asked about the changes that they had made in their crop, livestock and / or livelihood enterprises as a result of the training. The overwhelming majority (93%) of respondents had made changes in their crops, livestock or livelihood enterprises (table 4). There were no statistically significant differences when considering gender or wealth (table 5).

Table 4: Have farmers made changes based on the PICSA training?

	Yes	No
All (n=214)	93%	7%
Women (n=119)	91%	9%
Men (n=95)	97%	3%

Table 5: Likelihood of making changes split by wealth

	All % (n=214)	Wealthiest (n=53)	Upper middle (n=50)	Lower middle (n=56)	Least wealthy (n=55)
Yes	93%	98%	94%	93%	89%
No	7%	2%	6%	7%	11%

The most popular type of enterprise for changes was crops (table 6), with 90% of respondents making changes in their crop enterprises (a significantly larger proportion of men [96%] than women [85%] made changes in their crops ($p = 0.01$)). A quarter (24%) of respondents had made at least one change in their livestock enterprises (men: 23%; women: 24%) and almost one fifth of respondents (17%) had made changes in their livelihood enterprises (these changes were significantly ($p = 0.03$) more popular with men [23%] than women [12%]).

Table 6: Changes in different enterprises split by gender

	All (n=214)	Women (n=119)	Men (n=95)
Crops	90%	85%	96%
Livestock	24%	24%	23%
Livelihoods	17%	12%	23%

When wealth was considered there were no statistically significant differences between the PPI groups with regards to changes in crops or in livestock but larger proportions of the

wealthiest group (PPI4, 23%) reported making changes in livelihood enterprises when compared to PPI group 1 (9%; $p = 0.05$).

The number of changes that individual respondents and their households had made averaged two per household. There was very little difference in the average number of changes between men (2.1 changes per household) and women (1.9 changes per household).

If we consider the number of changers by wealth there is a small difference between the different wealth groups with the least wealthy making slightly fewer changes than their peers (figure 4).

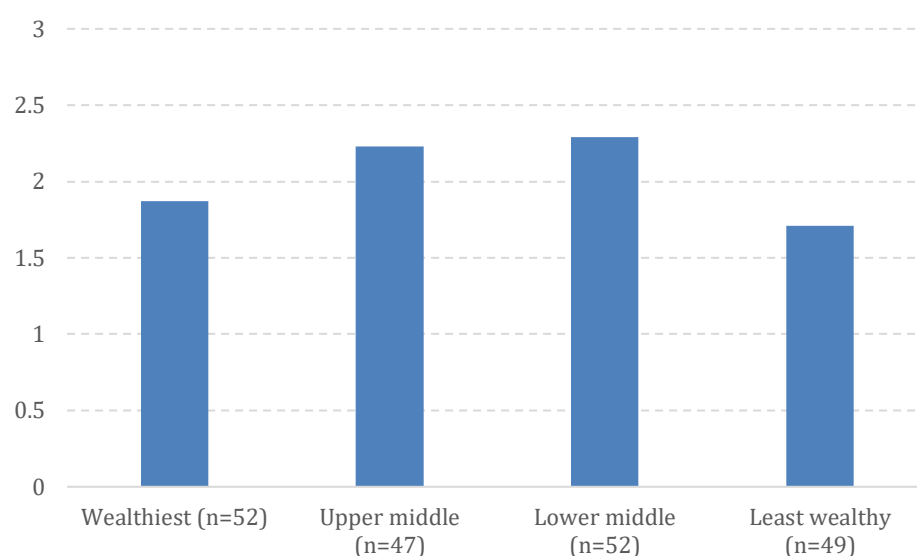


Figure 4: Number and types of changes split by wealth

4.3 Types of changes respondents are making in their crops following the PICSA training

As shown in table 8 the most popular changes were in crop enterprises. The most popular changes in crops were growing a new type of crop (34%); trying a new variety of a crop already grown (26%); and changing management of land (23%). Very few respondents made changes in the scale of their enterprises as a result of the training (figure 5). There were no statistically significant differences with when gender was considered.

