Impact of policy on food security in Africa: pathway to achieve rice self-sufficiency in Sub-Saharan Africa by 2030

A. Arouna[1,*], I. Fatognon[1], K. Saito[1], F. Koichi[1], H. Roy-Macauley[1], E. Duveiller[1],

[1]Africa Rice Center (AfricaRice), 01 BP: 2551 Bouaké 01, Côte d'Ivoire.

[*]Corresponding author: a.arouna@cgiar.org

Introduction

Rice is an important staple crop that plays a significant economic role and feeds approximately half the world's population (Fahad et al., 2019). In sub-Saharan Africa (SSA), rice consumption is higher than production. With the 2007-2008 food crisis, there was a threefold increase of the world price of rice within few weeks. Therefore, in sub-Saharan Africa (SSA) policy makers and international communities decided to strengthen rice sector in Africa. The Coalition for African Rice Development (CARD) was initiated as policy framework with the aim of doubling rice production in SSA over the period from 2008-2018.

This paper aims to assess the contribution of the CARD to rice production over the period 2008-2018 and forecast local rice supply and demand to provide a better understanding of the policy measures necessary to achieve rice self-sufficiency by 2030.in line with the Sustainable Development Goals (SDGs).

Methodology

❖ Study area and data

- 23 participants countries in CARD phase 1 (Fig 1.)
- Data used are tme series rice statistics from USDA and FAOSTAT

❖ Data analysis

Fig.1. Africa map with CARD participating countries

To assess the achievements of the CARD policy objective:
- Trends in rice yield, area and production from 2008 to 2018 were calculated.

- The growth rates of the decades before and after the 2007-2008 food crisis (1996-2007 and 2008-2018) were also computed and analyzed.

To quantify the impact or net effect of the CARD on rice production statistics (production, yield and area):
- A combination of the Autoregressive Integrated Moving Average method and counterfactual approach was used to analyze data on rice statistics from 23 countries in SSA.
- The counterfactual situation represents the status of a country had it not participated in the CARD. However, the availability of counterfactual data to estimate the effect of an intervention is often the most challenging part of impact analysis. We employed the ARIMA model, which is a time series model to forecast the future and to predict the counterfactual values (Wang et al., 2018).
- Yield, area and production impact are estimated as follows, respectively:

$$\nabla A_{It} = A_{ob,t} - A_{cf,t} \quad\quad (1)$$
$$\nabla Y_{It} = Y_{ob,t} - Y_{cf,t} \quad\quad (2)$$
$$\nabla P = A_{ob} * \nabla Y + (Y_{cf} * \nabla A) \quad\quad (3)$$

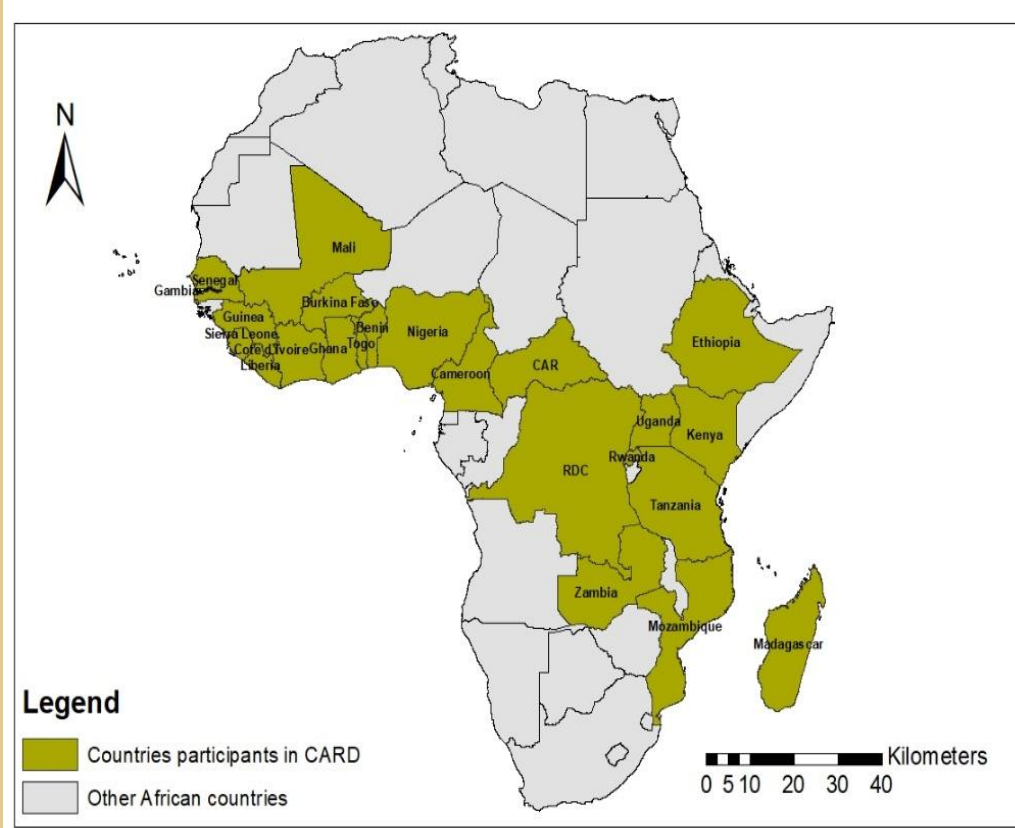$A_{ob,t}$ and $Y_{ob,t}$ are the observed values and $A_{cf,t}$ and $Y_{cf,t}$ are the counterfactual

