



Impact of contract farming on smallholder farmers' income and food security in Mozambique. A review

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ABSTRACT: Contract farming can potentially address agricultural market failures, especially in developing countries. However, the debate on how smallholder farmers benefit and the circumstances under which such benefits can be achieved seems to be far from reaching a consensus. This review aimed to analyze the impact of contract farming on smallholder farmers' income and food security in Mozambique using a systematic literature review protocol. The results show that the literature analyzing such relationships is limited. However, contract farming has the potential to increase income, but the nature of the contract, the actors involved, and the crops under the contract appear to be the key determinants of contract farming outcomes. Furthermore, the results show positive selection trends between firms and farmers, making estimating the net effect of contract farming difficult. Concerning food security, the reviewed studies did not allow us to draw consistent conclusions regarding its relationship with contract farming. Therefore, we argue that further research on the impact of contract farming on smallholder farmers' income and food security using consistent methodologies that consider selection bias is needed.

Keywords: out-grower schemes; inclusive business models; market failures.

Impacto da agricultura contratual na renda e na segurança alimentar dos pequenos produtores agrícolas em Moçambique. uma revisão de literatura

RESUMO: A agricultura contratual tem potencial para resolver falhas de mercados agrícolas, especialmente nos países em desenvolvimento. Contudo, o debate sobre a forma como os pequenos agricultores beneficiam e as circunstâncias em que tais benefícios podem ser alcançados parece estar longe de chegar a um consenso. Esta revisão teve como objectivo analisar o impacto da agricultura contratual no rendimento e na segurança alimentar dos pequenos agricultores em Moçambique, utilizando um protocolo de revisão sistemática da literatura. Os resultados mostram que a literatura que analisa tais relações é limitada. No entanto, a agricultura contratual tem o potencial de aumentar os rendimentos, mas a natureza do contrato, os intervenientes envolvidos e as culturas sob contrato parecem ser os principais determinantes dos resultados da agricultura contratual. Além disso, os resultados mostram que existem tendências de selecção positiva entre empresas e agricultores, tornando difícil estimar o efeito líquido da agricultura contratual. No que diz respeito à segurança alimentar, os estudos revistos não nos permitiram tirar conclusões consistentes sobre a sua relação com a agricultura contratual. Argumentamos, portanto, que é necessária mais investigação sobre o impacto da agricultura contratual no rendimento e na segurança alimentar dos pequenos agricultores, utilizando metodologias consistentes que tenham em conta o potencial viés de selecção.

Palavras-chave: esquemas de fomento; modelos de negócio inclusivos; falhas de mercado.

1. INTRODUCTION

Contract farming is increasingly recognized as a viable strategy for improving smallholder farmers' access to inputs and product markets through their integration into the value chain. After unsuccessful experiences of cooperativization and implementation of state-owned companies and following economic reforms imposed by Bretton Woods institutions, Mozambique made significant changes in its production models, including those of the agricultural sector (MOSCA, 2017). With the end of the centralized economy, greater primacy was given to large private companies, often foreign capital-owned, to invest in agriculture as a way to spur economic growth (CHAMBATI et al., 2019). However, this approach immediately proved to be inefficient. The

livelihood of smallholder farmers remained almost unchanged, forcing the government to find sustainable alternatives.

In the 2000s, Mozambique began promoting inclusive business models, focusing on public-private partnerships (MATTEO DI; SCHONEVELD, 2016). The objective was to integrate smallholder farmers into profitable value chains. An estimated 400,000 farmers in Mozambique are involved in contract farming (OYA, 2012). While contract farming is historically associated with cash crops such as tobacco and cotton (Oya, 2012; Navarra, 2019), the Strategic Plan for the Development of the Agrarian Sector (PEDSA:2011-2020) highlights contract farming as a means through which the production of food and cash crops increases and subsistence

agriculture transforms into commercial agriculture. Contract farming¹ is an agricultural production process under a contract between a firm and a farmer. It consists of a prior agreement, where the farmer commits to producing a certain product, and the company purchases it under certain conditions (MINOT, 2007).

