Effects of Voluntary Sustainability Standards and Related Supply Chain Initiatives on Yield, Price, Costs and Income in the Agriculture Sector

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Executive Summary

In an effort to improve stakeholder access to research results about the social, economic, and environmental impacts of voluntary sustainability standards (VSS) and related supply chain initiatives, ISEAL, WWF, and the Rainforest Alliance have partnered to create the online platform *Evidensia*. In addition to serving as a searchable repository for credible research, *Evidensia* features 'visual summaries,' which combine the findings of numerous rigorous studies into a single graphic. Each visual summary is accompanied by a narrative report that explains the review methodology and synthesizes the underlying data. This is one such report, which analyzes the economic costs and benefits of participation in VSS and related supply chain initiatives for smallholder farmers.

Approach

Using a modified systematic review approach, the report authors reviewed 49 studies that examined the impact of VSS participation on five livelihood-related outcomes: yield, input costs, crop prices, crop income, and net household income. In all, 212 individual results for these five outcomes were analyzed. The report builds on the results of two key reviews of the economic impacts of VSS published by Oya et al. and DeFries et al. published in 2017. Three studies examining 11 results from related supply chain initiatives, such as company sourcing codes, were also analyzed and are discussed separately from VSS results in this report.

Findings

The findings show that the volume of research on VSS has increased over time, with a peak in 2016. Africa was the most frequently-studied region, coffee was the most frequently-studied crop, and Fairtrade was the most frequently-studied VSS, results that are consistent with those of the Oya et al. and DeFries et al. reviews. Over half of the results that examined price and crop income found that VSS-certified farms performed significantly better than non-certified farms. The few results from related, non-VSS supply chain initiatives also showed an overall positive effect on price and crop income. Although critical to understanding farmers' financial wellbeing, net household income was the least-studied outcome, and had the highest proportion of results showing no difference between certified and non-certified farms. Net household income was significantly higher on VSS-certified farms in one-quarter of results. Over half of the results related to input costs showed no significant difference between certified and non-certified farms. Results are difficult to interpret for this outcome since the directionality of input costs (i.e. higher or lower) does not have a consistent relationship with farm economic health.

Context Matters

Several notable trends surfaced during the review, illustrating that the effect of VSS participation on livelihood indicators is rarely straightforward. For example, many VSS-certified smallholders are members of producer groups such as cooperatives that can both benefit and hinder the success of these farmers. Some studies addressed the influence of yield versus price on the overall economic wellbeing of farmers, suggesting that either price premiums should be higher or more effort is needed to ensure that the premiums paid for certified products reach farmers. Finally, some studies suggested that off-farm employment is often more lucrative than on-farm crop specialization, and that the emphasis that certification can place on specialization might have a negative effect on net household income.

Looking Forward

The findings suggest that participating in VSS and related supply chain initiatives can improve certain aspects of producers' financial wellbeing, including prices and income from crops. However, the findings point to a lack of data on non-coffee crops and a paucity of research on net household income as the outcome under study. Additional research is needed to clarify the influence of cooperatives, disentangle the relationship between yield, price, and net household income, and better understand the tradeoff between crop specialization and off-farm employment.

Contents

Introduction

The *Evidensia* Approach

ISEAL, WWF, and the Rainforest Alliance have partnered to create *Evidensia*, an online platform to house, curate and synthesize credible research on the social, economic, and environmental impacts of voluntary sustainability standards (VSS) and related supply chain initiatives and tools.[1] Funded by the Global Environment Facility, the platform features an online library where users can conduct customized searches for scientific and non-scientific documents, using filters such as sector, VSS or related supply chain initiative, region, outcome, and year.

For selected outcomes, the platform also features 'visual summaries,' which combine the findings of numerous rigorous studies into a single, easy-to-interpret graphic. The results featured in the visual summaries are identified through a systematic search protocol and are extracted from qualifying studies using a standardized coding approach. Associated with each visual summary is a standalone report that provides further information on the methodology used and describes and interprets the visual summary's main results. This is one such report, which corresponds to the visual summary entitled "Effects of Voluntary Sustainability Standards and Related Supply Chain Initiatives on Yield, Price, Costs and Income in the Agriculture Sector."

Why This Topic?

The report focuses on outcomes related to the financial costs and benefits of participating in VSS and related initiatives for three reasons. First, since smallholder farmers and workers constitute almost two-thirds of the world's rural extreme poor,[2] assessing the ability of VSS and related initiatives to affect smallholders' financial wellbeing is of high importance to companies, supply chain managers, government procurement specialists, and anyone else who uses or is considering using such tools as a means of fighting poverty.

