As per the COOPCUMA report, this cooperative cultivates 50 hectares of maize. The authors employed annual data on maize production as illustrated in Figure 2 and 3. The results on maize production between 2015 and 2017 showed that the production of maize was stable in 2015 and 2016 at 1.5 tons per hectare. And the year 2017 recorded increasing production at 7.5 tons per hectare. Hence, between 2015 and 2017, 16.5 tons were harvested per ha which implied that within 50 hectares occupied by COOPCUMA Cooperative, a total of 825 tons of maize were harvested within 50 hectares across three years (2015-2017).

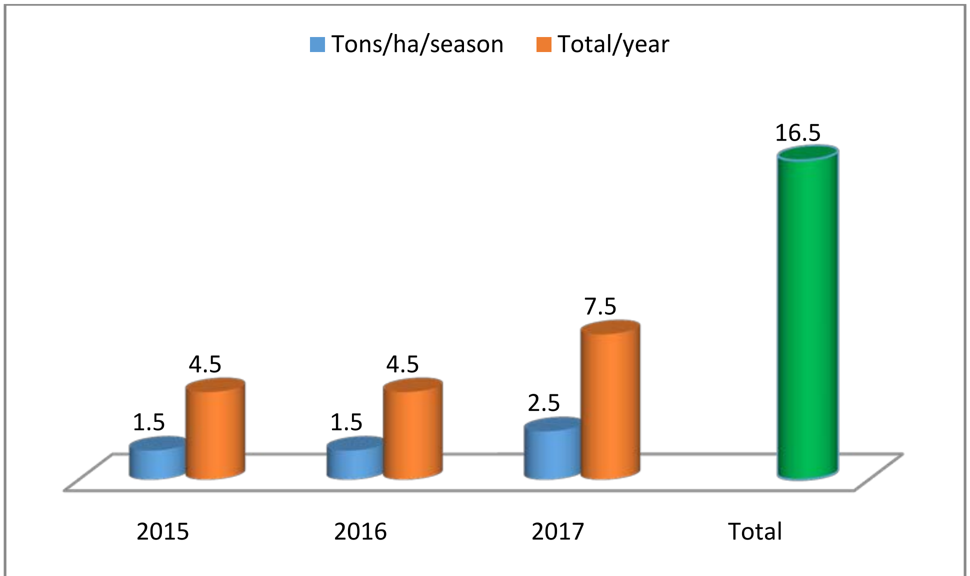

Figure 2: Maize production between 2015 and 2017

Source: COOPCUMA, 2022

In addition, as the authors aimed to analyze maize production after applying meteorological information shared with farmers, the results in Figure 3 were related to the recorded maize production. The research finding sin Figure 3 revealed a growing trend of maize production from 2018 and 2020 when COOPCUMA cooperative members were growing maize by referring to the meteorological information shared with them. In 2018, 15 tons were harvested per hectare which increased up to 27.5 tons of maize per hectare in 2020. The total production recorded between 2018 and 2020 was 63.5 tons per hectare equivalent to 3,175 tons per 50 hectares owned by the COOPCUMA cooperative (Figure 3).

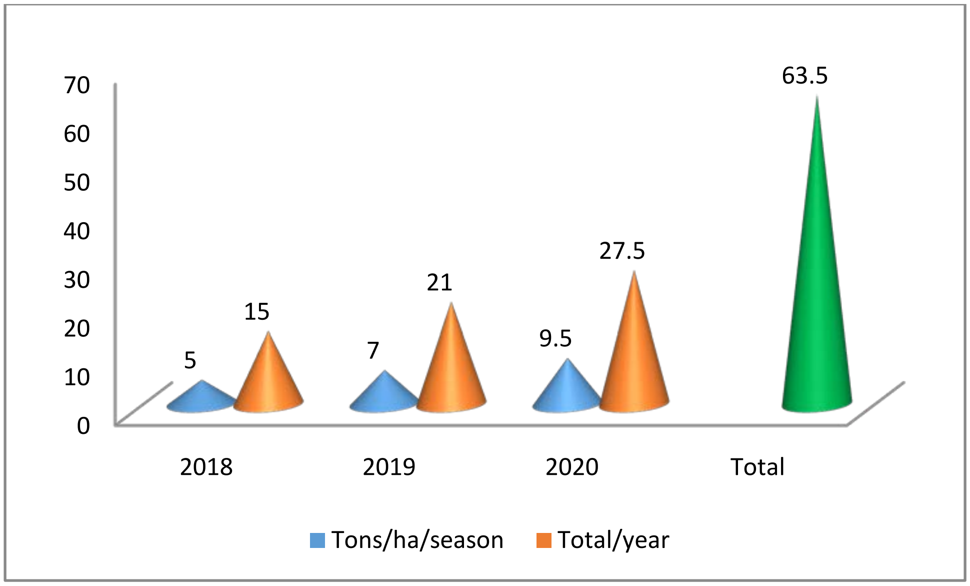

Figure 3: Maize production between 2018 and 2020

Source: COOPCUMA, 2022

3.3 Impact of meteorological information delivery on maize production

Based on the results on both maize productions recorded before (2015-2017) and after (2018-2020) meteorological information to farmers, it is evident that the maize production increased distinctively after farmers received and applied the shared information within their maize growing practices. Although for maize production several factors are considered including soil types, seeds types, fertilizer and many more, only the authors limited the focus on meteorological information by considering other factors as constant.