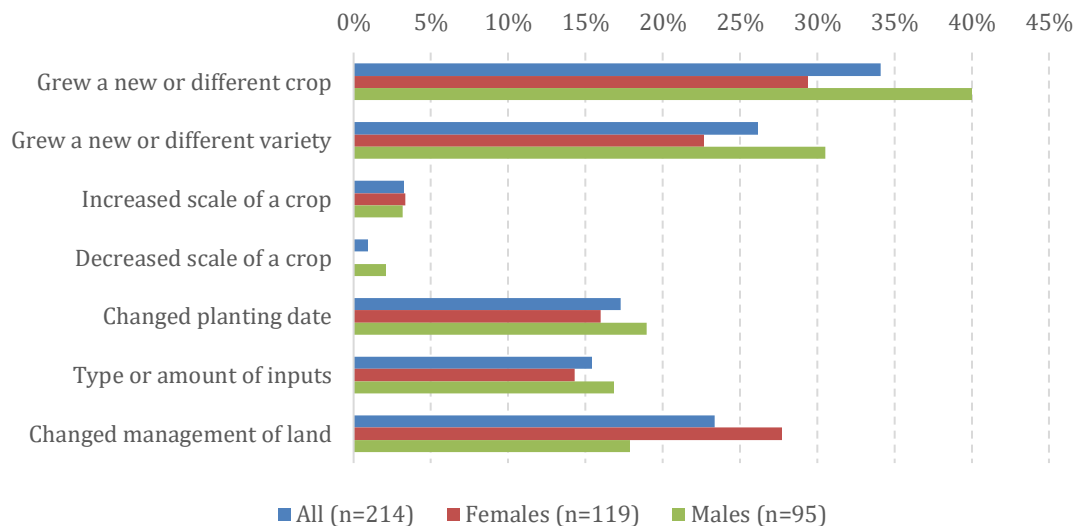


Figure 5: Types of changes in crop enterprises split by gender

When considered by wealth (figure 6) there was little difference between the different changes – though the least wealthy (PPI1, 22%) were less likely to grow a new crop when compared to those in PPI group 3 (46%; $p = 0.01$) and the wealthiest category (PPI4, 9%) made fewer changes to the planting date than their peers in PPI group 2 (23%; $p = 0.05$).

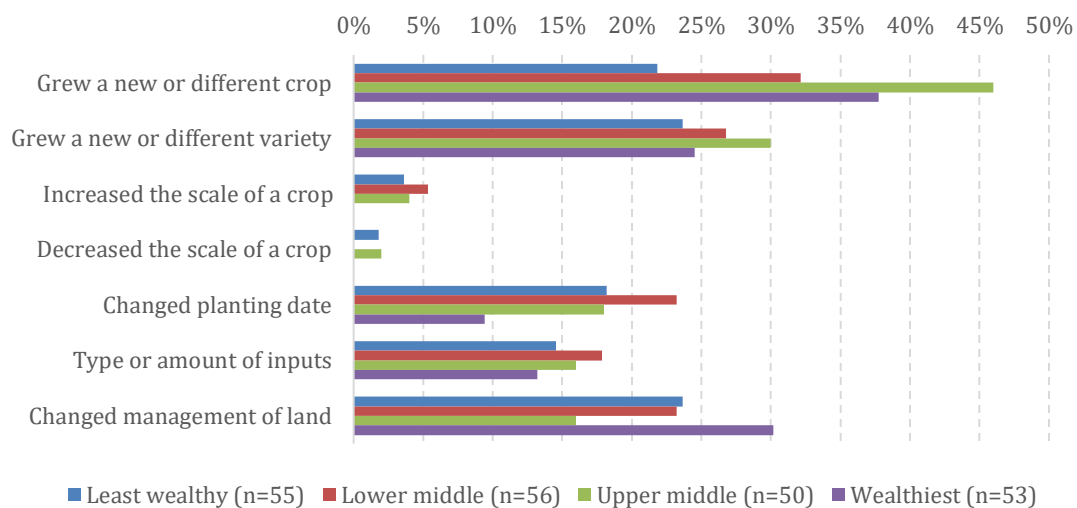


Figure 6: Types of changes in crop enterprises split by wealth

Of the 73 respondents that tried a new crop (table 7) the most popular were bush beans (34%), maize (32%) and Irish potatoes (15%).