References

Fahad, S., Adnan, M., Noor, M., et al., 2019. Major constraints for global rice production, in: Hasanuzzaman, M., Fujita, M., Nahar, K., Biswas, J.K. (Eds.), Advances in Rice Research for Abiotic Stress Tolerance. Elsevier, Cambridge, UK, pp. 1–22.

Wang, Q., Li, S., Li, R., 2018. China's dependency on foreign oil will exceed 80% by 2030: developing a novel NMGM-ARIMA to forecast China's foreign oil dependence from two dimensions. Energy 163, 151–167.

Results

- Rice production increased faster during the decade of the implementation of the CARD than during the decade before (Fig. 2 and 3).
- During the CARD period (2008-2018), rice production, harvested area and yield increased by 103%, 60% and 27%, respectively.
- The yield growth rate after 2008 was not sustainable. The yield trend can be divided into two periods after 2008. From 2008-2012, the yield increased by 1.47% annually. From 2012-2018, the increase was 1.19% annually (Fig. 4).
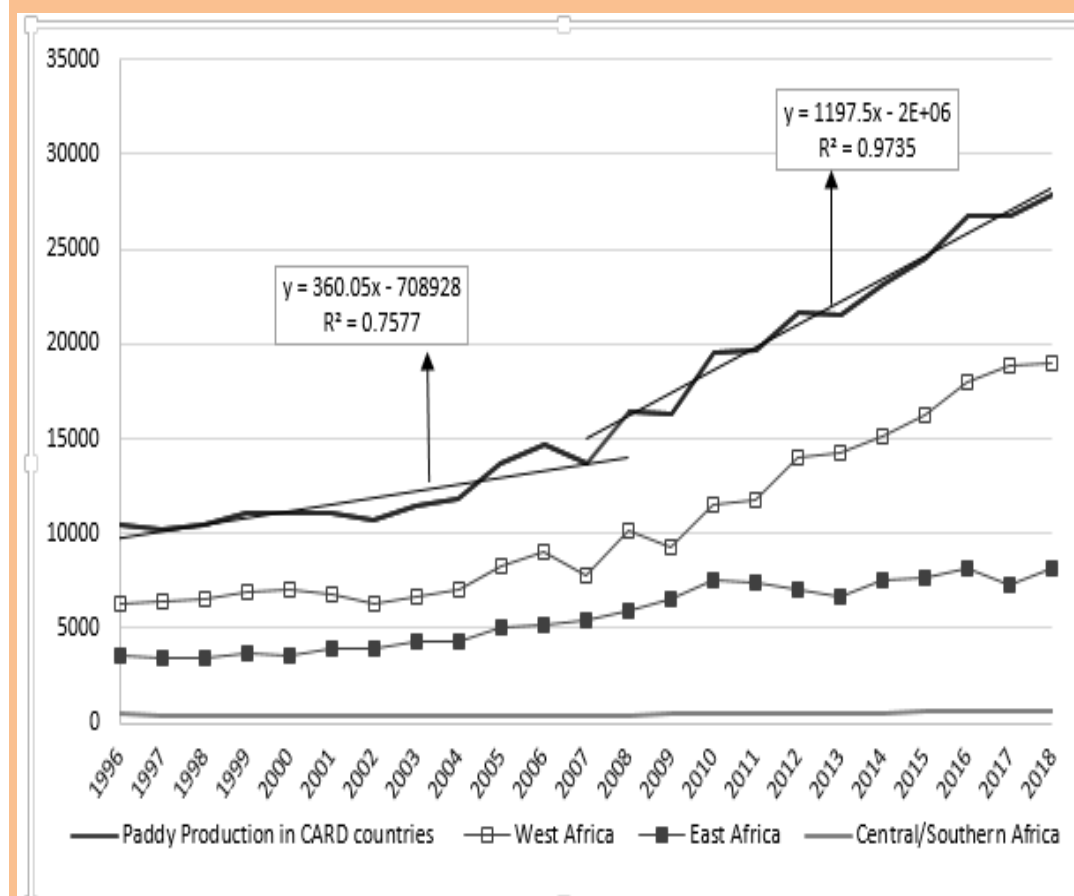

