

Refining Sustainability Indicators for Sugarcane Production in Sofala Province of Mozambique: A Delphi Approach

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INTRODUCTION & AIM

Sugarcane is one of the world's main crops. It is grown in more than 100 countries, representing an important source of job creation, especially in rural areas (BM, 2022). In Mozambique, the sugar sector is considered one of the most promising industries in the country, employing more than 30,000 permanent employees and seasonal workers (Jafar, 2020; O'Laughlin & Ibraimo, 2013). However, the rapid development of this industry is accompanied by the intensive use of inorganic fertilizers, herbicides, pesticides, energy and water consumption, leading to negative consequences for the environment and society (O'Laughlin & Ibraimo, 2013) compromising the sustainability of sugarcane production. To achieve sustainable development, sustainability assessment is needed to reduce the negative impacts of sugarcane to balance the economic, social and environmental aspects (Cruz et al., 2018). Although, there are still no standard indicators for the sugarcane production sustainability assessment. Furthermore identifying the suitable indicators is still a challenge (Gerbens-Leenes et al., 2003), and each related organization uses its own indicators to assess sustainability and make decisions related to implementing sustainability programs.

Thus, this paper aims to select a set of suitable and priority indicators for assessing the sustainability of sugarcane production in Sofala province, in Mozambique.