Contract farming has attracted the attention of different stakeholders at various levels in Mozambique, including in academia. It has been a subject of research for at least a couple of decades. Studies involving cash crops such as tobacco and cotton (Benfica et al., 2005; Pérez Niño, 2016; Navarra, 2019; Ngwenha et al., 2021), as well as sugarcane, rice, and soya (Jelsma et al., 2010; Veldwisch, 2015; Porsani et al., 2019; Dal Belo Leite et al., 2020; Joaquim et al., 2022) are some of the examples. Although contract farming has been a subject of study for several years, consistent data on its incidence at the national level are limited; as a result, the findings of such studies are difficult to generalize (OYA, 2012; SMART; HANLON, 2014). Moreover, some authors argue that contract farming improves smallholder farmers' income (Meemken; Bellemare, 2020; Baxter et al., 2022) and welfare (BARRETT et al., 2012), while others argue that contract farming involving large commercial firms can cause food insecurity when food production is replaced by cash crop farming under contracts (CHAMBATI et al. 2019; FITAWEK; HENDRIKS, 2022). The issue of land use shifts and the imbalances between firms (with greater negotiating power) and farmers (who are generally price takers) are other factors mentioned against contract farming (SMART; HANLON, 2014; PÉREZ NIÑO, 2016).

In the context of the diversity of findings and lack of consensus on the impact of contract farming on smallholder farmers' welfare, this study sought to answer the question: does contract farming contribute to smallholder farmers' income and food security in Mozambique? This study contributes to this debate in two ways. First, it provides an overview of the state-of-the-art of contract farming literature in Mozambique, including its impact on income and food security. Second, it highlights the existing challenges in assessing the relationship between contract farming and smallholder farmers' income and food security and suggests pathways for future research.

2. MATERIAL AND METHODS

To analyze the relationship between contract farming and smallholder well-being, the study applied the systematic literature review method proposed by Galvão; Pereira (2014) and Uman (2011), which consists of identification and a literature search, selection of relevant studies, and data extraction and analysis. The search and selection of the literature followed three steps. First, a literature search was carried out in electronic databases, namely, ScienceDirect, JSTOR, and Google Scholar, using different combinations (see Table 1 below for details). Since the study intended to analyze the impact of contract farming on smallholder farmers' income and food security, the search strategy was restricted to studies analyzing such relationships. In addition, the search was limited to articles written in English and Portuguese.

Second, 59,994 studies were generated from search engines, 163 of which were retained for prescreening. The remaining 59,831 were not considered for the next phase for the following reasons: some studies were not related to the objective of this work, while others were from sources of dubious scientific rigor. The selected articles were added to Mendeley and exported to Rayyan, from which the respective abstracts were extracted into Excel for screening purposes. After the abstract screening process, 25 studies were selected for analysis based on the following criteria: articles or working papers that analyzed one or simultaneously the following relationships: contract farming and food security and contract farming and income for smallholder farmers in Mozambique. A total of 138 studies were not considered for the final review because 118 did not analyze pre-established relationships, seven studies that, despite analyzing pre-established relationships, did not include Mozambique, three studies that analyzed another type of contract, namely, paid work in plantations, another three that did not use a sufficiently detailed methodology and seven studies that had been repeated. The results are presented in the following section, and the details about each study analyzed are found in Table 2.

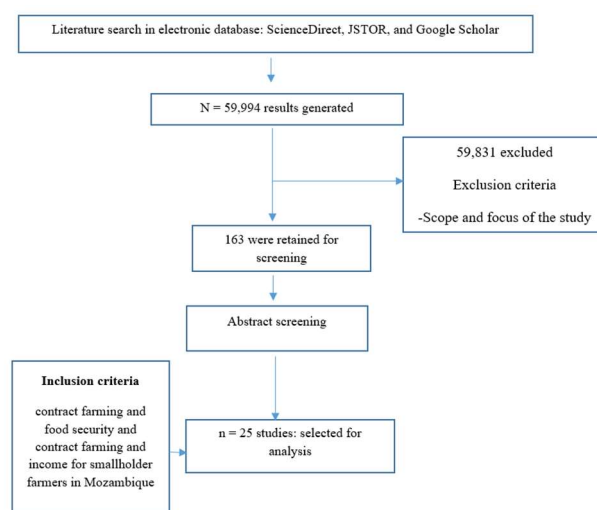


Figure 1. Literature search and selection process.

Figura 1. Processo de busca e seleção de literatura.

