This study analyses the trade-offs between welfare (measured by income) and greenhouse gas (GHG) emissions using a farm-level optimization model that incorporates the predominant cereal (sorghum), legumes (groundnut, soybeans), livestock (cattle, goats and sheep) and trees (locust-bean, camel’s foot) representative of production systems at two contrasting sites in northern Nigeria. The optimization model maximizes value of total farm production subject to constraints on GHG reductions of 10%, 25% and the maximum allowable reductions of 26 and 30%. Substantive reductions in livestock and legume production would be required to achieve the maximum possible reductions from current emissions and would reduce household income by 22 and 44%, respectively.

There were no win-win opportunities of increased income and reduced GHG emissions using current production technologies, which further suggests the need for further research on productivity-enhancing-technologies that could enhance income and reduce emissions in this production context.

Methods

Three Focus Group Discussion (FGD) as Participatory Rural Appraisal (PRA) were used to provide an overview of the production systems.

The 1st group included 17 and 11 adult male farmers only, from 24 years and above.

The 2nd group were made up of 10 & 11 adult female farmers only with similar age group with the male counterpart.

3rd group comprised of 12 & 11 young male & female farmers within of 18 – 24 years of which 5 were females.

5 farmers were randomly selected from each of the 10 & 11 wards in Bunkure & Mai-gateri, respectively.

Sample size of 90% was obtained by interviewing 50 & 55 respondents from Bunkure and Mai-gateri with the aid of questionnaires.

Results

There are few empirical studies on trade-offs between farm-level GHG emissions and welfare (Paul et al., 2017) or on the potential productivity improvements required to avert trade-offs (Tittonell, Gérard, & Erenstein, 2015). A key question is whether changes in smallholder farm-level production activities can reduce GHG emissions without negatively affecting household income. This research addresses this question for smallholder farms using crop-tree-livestock systems in northern Nigeria. The objective of this study is to assess tradeoffs in reducing Greenhouse Gas emission and income in smallholder farms of Northern Nigeria.

Conclusion

There are few empirical studies on trade-offs between farm-level GHG emissions and welfare (Paul et al., 2017) or on the potential productivity improvements required to avert trade-offs (Tittonell, Gérard, & Erenstein, 2015). A key question is whether changes in smallholder farm-level production activities can reduce GHG emissions without negatively affecting household income. This research addresses this question for smallholder farms using crop-tree-livestock systems in northern Nigeria. The objective of this study is to assess tradeoffs in reducing Greenhouse Gas emission and income in smallholder farms of Northern Nigeria.

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