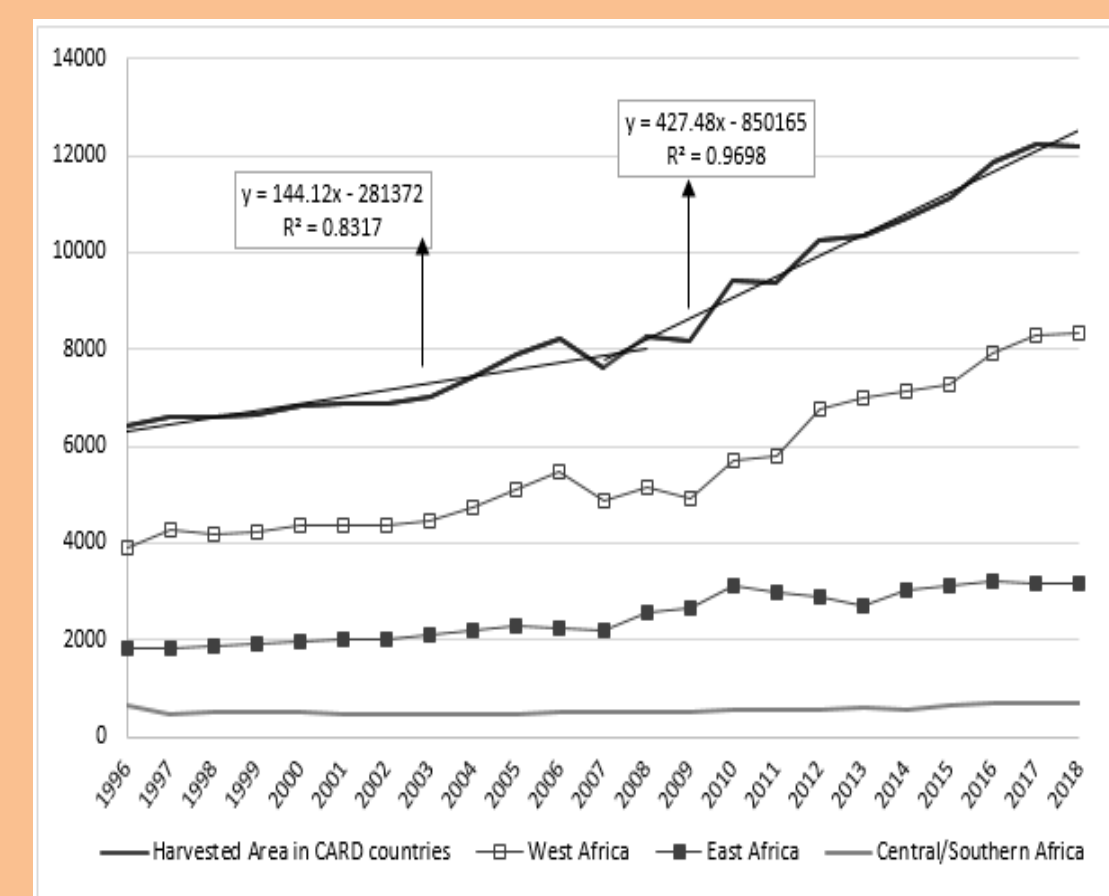**Fig.2.** Trend in paddy production in the CARD countries (1000 tons)

Fig. 3. Trend in rice harvested area in the CARD countries (1000 ha)

❖ Impact of CARD on production:

- The rice production in the 23 participating countries was 27.9 MT in 2018 but the production would have been 17.6 MT without CARD (Fig. 5). Therefore, the contribution of the CARD in 2018 was 10.2 MT of paddy compare to a target of 14 MT, representing a real achievement of 74%.
- Impact varied between countries. Countries were categorized into four groups (Fig. 6).
- Investments on supply-push factors such as fertilizer and irrigation development have less effect on the rice production
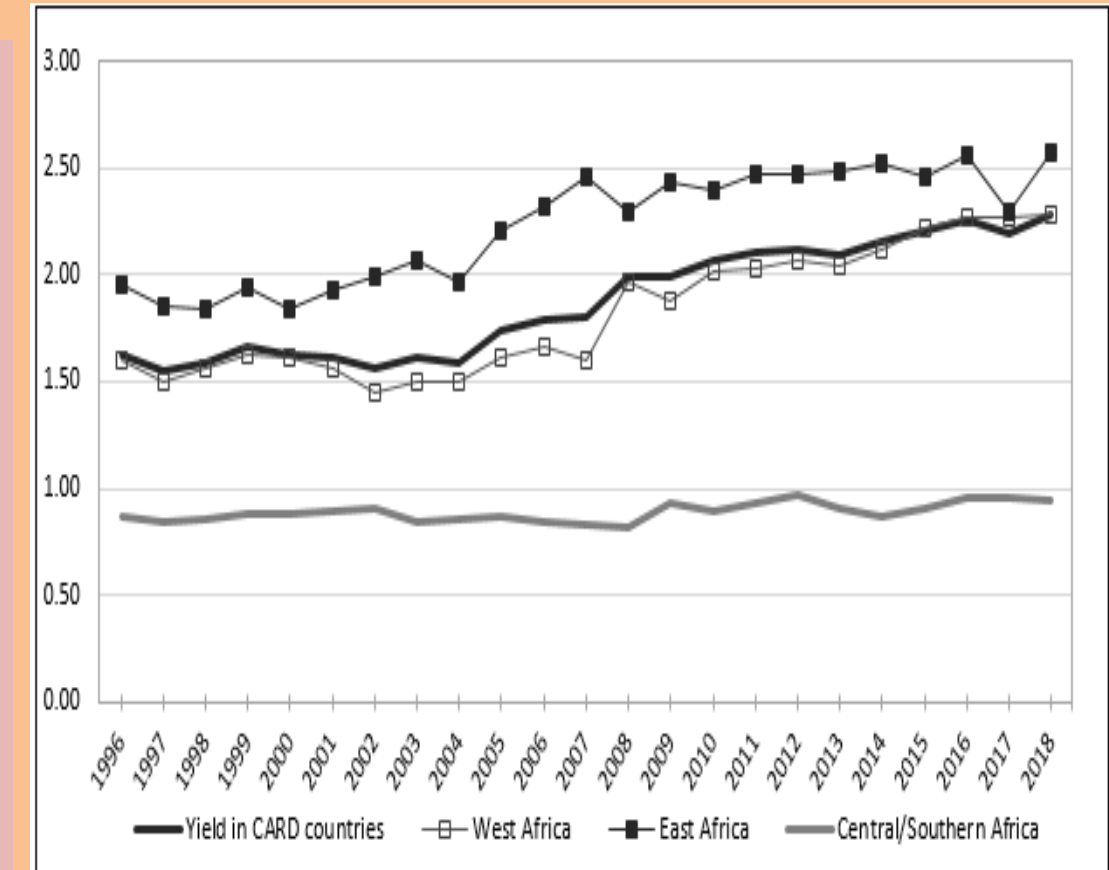

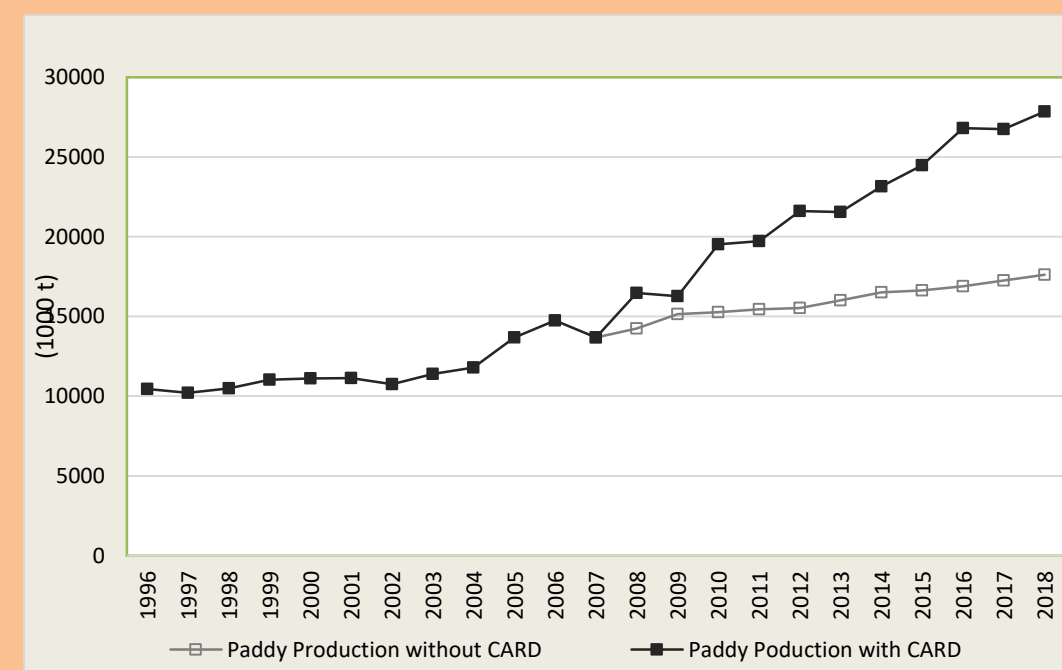**Fig. 4.** Trend in rice yield in the CARD countries (t/ha)