3. RESULTS

Although contract farming is not necessarily new in Mozambique, studies analyzing its impact are still limited. Regarding the crops mostly grown under contract, it was found that out of the 25 reviewed studies, six analyzed tobacco contract farming (either exclusively or in combination with other crops), four analyzed cotton, and the other 4 dealt with sugarcane. These crops are the ones that have predominantly been grown under out-grower schemes in Mozambique (Smart; Hanlon, 2014; Baxter et al., 2022), even though there are a considerable number of other food crops (rice and maize) and energy crops (jatropha and sunflower) emerging in such schemes in recent years. Three reviewed studies analyzed maize contracts, while two

¹ Although authors such as Baumann (2000), Glover; Kusterer (1990) define out-grower schemes as those that provide production and marketing services to farmers on their land, generally involving the government and public enterprise, purchasing crops from farmers, as opposed to contract farming

which essentially refers to the arrangements involving private firms and farmers, in this work the two terms are used synonymously.

analyzed rice contracts. Looking at the methodology applied across studies, we observe that only 9 out of 25 applied a methodology that allows us to control for selection bias. Barrett et al. (2012) and Glover; Jones (2019) show that firms involved in contract farming tend to select farmers with the capacity to produce profitably. Moreover, farmers who believe that they have the skills to produce profitably apply and decide to accept contracts. Ignoring these decisions when analyzing the effects of contracts can lead to biased estimates and misinform policies. Navarra (2017) demonstrated how using inappropriate techniques when analyzing the impact of contract farming can lead to incorrect conclusions.

The results show that studies carried out in the same region used almost identical methodologies; however, there was significant variability in study design across regions. In addition, there are significant differences in the way the results are measured and presented, leading to significant differences in the estimated relationships. For instance, studies using qualitative approaches and those using descriptive statistics tend to underestimate the impact of contract farming on income and food security. Furthermore, differences in output measurement make it impossible to compute the mean values of the estimates and their respective standard deviations. Therefore, the results of this analysis are narratively presented, and the details of the reviewed studies are individually presented in Table 2 (in appendices). It is worth, however, emphasizing that other non-quantifiable variables may be relevant in analysing the relationship between contract farming and food security/income security and should not be ignored. For example, Tamura (2021) discusses how a given community's political, historical, and cultural trajectory may influence the decision to accept or reject a contract among certain groups.

Regarding the study's objective, most studies (24/25 or 96%) analyzed the relationship between contract farming and income; seventeen exclusively analyzed the impact of contract farming on income, while seven included food security. Only one study analyzed the impact of contract farming exclusively on food security. Despite the growing interest in contract farming as an alternative way to address smallholder farmers' problems, its effect on food security has yet to be fully debated. Food security is relatively well discussed in the context of large commercial farms without out-grower schemes but potentially threatening land tenure (BRAUTIGAM; EKMAN, 2012; MATTEO, DI; SCHONEVELD, 2016; OBERLACK et al., 2021).

3.1. Geographic distribution of the studies

In terms of geographical settings, Figure 2 shows that 7/25 or 28% of the studies are national in scope; however, five studies out of 7 do not specify the crops under contract; rather, they assess only whether a farmer participates or not in contract farming in general. While on the one hand, studies conducted at the country level are more comprehensive; on the other, they lack considerable details, especially due to the uniqueness of each type of crop and contract that they not capture. Glover and Jones (2019), Meemken and Bellemare (2020), and Tamura (2021) showed that the impacts of contract farming should be assessed on a case-by-case basis and that the results should not be generalized (OYA, 2012). Thus, in addition to the national studies, other local studies were selected, among which Zambezi Valley (3), Angónia (2)

and Xinavane (2) had more than one study. Unlike studies at the country level, studies conducted at the local level specify crops under contract. Disaggregating crops is important because specific information, including opportunities and constraints, may be obtained for each crop. Figure 2 below shows the geographic distribution of the reviewed studies.

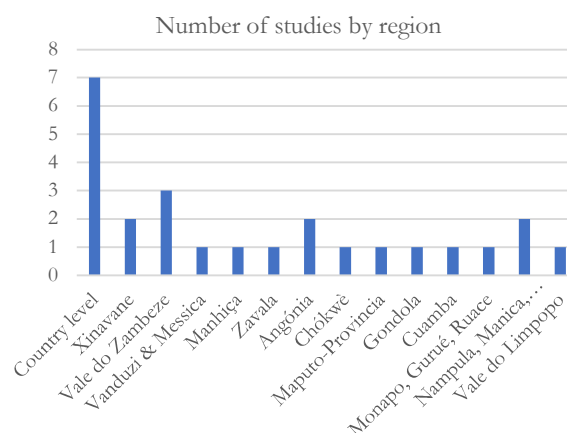


Figure 2. Geographic distribution of the studies included in the analysis.

Figura 2. Distribuição geográfica dos estudos incluídos na análise.