Table 7: New crops respondents reported trying as a result of the training

Crop	Proportion of respondents trying a
------	------------------------------------

new crop (n=73)	
Cassava	1%
Soya beans	5%
Maize	32%
Tomatoes	3%
Irish potato	15%
Bush beans	34%
Climbing beans	3%
Wheat	10%
Bananas	1%
Cabbages	1%

56 respondents had decided to try a new variety of crops they were already growing following the PICSA training. The most popular of these (table 8) were maize (45%) and climbing beans (41%).

Table 8: New varieties of crop that respondents reported trying as a result of the training

Crop	Proportion of respondents trying a new variety (n=56)
Cassava	2%
Maize	45%
Irish potato	13%
Bush beans	16%
Climbing beans	41%
Wheat	2%
Bananas	2%
Mango	2%

As shown in figure 6, above, 37 respondents made the decision to change the date that they planted their crops following the PICSA training. All of these respondents made the decision to move their planting date earlier rather than later. The impact of the decisions to plant earlier were mostly positive with 84% of respondents stating that it led to them increasing their yield and a further 5% increasing their income. There were two respondents (5%) who recorded a decreased yield and 2 (5%) that felt there was no impact from their decision.

15% of respondents (33) stated that they changed the type or amount of inputs in their crops as a result of the training that they attended. The most popular change in inputs was

for an increase in the amount of fertiliser (see figure 7). Also popular was decreasing the amount of seed used for specific crops and the use of compost. 'Other' changes included adopting mono-cropping and mixing fertiliser with manure.

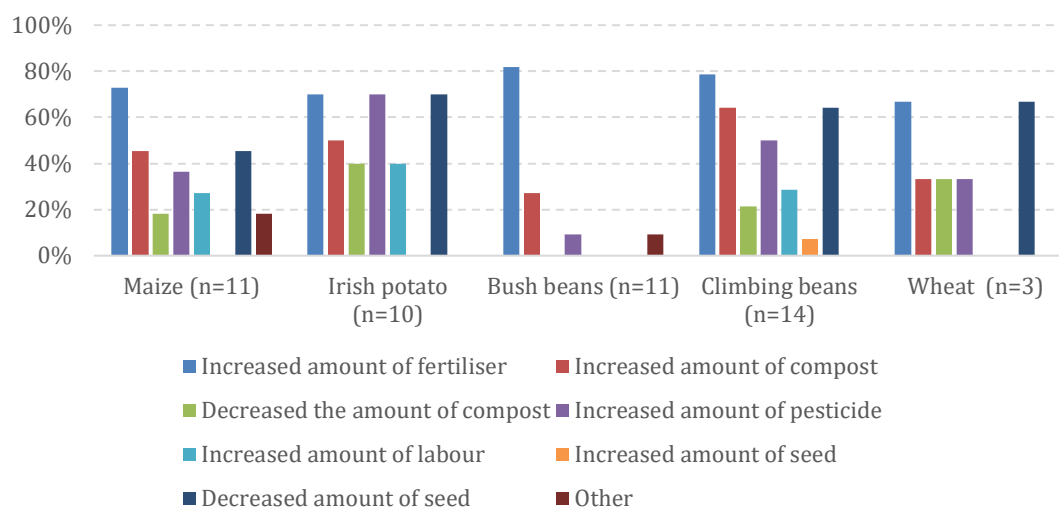


Figure 7: Changes in inputs for crops

4.4 Types of changes respondents are making in their livestock enterprises following the PICSA training

A quarter of respondents had made changes in their livestock enterprises. The most popular change was starting a new livestock enterprise (14%) (figure 8). A small proportion of respondents (6%) increased the scale and / or changed management of a livestock enterprise (4%).