METHOD

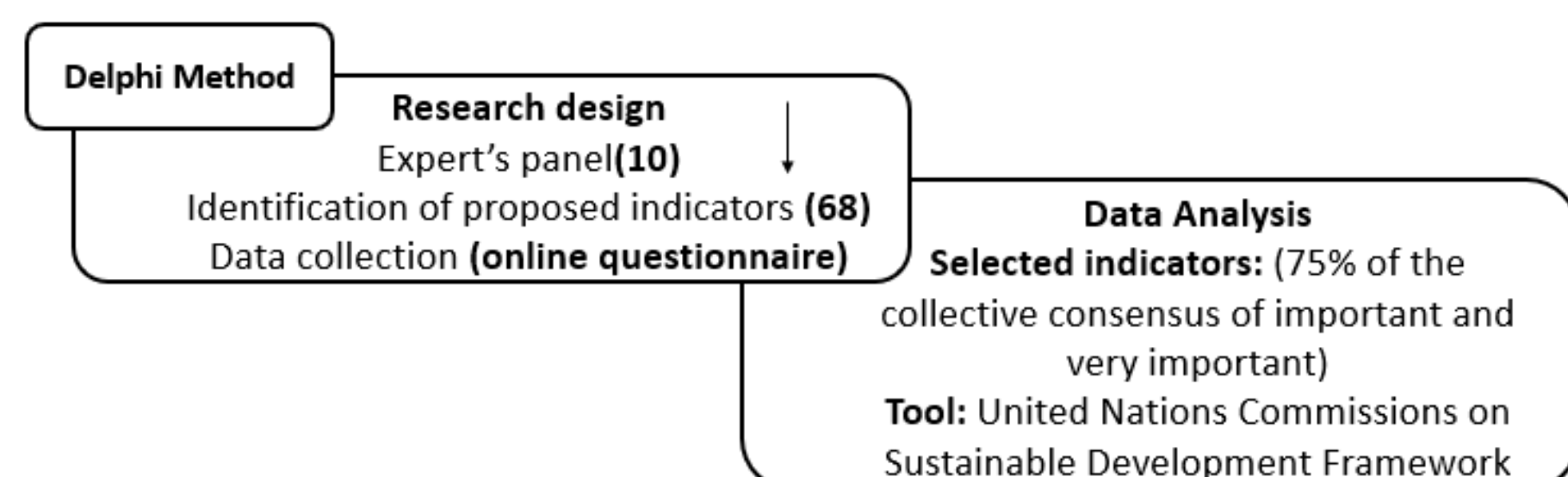


Figure 1. Methodology diagram

Source: Own elaboration

RESULTS & DISCUSSION

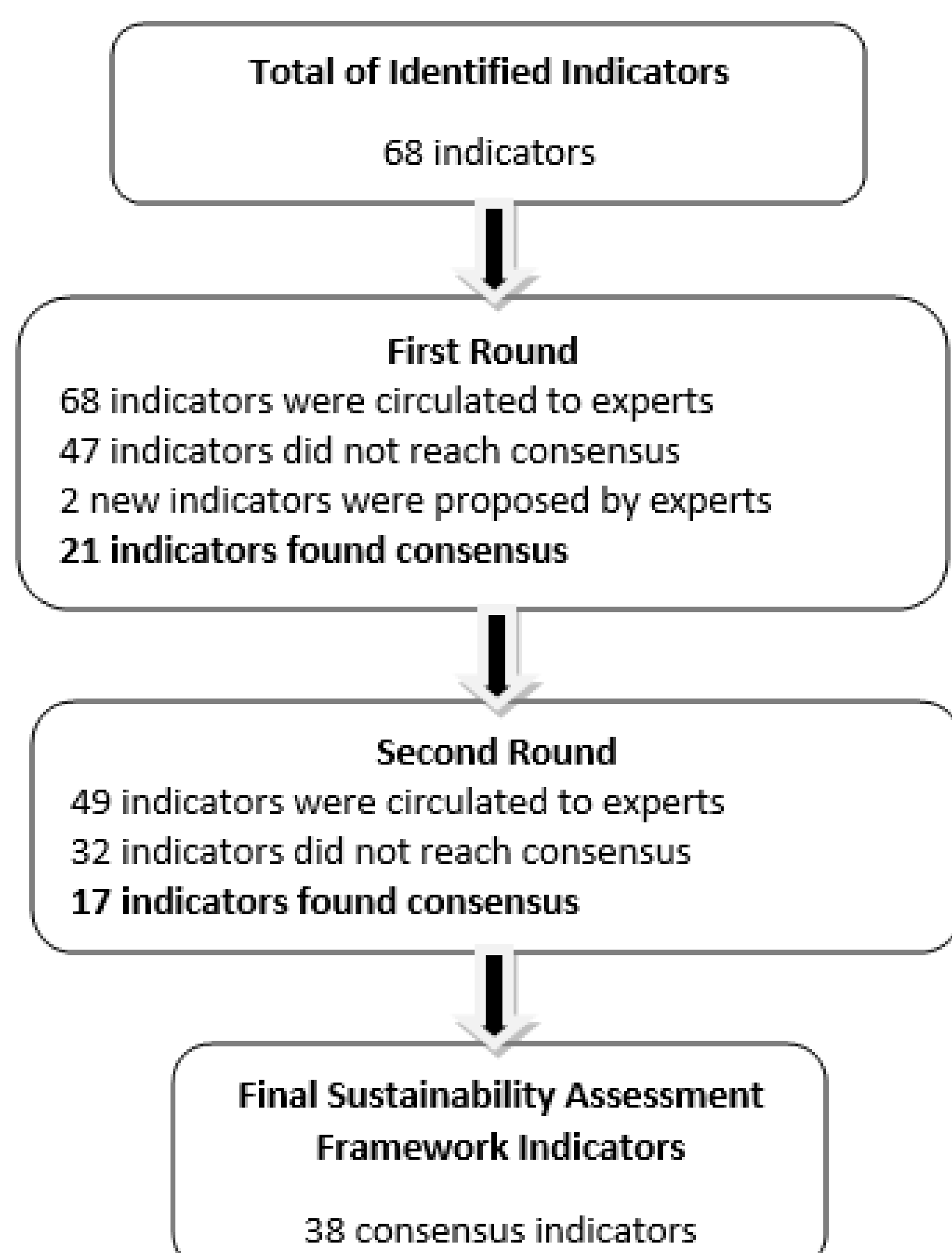


Figure 2. Modified Delphi process and the results of each round

Source: Own elaboration.