3.2. Crops involved in the reviewed studies

As mentioned previously, the emphasis was on tobacco, cotton, and sugarcane crops. Tobacco contracts were analyzed in 6 out of 25 studies, and cotton and sugarcane were analyzed in 4 studies each. In addition to tobacco, cotton and sugarcane, maize and rice are among the food crops grown under contract, and in this review, these crops were analyzed in 3 and 2 studies, respectively. The details about the crops analyzed are presented in Figure 3 below.

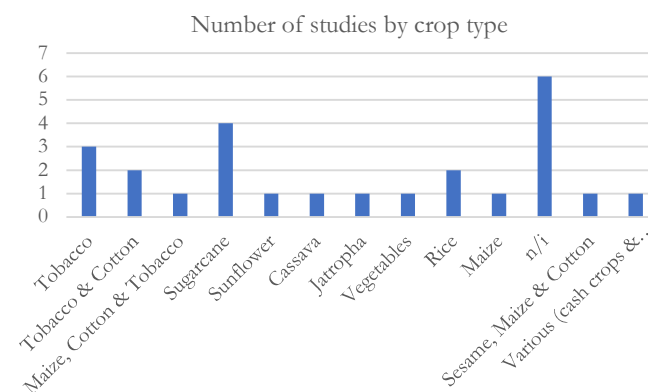


Figure 3. Crops analyzed in the selected studies.

Figura 3. Culturas analisadas nos estudos seleccionados. Notes: n/i: indicates that the crops were not specified. Most of these studies were carried out based on data from national surveys. Various: involves groups of crops (cash crops, vegetables, legumes and cereals).

4. DISCUSSION

4.1. Contract farming and income

Out of 24 studies analyzing the relationship between contract farming and smallholder farmers' income, either exclusively or in combination with other outcomes, namely, food security, 16 suggest that participation in contract farming positively affects income. However, ten studies argue that there is positive selection between firms and farmers in contract farming in Mozambique. That is, firms select regions

with favorable agroecological conditions for producing certain crops and choose farmers who demonstrate capacity or proven experience in growing such crops. On the other hand, farmers with skills and those who believe they are capable of obtaining profit by participating in contract farming decide to accept contracts. These findings are similar to those of Ton et al. (2017) who argue that contract farming in developing countries may increase income, with an average effect ranging from 23 to 54%. Still, they noted that poorer farmers were not involved in contract farming schemes.

Nevertheless, nine studies that adopted a methodology taking into account the issue of selection bias found a positive correlation between participation in contract farming schemes and income, of which six were national in scope. Notably, out of the 24 studies on contract farming and income, six did not specify the crops under analysis, 5 of which found a positive relationship. Out of the 18 studies specifying crops, 7 find a negative or no impact, while the other 11 find a positive impact for certain crops and a negative or no impact for others. These findings suggest the need to analyze contracts on a case-by-case basis to avoid generalizations that could lead to biased conclusions, but they also unveil areas of concern. Differences among commercial farms offering contracts and the fact that contracts are targeted at relatively well-endowed farmers hide substantial information regarding the impact contract farming would have on poorer farmers, who are the majority the government intends to lift out of poverty.

For instance, Glover; Jones (2019) argue that the effects of commercial farms on smallholder farmers' income can be explained by other factors, such as the type of crop and the size of the integrator's farm. Thus, the authors state that contracts involving cash crops and being located in administrative posts with relatively smaller farms (50-263 ha) tend to generate better outcomes (in terms of income) for smallholder farmers. Tamura (2021) shows that a given community's historical and political trajectory may influence decisions on whether or not to accept contracts but also on performance. For this author, farmers residing in regions with greater influence from the political party in power in Mozambique have developed a culture of dependence and, consequently, tend to accept contracts more than those residing in regions with greater influence from opposition parties. Furthermore, negotiation imbalances between firms and farmers may imply lower gains for farmers (CHAMBATI et al., 2019).

From the above discussion, it can be noted that contract farming is not an end *per se*; other important factors need to be considered when analyzing its impact on income or food security.

The review included studies analyzing the contracts of specific crops. Overall, 4 out of the six studies involving tobacco positively impacted income, while 2 found no significant impact. Regarding cotton, 2 out of the four reviewed studies find a positive impact of contract farming schemes on income, 1 finds no significant impact, and the other finds a negative impact. Additionally, studies that simultaneously evaluated tobacco and cotton contracts revealed that tobacco tends to have better outcomes than cotton. The literature (BOUGHTON et al., 2003; TSCHIRLEY et al., 2006; DIAS, 2012; STARITZ; TRÖSTER, 2015) suggests that the poor performance of the cotton sector is due to low productivity and low prices.