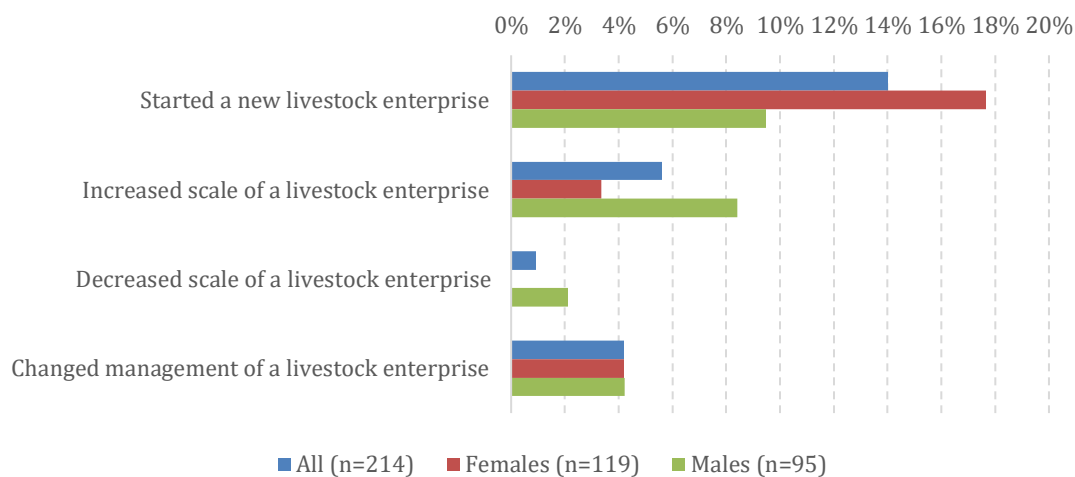


Figure 8: Changes in livestock enterprise - split by gender

A total of 30 respondents had started a new livestock enterprise. The most popular new livestock were cattle and pigs (see table 9). A third of respondents that tried a new livestock enterprise had started with one cow. More than a quarter of those who had tried a new livestock enterprise had started to keep pigs (27%) and the next most popular new livestock were goats (23%) and chicken for eggs (17%).

Table 9: Respondents trying a new livestock enterprise

Livestock	Respondents (n=30)	Average scale	Scale range
Cattle	33%	1	1
Sheep	10%	2.67	1-4
Goats	23%	2.42	1-6
Pigs	27%	1.88	1-7
Chicken for meat	3%	4	4
Chicken for eggs	17%	4.8	1-10
Guinea fowl	3%	4	4
Guinea pigs	0%	N/A	N/A
Rabbits	13%	6.75	2-10
Duck	0%	N/A	N/A

12 respondents had increased the scale of a livestock enterprise that they already had (table 10). The most popular livestock enterprise that respondents looked to increase in scale were goat enterprises (58%).

Table 10: Respondents increasing the scale of a livestock enterprise

	Respondents (n=12)	Average increase in scale
Cattle	17%	1
Sheep	17%	2
Goats	58%	2.1
Pigs	17%	1.5
Chicken for meat	8%	17
Chicken for eggs	8%	6
Rabbits	8%	5

Respondents were asked what the impact of the increased scale had been. They discussed the increase in manure for their crops as a positive impact, increased income from sale of animals and better nutrition for their family.

4.5 Types of changes respondents are making in their livelihood enterprises following the PICSA training

Changes in livelihood enterprises were the least likely amongst respondents (17%). A larger proportion of men reported they had made a change in their livelihood enterprises (23% v 12%; $p = 0.03$).