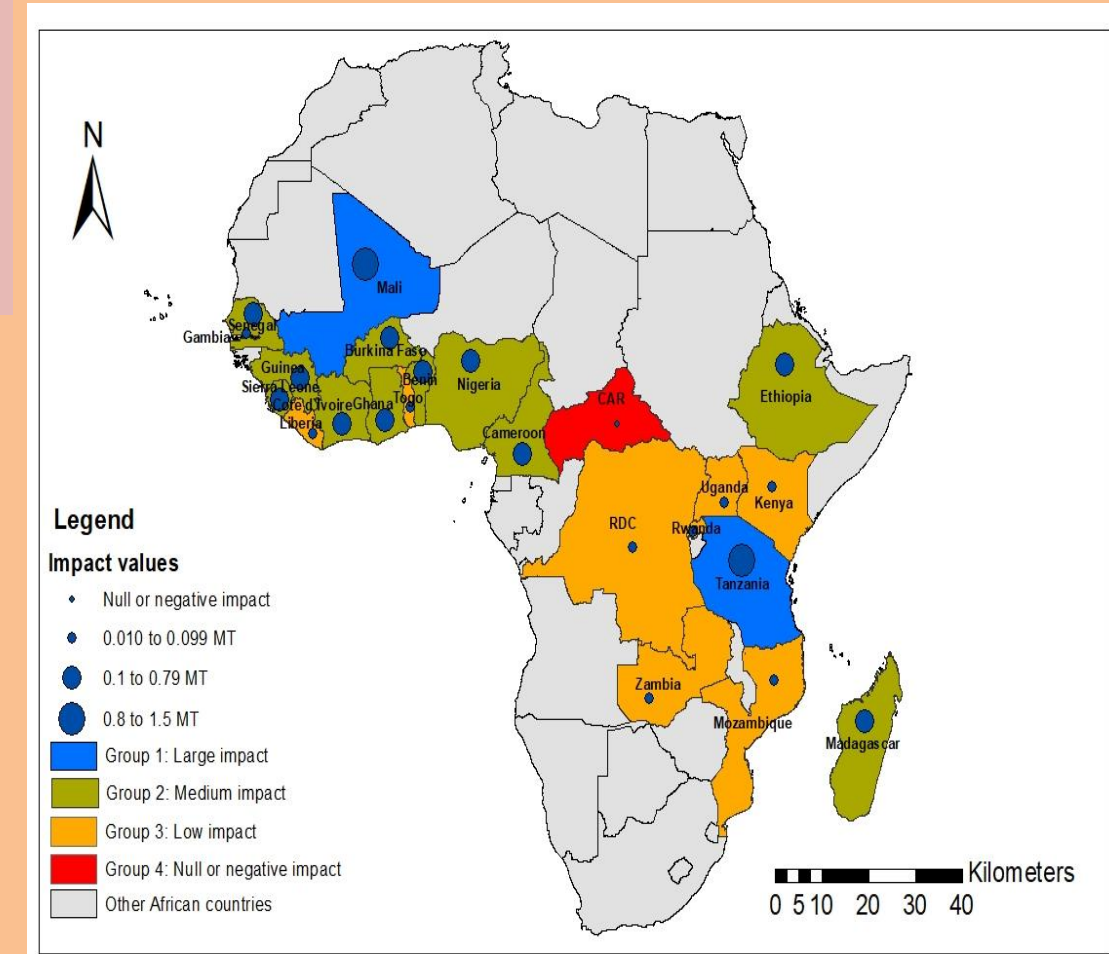**Fig. 5.** Comparison of paddy production with the CARD and the counterfactual scenario

Fig. 6. Grouping of countries based on CARD Impact on production

Conclusion

- The impact assessment of the CARD showed that, over the period of implementation, 74% of the objective of doubling rice production in 2018 was achieved.
- Sustainable investments on demand-pull factors such as private-led modern milling sector and contract farming development should be prioritized for future action to achieve rice self-sufficiency in SSA.