Despite government interventions to improve the performance of the cotton sector in recent years, the reduction in harvested areas appears to nullify the efforts aimed at revitalizing the sector (BAXTER et al., 2022). Another crop commonly produced under contract is sugarcane. In this review, four studies were analyzed, 3 of which showed a positive impact, while the other found a negative impact.

Apart from studies analyzing cotton, tobacco and sugarcane, the analysis included other studies involving other crops, including food crops. This review analyzed eight studies involving food crops, namely maize, rice and vegetables. All three studies analyzing maize contracts found a positive relationship between contract farming and income. Concerning the two studies analyzing rice contracts, one found a positive impact, and the other found no significant impact. Studies analyzing cassava and vegetables have shown no significant impact. Significant differences appear to exist in contract farming among crops.

Glover (1994) and Glover; Jones (2019) argue that contracts involving cash crops intended for export tend to generate better returns (income) for farmers than contracts involving crops sold on the local markets. This was partially confirmed in this review, especially with tobacco contracts but not with cotton contracts. Cash crops in Mozambique have a relatively well-established external market compared to food crops such as maize and rice. However, unlike maize contracts, which were found to impact income positively, 2 out of 4 studies analyzing cotton contracts did not find a significant impact on income. This does not necessarily mean that maize contracts are more profitable than cotton contracts are; rather, it shows that the success of contract farming does not depend on one variable. The nature of the contracts and the institutional arrangements, including management, the actors involved and their commitment to complying with the contract, may also play important roles (OYA, 2012; VON MALTITZ et al., 2019; NCUBE, 2020). In Mozambique, for instance, the types of contracts may vary from crop to crop and from region to region. Rice and sugarcane contracts in the southern region do not operate in the same fashion as tobacco and cotton contracts in central Mozambique, see for example (GANHO, 2013; ; SMART; HANLON, 2014; PÉREZ NIÑO, 2016; CHAMBATI et al., 2019; JOAQUIM et al., 2022).

Studies that find an insignificant or negative impact of contract farming on income underscore the high costs of inputs combined with the low prices paid by the buyer (firms) as well as the absence of an external regulatory agent as the main factors limiting the possibility of making a profit by smallholder farmers. Cipriano et al. (2017) analysed the impact of tobacco contract farming in central Mozambique and concluded that commercial firms offered low prices leading to low income among farmers who held contracts. But this may also arise when out-grower farmers reduce the time allocated to other sources of income (PONGUANE et al., 2021). Baxter et al. (2022) argue that there is a positive impact of contract farming on income when a farmer is earning with a contract than what he/she would earn without it. However, as mentioned earlier, many studies in this review do not use a methodology that allows us to capture the magnitude of the impact from this perspective.

4.2. Contract farming and food security

Despite the recognized potential of contract farming to address smallholder farmers' problems, studies analyzing its effect on food security are relatively limited. The few existing studies do not adopt a methodology that allows us to draw consistent conclusions. As explained, out of the 25 studies selected, only 8 or 32% analyzed the effect of contract farming on food security, and only one study analyzing contract farming and food security was national in scope. Regarding the crops studied, two studies did not specify the crops studied; three analyzed sugarcane, one analyzed several crops, and the other two analyzed contracts of tobacco and sunflower.

Regarding the results, only two studies found that contract farming had a positive impact on food security, four found no impact, and two argued that contract farming had a negative impact on food security. The nationwide study was the only one applying a methodology taking into account potential selection bias. However, the study does not specify the crop and finds no significant impact. Studies that do not specify crops find no significant impact of contract farming on food security. On the other hand, out of the six studies specifying which crops were involved in contracts, 2 found a positive impact, 1 of which analyzed sugarcane contract and the other was on sunflower. Two (2) studies, one on tobacco and the other on sugarcane, found that participation in out-grower schemes had a negative impact on food security. According to Oya (2012) and Dias (2012), 400,000 smallholder farmers or 10% of all listed smallholder farmers in the country are involved in contract farming, and most cotton, tobacco and sugarcane are grown under contract farming.