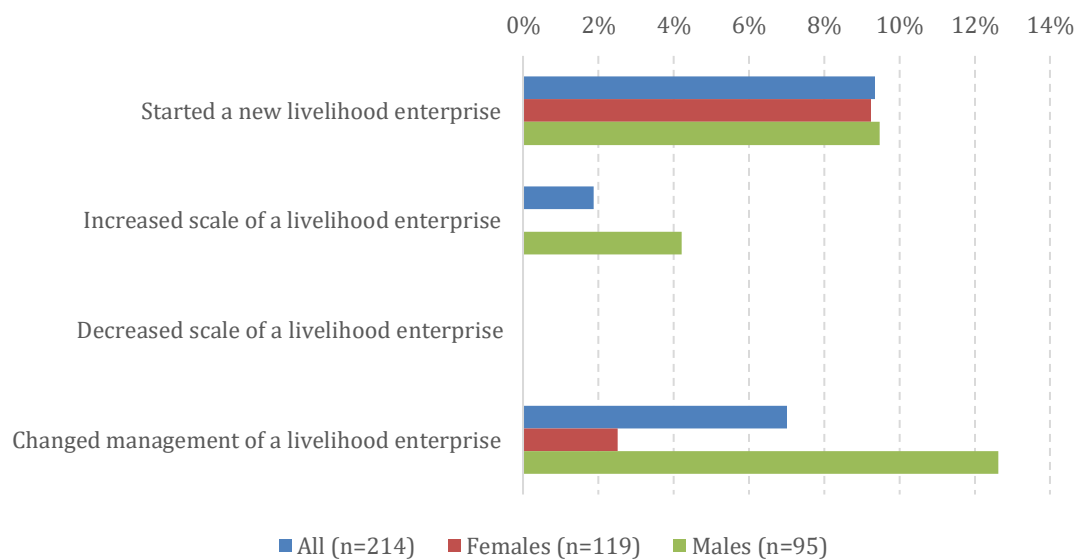


Figure 9: Changes in livelihood enterprises – split by gender

Figure 12 shows that men and women were equally as likely to start a new livelihood enterprise (9%) whilst a larger proportion of men (13%) changed the management of a livelihood enterprise than women (3%; $p = 0.01$).

The majority of those that started a new livelihood enterprise (figure 10) had started food crop selling (65%).

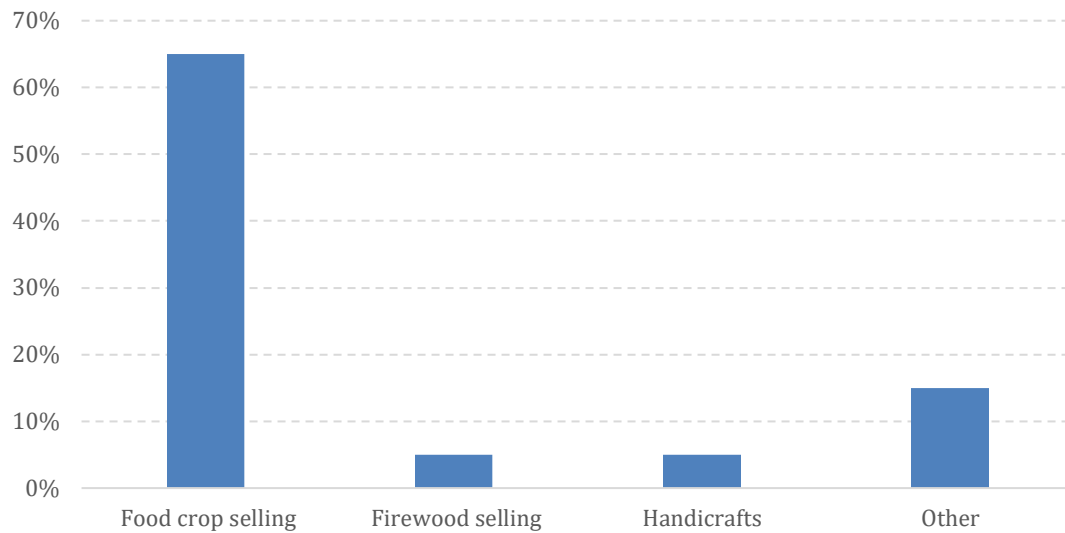


Figure 3: Respondents starting a new livelihood enterprise (n=20)

4.6 Would respondents have liked to have made more changes in their enterprises?

Most of the respondents in the survey stated that they would have liked to have made more changes in their crop, livestock or livelihood enterprises following the training.