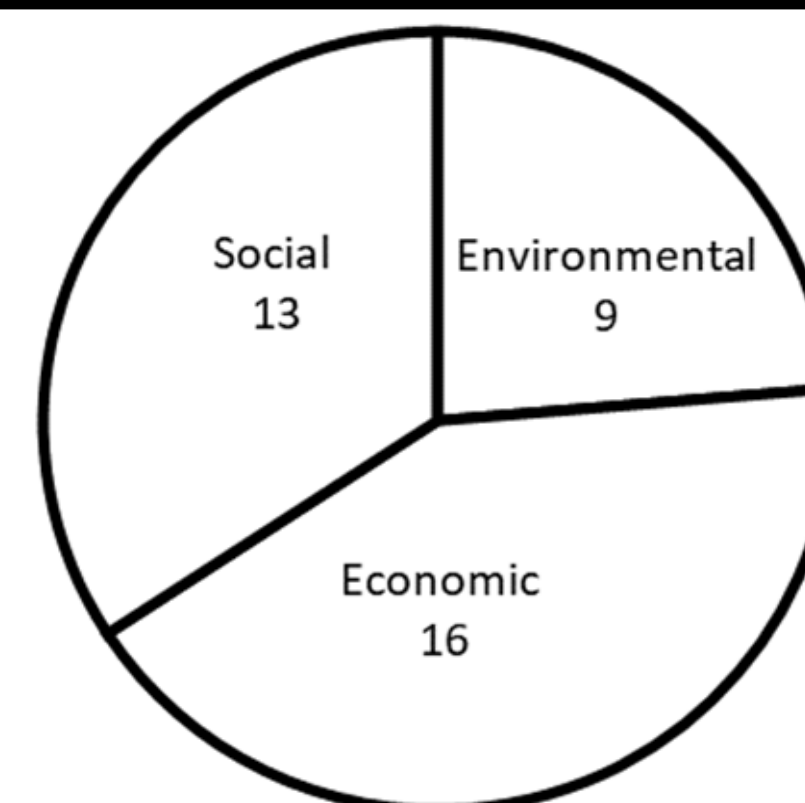


Figure 2. Selected indicator per dimension of sustainability

Source: Own elaboration

- **Environmental dimension:** five indicators from the Water and Atmosphere theme, two indicators from the Land theme, and two indicators from Biodiversity, Materials and Energy, were selected.
- Only Water availability during the all sugarcane production process had 100% of the consensus level. 11% of indicators had 90% and 88.9% of the consensus level and 33.3% of the indicators had 77.8% and 80% of the consensus level.
- **Economic dimension:** fifteen indicators from Investment theme and one from Local economy and Product quality.
- Average yield, Price of sugarcane, Evaluation of the production based on the market size and price, and Production risk share between producers and factory, have received 100% of consensus from the experts. Investment return, Sugarcane productivity, Existence of the production expansion plan and Sucrose percentage, have received 90% of the consensus.
- **Social dimension:** eight indicators from the Labor rights and Safety and Health, and five to the Equity and Decent Livelihood themes.
- Two indicators, namely Access to adequate protective equipment and Salary satisfaction had 100% consensus, followed by Existence of worker training and Job generation, with 90% consensus. Therefore, according to experts' consensus, the results show that there is almost a balance between the concerns and considerations of experts on the aspects of equity and decent livelihood, labor rights, safety, and health regarding sugarcane production in the province of Sofala.

CONCLUSION/ FUTURE WORK

Experts emphasized economic indicators as the most influential factors on sugarcane production sustainability, followed by social indicators. Although fewer in number, indicators related to water management and handling proved to be of significant importance for assessing sugarcane sustainability. Key indicators identified include water availability during the all sugarcane production process, sugarcane yield, sugarcane price, market-based production assessment, risks sharing between producers and factories, access to adequate protective equipment, and satisfaction with salaries. These indicators are deemed critical for evaluating the sustainability of sugarcane production in Sofala.

The selected indicators offer a valuable tool for monitoring and evaluating sustainability achievements in sugarcane production.

REFERENCES

- BM. 2022. Challenges and opportunities of the Sugarcane Industry in Mozambique : The case of Sofala Province. The 47th BM Advisory Board Meeting, Beira.
- Gerbens-Leenes, P. W., Moll, H., & Uiterkamp, A. S. 2003. Design and development of a measuring method for environmental sustainability in food production systems. *Ecological economics*, 46(2), 231-248.
- O'Laughlin, B., & Ibraimo, Y. 2013. A expansão da produção de açúcar eo bem-estar dos trabalhadores agrícolas e comunidades rurais em Xinavane e Magude. IESE.