The historical development of cash crops may explain this trend. After the collapse of cash crop value chains due to, among other factors, a lack of financing and markets and the need to implement reforms in the sector, revitalization strategies involving private companies and smallholder farmers followed in the form of inclusive business models (NGUENHA et al., 2021). The debate surrounding the impact of contract farming on food security remains polarized. On the one hand, studies that find a negative impact underline the reduction in time dedicated to food production and the limited returns in contracts (CIPRIANO et al., 2017) as well as the loss of large areas of land in favor of projects (CHAMBATI et al., 2019) as some of the reasons for the poor performance of contract farming on food security. On the other hand, pro-contract farming scientists argue that the positive impact of contract farming on food security is a result of higher income generated by participation in contract farming that enables smallholder farmers to afford food in the local market. Interestingly, although there are signs of a positive relationship between contract farming and income in Mozambique, it was impossible to identify the transmission mechanism underlying contract farming income and food security from this review. The reviewed studies do not allow us to draw consistent conclusions between contract farming and food security. Therefore, there is a need for additional research on the impact of contract farming on food security.

4.3. Bibliometric analysis

To supplement the analysis, a bibliometric examination of the co-occurrence of research keywords in contract farming was conducted using the combination ("contract farming") AND (income) in Scopus. The network map below

was created with the assistance of the VosViewer application (Figure 4), which displays that the most frequently cited expressions are contractual agriculture, food security, and income. The map confirms that the number of studies analyzing these relationships in Mozambique is still limited. Mozambique appears four times with 19 links and a connection strength of 22. On average, these studies were conducted around 2016. The co-occurrence network indicates a growing interest worldwide in analyzing relationships between contract farming and food security, which provides an opportunity for more studies in Mozambique analyzing such relationships.

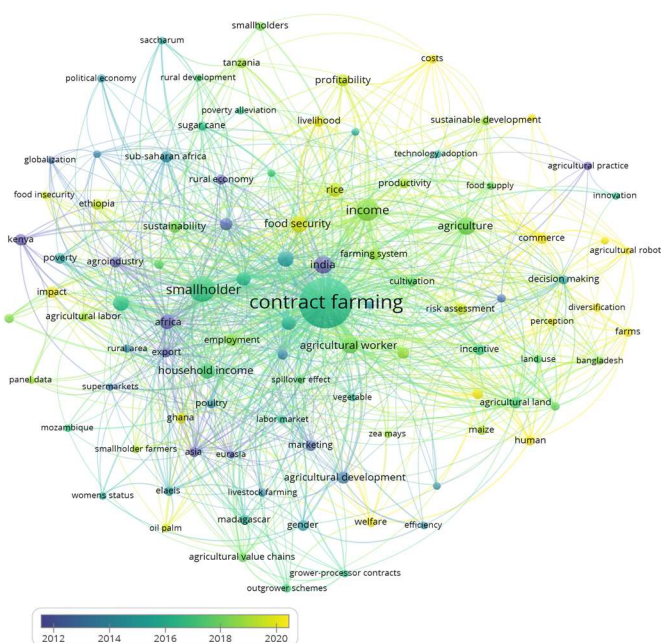


Figure 4. Co-occurrence network of keywords.

Figura 4. Rede de coocorrência de palavras-chave.

5. CONCLUSIONS

This review sought to evaluate the impact of contract farming on smallholder farmers' income and food security in Mozambique using a systematic literature review. Before presenting the main findings concerning the research question, it is important to highlight some key points that deserve attention. First, although contract farming is relatively old and supported by various stakeholders, studies analyzing its impact on income and food security are limited. Second, the methodology used in some (of the few) existing studies is problematic, and the fact that, in many cases, the issue of selection bias is not taken into account is of particular concern. Furthermore, studies using qualitative approaches tend to conclude differently from quantitative ones. Third, greater attention has been given to crops traditionally grown under contracts, namely, tobacco, cotton and sugarcane, and little is debated about the impact of contract farming involving food crops. For these reasons, the debate on whether contract farming is good or not seems far from consensus. However, despite these shortcomings, this review has identified some points of convergence that could serve as a starting point for future research.

Although the reviewed studies show that contract farming has the potential to increase smallholder farmers' income in Mozambique, the context in which each contract

is implemented, the type of crops under contract, and the nature of the contract or the institutional arrangement seem to explain the performance of contract farming better. The imbalances in bargaining power between firms and farmers may partly explain why some contract farming arrangements had no significant impact on income. On the other hand, contracts involving cash crops with relatively well-consolidated external markets, such as tobacco and sugarcane, are associated with a positive impact on income. Although studies highlight the potential of contracts involving food crops and informal arrangements, the results of the reviewed studies could not allow us to draw consistent conclusions. In this context, specific case studies evaluating the impact of informal contract farming and contracts involving food crops are strongly recommended.