The majority of respondents (71%) stated that they would have liked to have made more changes in their crop enterprises. 42% of respondents would like to have made more changes in livestock enterprises and a similar proportion of respondents (43%) would like to have made more changes in their livelihood enterprises.

The reasons that respondents gave for not being able to make the changes they would like differed between the different enterprises that farmers practised. Respondents who stated that they would like to have made more changes in their livestock and livelihood enterprises overwhelmingly put the reason that they were unable to make the change down to a lack of money (livestock: 91%; livelihoods: 93%). For crops, the picture was more varied. While the most prominent reason for respondents being unable to make changes was still a lack of money (54%) there were also a substantial number of respondents that gave a lack of land (43%), limited access to inputs and resources (21%) and high risk of an unfavourable season (11%).

4.7 What are the effects of PICSA training and decisions made on farmers and their households?

The effects of the PICSA training and the subsequent changes made by farmers were assessed, in part, through a series of Likert style statements (figure 12). The majority of respondents reported that the decisions they had taken because of the training had improved their household food security (85%), income (81%), helped them to better provide for their household's healthcare (84%) and more easily pay for their children's school fees (75%). Larger proportions of men reported increased food security than women (91% v 81%; $p = 0.04$); improved income (87% v 76%; $p = 0.03$); and pay school fees (83% v 68%; $p = 0.01$).

Lower proportions of the least wealthy PPI group 1 reported that they were able to more easily pay for their children's school fees than those in PPI groups 2 (62% v 79%; $p = 0.05$) and 3 (62% v 84%; $p = 0.01$); and also that they were able to better provide for their families healthcare than those in PPI groups 2 (71% v 91%; $p = 0.01$) and 4 (71% v 87%; $p = 0.04$).

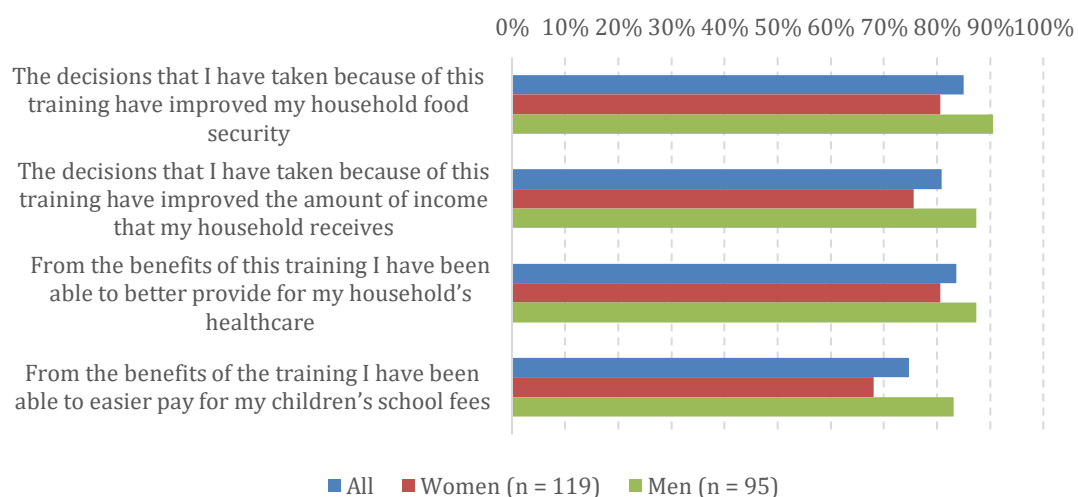


Figure 4: Likert statements considering effect on income and food security

The survey provided the opportunity for respondents to expand briefly on the impact of the changes that they had made in their crops, livestock and livelihoods.