Therefore, the authors based on the above facts and then conducted a Pearson analysis test in order to examine the extent to which meteorological information sharing contributed to maize production at COOPCUMA cooperative as detailed in the following Tables 2 and 3. In order to better assess the impact of meteorological information sharing on maize crop production, the researcher consider the values of coefficient r suggested in Table 2.

Table 2: Pearson correlation analysis guideline

	Coefficient, *r*	
Strength of Association	Positive	Negative
Small	.1 to .3	-0.1 to -0.3
Medium	.3 to .5	-0.3 to -0.5
Large	.5 to 1.0	-0.5 to -1.0

For the current study, the Pearson Correlation analysis between the meteorological information sharing and maize production, the estimated P value was 0.968. This was value was considered as largely positive and/or very strongly statistically significant relationship between meteorological information sharing and maize production.

Table 3: Pearson correlation results

		Information usage	Maize production
Information usage	Pearson Correlation	1	.968
	Sig. (2-tailed)		.162
	N	3	3
Maize production	Pearson Correlation	.968	1
	Sig. (2-tailed)	.162	
	N	3	3

4. Discussion

The changing climate is gradually increasing its negative impacts on food security and the poor and developing countries are the largely affected among others. This results from the fact that agriculture as a major source of food employing high number of people in these countries but depending on climate and also exposed to extreme weather events that lead to a reduction in agricultural production worldwide (Pachauri et al., 2014).

It is reported that the impact of climate variability in agriculture mainly is observed either by increased water demand or reduced water availability in the areas suitable for irrigation (IPCC, 2014).

Across the Sub-Saharan African region where Rwanda is located, the agricultural practices count nearly 96% of rain fed agriculture compared to overall production. However, the region is also facing the effects of climate change which weaken agricultural productivity by causing a series of extreme weather events that require high adaptation cost especially in developing countries

(Pachauri et al., 2014). This is nowadays recognized and agriculture is receiving more attention worldwide in terms of adapting to the negative impacts in order to meet the needs of poor people who depend directly on agriculture for food (Connolly-Boutin and Smit, 2016).

This study was conducted to analyze the impact of timely sharing meteorological information with farmers on their maize production. The results indicate a growing trend of maize production after farmers started working with the framework. The results of 2015-2017 (Table 1) were also increase but not as that of 2018-2020 (Table 2) when CIAT approached farmers and share with them meteorological information. The results on this study are supported by the recent reports (Chenglin et al., 2018; Mukabutera et al., 2016; Tarnavsky et al., 2014) which state the importance of updating farmers in terms of weather variability and climate change, especially those in poor and developing countries who are still depending on rainfall in order to plan when to sow and/or practice other farming practices.

In most cases, meteorological information is shared through radio and televisions; however, as long as mobile phones of farmers are receiving such alert (Table 1) on daily basis, it is a good option to ensure changes on crop production. Furthermore, the analyzed Pearson correlation (Table 3) generated a positive P value (higher than 0.5) which undoubtedly confirms how much sharing meteorological information with farmers can contribute to their crop production. Finally, despite the fact that the consulted cooperative grows maize, it can be suggested to expand the program to other farming cooperatives engaged in growing other crops and livestock as well.

5. Conclusion

This study aimed to analyze the extent to which sharing meteorological information with farmers contributed to increasing their maize production. The authors considered the case of Cooperative de Cultivateurs de Mais (COOPCUMA) located in Gatsibo district of the Eastern Rwanda. The results indicate that before meteorological information was shared with farmers and used as well, maize production was quite low. The highest production was 2.5 tons per hectare while after the information was shared with farmers, significant changes in terms of maize production were recorded. It was noticed that between 2018 and 2020 during the period when meteorological information was shared, the lowest production per hectare was 5tons/ha but higher than the last production registered before sharing the information (2015-2017) with farmers. In addition, the statistical relationship between meteorological information sharing and maize production generate a very high P value of 0.9 which confirms how much such information sharing to farmers contributes to production. The results of this study greatly confirm that m sharing meteorological information has an impact on the production of maize. Policy makers can benefit from this research as well as local communities.

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