Unlike the positive relationship between contract farming and smallholder farmer income, a review of contract farming and food security could not provide sufficient information to draw consistent conclusions. Therefore, empirical studies investigating the impact of contract farming on food security are needed.

Although this review sheds light on the impact of contract farming on smallholder farmers' income and identifies areas for future research, fundamental methodological limitations need to be emphasized. First, the approaches used to measure impact among the reviewed studies differ considerably. Second, the results seem to be associated, in part, with the methodology used, which raises the suspicion of heterogeneity and a potential degree of bias. Therefore, since the impact was not measured using the same unit, the results could not be grouped, and the average impact of contract farming could not be computed and presented quantitatively. For this reason, the results are presented only narratively, and the details of each study are provided separately. Thus, studies applying consistent methodologies may be able to capture the magnitude of the impact of contract farming on smallholder farmers' income and food security in Mozambique.

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Table 1. Key words and combinations used for the literature search
Tabela 1. Palavras-chave e combinações usadas na busca de literatura

Key-words/Combinations	Results generated	Source
Outgrower scheme food security smallholder farmers Mozambique	3 490	Google Scholar
Outgrower scheme income smallholder farmers Mozambique	3 580	Google Scholar
Contract farming food security smallholder farmers Mozambique	20 500	Google Scholar
Contract farming income smallholder farmers Mozambique	21 700	Google Scholar
<i>Agricultura por contrato segurança alimentar pequenos agricultores Moçambique</i>	3 010	Google Scholar
<i>Agricultura por contrato renda pequenos agricultores Moçambique</i>	2 890	Google Scholar
<i>Esquemas de fomento segurança alimentar pequenos agricultores Moçambique</i>	1 750	Google Scholar
<i>Esquemas de fomento renda pequenos agricultores Moçambique</i>	1 610	Google Scholar
Contract farming income smallholder farmers Mozambique	328	Sciencedirect
Contract farming food security smallholder farmers Mozambique	298	Sciencedirect
Outgrower scheme food security smallholder farmers Mozambique	93	Sciencedirect
Outgrower scheme income smallholder farmers Mozambique	102	Sciencedirect
((((Contract farming) AND (small holder farmers income)) AND (Mozambique)))	302	JSTOR
((((Contract farming) AND (small holder farmers food security)) AND (Mozambique)))	283	JSTOR
((((Outgrowers) AND (small holder farmers income)) AND (Mozambique)))	30	JSTOR
((((Outgrowers) AND (small holder farmers food security)) AND (Mozambique)))	28	JSTOR

Table 2. Findings of the reviewed studies.
Tabela 2. Resultados de estudos revisitos.