4.7.1 Crops

There were a wide range of impacts that respondents described from their changes in crop enterprises. A lot of the impacts stemmed from the increased yields that respondents explained had resulted from the changes that they had made. The increased yields had resulted in respondents seeing increased income as they had been able to sell some or more

of their produce; increased food security as they were able to feed their family for longer periods / the whole year. The increased income that respondents had recorded had been used to help pay for school fees for family members and to pay for medical insurance (Mutuel de Sante) and also to invest in farming through buying or renting land for further cultivation, buying livestock (cattle, pigs, goats, sheep and chickens) and investing in more seeds. Other respondents talked about investing increased income in houses, land, bicycles, setting up electricity to their homestead, televisions, buying solar lamps and setting up a boutique.

4.7.2 Livestock

Respondents also mentioned a range of positive impacts from the changes they had made in their livestock enterprises. Interestingly a large number of respondents flagged the impact of their livestock changes on their crop enterprises, saying that the use of manure from their livestock enterprises was increasing their crop production. The direct impact on livestock enterprises were increased income and the increase of milk, meat or eggs for their children (food security). Medical insurance and school fees were also supported due to the changes respondents had made.

4.7.3 Livelihoods

Livelihood changes had also led to positive impacts for respondents. The most mentioned impact was improved food security and the increased ability to pay for medical insurance. Some respondents that had made changes in their livelihood enterprises had used the benefits to invest in new land, new livestock and also paid their children's school fees.

4.8 Effects of PICSA training on respondents' attitudes to farming and their social standing

Likert statements were used to investigate changes in respondents' attitudes to farming as a result of the training and the decisions they made (figure 11). Almost all respondents reported that they were now more confident in planning and making decisions about their farming and livelihoods (96%); that they thought more strategically about their farming and saw it 'more as a business' (96%); and that they are now more prepared to cope with bad seasons caused by the weather (93%). Larger proportions of men reported viewing farming as more of a business than women (99% v 93%; $p = 0.04$). A smaller proportion of PPI group

1 reported viewing farming as more of a business than those in PPI group 2 (93% v 100%; p = 0.04).

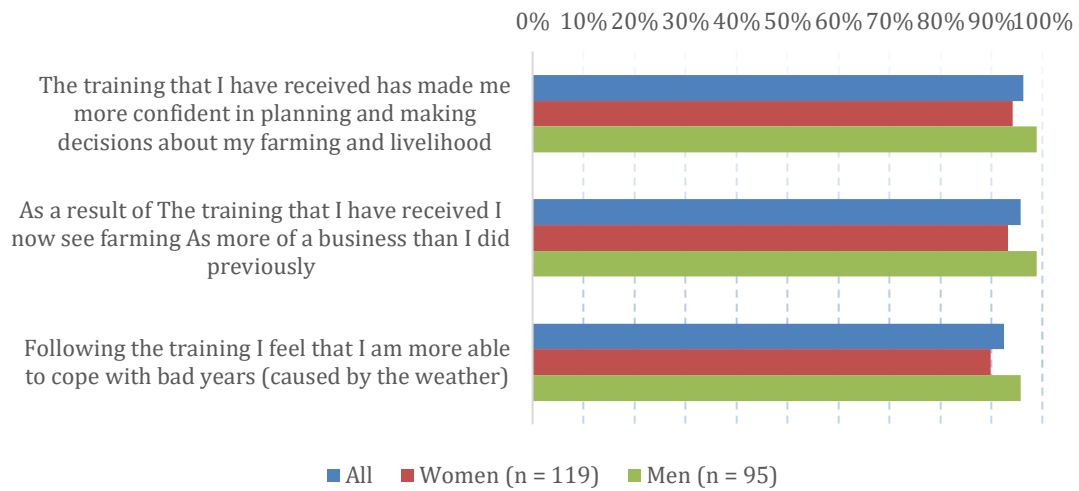


Figure 5: Likert statements considering effect on farmer attitudes

We also investigated the impact on the social status of respondents (Figure 14).

Respondents overwhelmingly reported that as a result of the training and the decisions they had made their social status had improved both within their own household (93%) and in their local community (93%) and that they are, prior to the training, more confident to discuss farming and other livelihoods with their fellow farmers (96%). A larger proportion of men reported each of these when compared to women (all to a 5% significance level). With regards to wealth, a larger proportion of those in the wealthiest group (PPI4, 96%) reported improved social status both within their household and within their community (both 96%) than those in PPI group 1 (both 85%; p = 0.05).

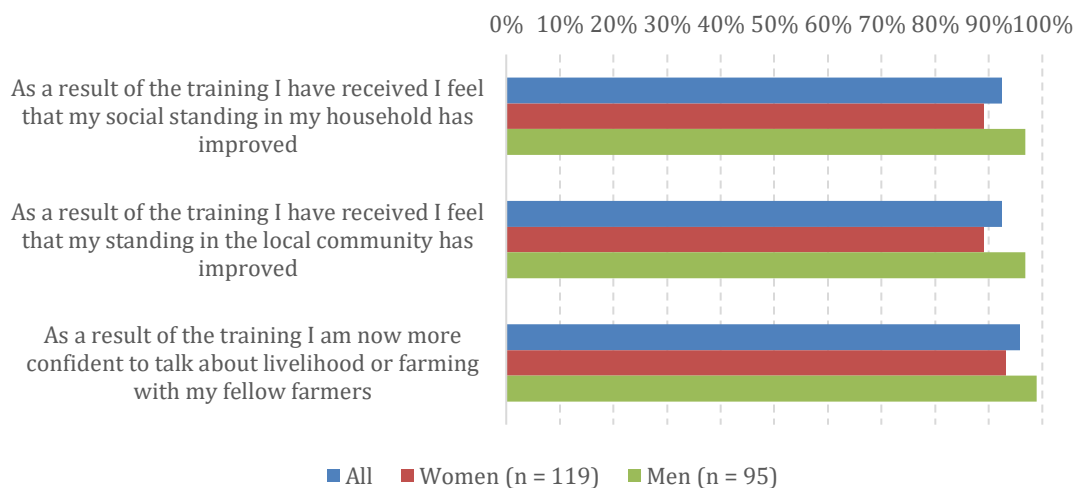


Figure 6: Likert statements considering effect on farmer's social status

4.9 Are farmers sharing the information that they have learnt in the PICSA training?

Most of the respondents in the survey had shared the information that they had learnt in the PICSA trainings with their fellow farmers (outside of the training and their household). A larger proportion of men (97%) shared information with their peers than women (86%; $p = 0.01$), though women were clearly still very likely to share the information / tools with their peers. There were no statistically significant differences when wealth groups were considered.

Men were sharing with an average of 15 farmers and women an average of 10 farmers. When combined each respondent was sharing with an average of 13 farmers.

5. Conclusions

This evaluation of the first implementation of PICSA in Rwanda shows that most of the farmers were trained on the PICSA elements and that they understood them. Farmers reported that they would have appreciated training earlier ahead of the season to allow more time for planning and making changes. The overwhelming majority of farmers made changes in their farming or other livelihood activities as a result of PICSA training which shows that it stimulated innovation within the farming communities targeted. As a result of the changes farmers made, they reported improved income and food security and responses to Likert statements provided evidence that training had influenced attitudes to farming and improved farmers' confidence and social status.

The results of this evaluation provide evidence that the PICSA approach has been effective at scale across the first four districts in Rwanda. As the project scales the approach over the remaining districts in Rwanda it is vital to maintain quality in training and implementation. The success evidenced in this report stems from PICSA being an integrated approach that enables farmers to assess their own individual farming systems and to evaluate and plan appropriate options in the context of their local climate and weather.

References

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