Author	Year	Crop	Location	Impact on	Methodology	Findings
Glover & Jones	2019	n/i	Countrywide	Income	Weighted inverse probability on 6,736 small and medium-sized farmers and 156 commercial farms	income of participants in contract farming increases between 1.31% and 1.35% at 1% and 5% - LS
Barrett et al.	2012	n/i	Countrywide	Income	Matching estimators on a panel of 3,480 households (Based on Bachke, 2010)	There are significant differences between participants and nonparticipants. Participants have more income than nonparticipants in contract farming
German et al.	2016	n/i	Countrywide	Income	16 partnerships and 5 focus discussion groups	In 16 partnerships analysed, 4 were in the initial phase, 3 ended but had a positive effect, 5 or 31% showed a positive effect on income while the other 4 had no significant effect
Meemken & Bellemare	2019	n/i	Countrywide	Income	Fixed effects model on 3,979 farmers	The results show that farmers in contract farming have a 10% higher income than farmers without a contract at 10% - LS
Navarra, C.	2017	n/i	Countrywide	Income & food security	Propensity score matching and DID in 4,014 rural households	Positive effect on income at 10% - LS, but no significant difference in food security
Giger et al.	2018	n/i	Monapo, Gurué, Ruace	Income & food security	Mixed approach in 15 companies and 600 households	No significant difference between participants and nonparticipants in terms of income and food security
Jelsma et al.	2010	Sugarcane	Xinavane	Income	Thematic analysis of 34 respondents, including representatives of farmers' associations, representatives of AdX, the Government and NGOs	A net income of USD 650 per year/ha for participants in contract farming
Dal Belo Leite et al.	2020	Sugarcane	Maputo Província	Income & food security	Descriptive statistics on 115 farmers and 2 AdX managers	Income varies between MZN 9000 and MZN 20000 per year before payment for inputs provided by AdX. In some cases, the cost exceeds the revenue. 65% partially or significantly affected in food production
Joaquim et al.	2022	Sugarcane	Xinavane	Income & food security	Content analysis of 16 interviews and literature review	Although on a small proportion, contract farming brought some gains in terms of income and food that farmers need to meet basic needs.
Chambati e Mberi	2018	Sugarcane	Manhiça	Income & food security	Content analysis	The income of participants in contract farming is positive. However, it is low and dependent on the size of the farm and the endowment of the factors of production in the associations. On the other side, contract farming cause food insecurity due to loss of land and time shift for sugarcane production
Cipriano et al.	2017	Tobacco	Angónia	Income & food security	Content analysis on 359 farmers, 67 key informants and focus group discussion with 27 participants	Nonsignificant effect on income and food security. The few who had significant income invested in durable goods and ran out of reserves to purchase food, putting food security at risk.
Pérez Niño	2017	Tobacco	Angónia	Income	Content analysis on a sample of 102 respondents, including tobacco farmers in outgrower schemes, members of local government and representatives of the tobacco production company	In a complex process of labor and production relations in Angónia, contract farming proved to be insufficient to improve income
Benfica et al.	2006	Tobacco	Vale do Zambeze	Income	Heckman Sample Selection on 159 farmers	Income increases only for larger areas (fourth quartile on average of almost 7ha) at 10% - LS
Porsani et al.	2019	Rice	Vale do Limpopo	Income	Content analysis and descriptive statistics on 213 farmers	No significant changes in farmers' income were identified
Veldwisch, G.J.	2015	Rice	Chókwè	Income	Content analysis and descriptive statistics on 229 farmers	In general, participation in contract farming had a positive relationship with income: MZN 5000 profit/ha, although there was a possibility of losses depending on the services provided by the integrator, as well as on farm productivity and the price paid
Benfica, R.	2006	Tobacco & Cotton	Vale do Zambeze	Income	Selection treatment effects model adjusted on 300 households	Participation in contract farming has no impact on income up to the IV quartile (largest areas) at 10% - LS for tobacco, but there is no impact on cotton

Benfica et al.	2005	Tobacco & Cotton	Vale do Zambeze	Income	Descriptive statistics on 300 farmers, including 180 tobacco and 120 cotton	72.5% contribution of farm income to total income for cotton out-growers compared to 71% of non-out-growers and 82.8% of tobacco out-growers compared to only 68.5% of nonoutgrowers
Baxter et al.	2022	Sesame, Maize & cotton	Nampula, Manica, Niassa e Maputo	Income	Estimates of the average treatment effect using DID and PSM in 1373 households	Income increases between 6pp and 46pp and decreases by 21pp for cotton out-growers in 2 years at 5% and 10% - LS
Boughton et al.	2007	Maize, cotton & tobacco	Nacional	Income	Heckman sample selection model and nonparametric regression on 4900 households in 80 districts	Positive income especially for households with larger areas, with access to animal traction and assets such as bicycles at 1% and 5% - LS
Ingram, M	2022	Maize	Nampula, Manica, Niassa e Maputo	Income	Treatment effect model in a Panel of 274 households	The effect of contract farming is positive, not only for those who participate but also for those who live in the region. The income of those who participate increases by an average of MZN 1368 compared to residents outside the region implementing contract farming, and increases by an average of MZN 0.751 for nonparticipants in the same region
Lukanu et al	2010	Various (Cash crops, income & vegetables, cereals	Cuamba	Income & food security	Thematic analysis and descriptive statistics on 245 farmers	52% of cotton farmers, 80% of tobacco farmers and 51% of vegetable farmers argue that participating in out-grower schemes was profitable, but the schemes had no effect on food security
Leonardo et al.	2015	Sunflower	Gondola	Food security	Descriptive statistics on 80 farmers	Although to a small extent, participation in contract farming has a positive effect on food security
Veldwisch & Woodhouse	2021	Vegetables	Vanduzi e Messica	Income	Descriptive statistics on 245 households in Messica and 159 in Vanduzi	Both formal and informal contract farming were not significant
Gengenbach, H.	2019	Cassava	Zavala	Income	Statistical and content analysis on 129 women	59% use income from contract farming to purchase food, but the number of those who sell to the company is smaller than those who do not want to participate in contract farming
Arndt et al.	2011	Jatropha	Nacional	Income	Computable General Equilibrium Model (CGE Model) for Mozambique with 56 sectors, of which 26 are agricultural and food processing activities	Positive impact on income.

Notes: LS: Significance level; n/i: indicates that the crops were not specified.