Second, the theories of change of nearly all VSS (and many related initiatives) contain provisions that are meant to affect the outcomes covered in this review: training on farming practices can affect yields; market interventions such as price premiums and establishing relationships with new buyers can affect income from crop sales; changes in the use of fertilizers and pesticides can affect input costs; and all of these variables can affect the net household incomes of farmers.[3]

Finally, this topic was chosen because it acts as a complement to the first *Evidensia* narrative review, called "Conservation Impacts of Voluntary Sustainability Standards." This review was published in 2018 and addressed biodiversity, deforestation, and other environmental outcomes in the agriculture, forestry and fisheries sectors.

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[1] Related initiatives and tools include public or quasi-public sustainability standards, company sourcing codes, and supply chain investment or training programs. To qualify, related tools must: 1) Address one or more sustainability topics; 2) define a standard or performance level; 3) include a monitoring, verification or assurance system; and 4) report the performance or compliance level of participants.

[2] World Bank, 2018.

[3] To qualify for inclusion in the review, VSS programs must have the following characteristics: 1) Are developed and owned by non-state actors including civil society; 2) address one or more sustainability topics; 3) define normative requirements for management systems, practices, and/or outcomes; 4) include a verification or assurance system; and 5) include a mechanism for market recognition and/or differentiation.

As noted above, in addition to examining the impact of VSS schemes, such as Fairtrade, organic, UTZ and Rainforest Alliance, this review also investigates the impact of newer, related supply chain tools and initiatives on the economic wellbeing of farmers. Examples of non-VSS initiatives include sustainable sourcing codes like Starbucks' C.A.F.E. Practices, quasi-public sustainability standards like the Indonesia Sustainable Palm Oil Standard (ISPO), and specific implementation norms for responsible supply chains, such as the High Carbon Stock Approach (HCSA).

This is not the first review examining the effects of VSS on the financial health of farmers. In recent years, the influence of VSS on socioeconomic variables has been examined by two major analyses, both published in 2017. The first, by Oya et al., was a systematic review with a meta-analysis that examined the effects of VSS participation on socioeconomic outcomes for agricultural producers in low- and middle-income countries. The second review, by DeFries et al., looked at whether voluntary certification of tropical agricultural commodities has improved environmental, social, and economic outcomes. While the current review is very different from both of these analyses, it avoids duplicating efforts wherever possible by adopting some elements of these previous reviews. The approach is described in the *Methods* section of this report.

This review addresses four questions:

1. How much research has been conducted on yield, input costs, price, crop income, and net household income in the agriculture sector since 1990, and how does that vary over time and by crop and region?
2. How does participation in VSS and related supply chain initiatives affect yield, input costs, price, crop income, and net household income in the agriculture sector?
3. Do studies published since the systematic reviews by Oya et al. and DeFries et al. reinforce the conclusions of those reviews, or do they suggest something different?
4. Do the reviewed studies highlight any urgent directions for future research?

Methods

The methods used in this review were developed in 2017 by a working group that included academic researchers and VSS practitioners and were first applied in the review "Conservation Impacts of Voluntary Sustainability Standards," published in 2018. The application of those methods in the current review was done by a team consisting of staff and consultants from the *Evidensia* founding partners.

Scope of the Review

To be included in the review (and in the corresponding *Evidensia* visual summary), each paper (called a 'resource') had to meet a detailed set of inclusion criteria. It had to empirically compare the performance of farms implementing a VSS or related initiative to a non-participating control group, with the treatment and control groups selected using a rigorous matching process. Resources were also included if they compared a treatment and control group at multiple points in time (pre- and post-intervention) without matching, if they used modeling techniques to compare treatment and control scenarios, or if they conducted randomized controlled trials.[4] Excluded from the analysis were systematic reviews, routine monitoring reports published by VSS, modelling studies that examine future scenarios, and descriptive (i.e. non-analytical) resources.

Resources sometimes contained more than one 'study'; for example, they examined outcomes in distinct regions or using different methods. The scope of the study population included in the analysis was quite broad: farms producing agricultural commodities (including honey but excluding cattle and other animal products) in any low- or middle-income country. In practical terms, this meant that research conducted in any region except Western Europe, Australia, New Zealand, and the US and Canada was included.

The list of eligible VSS and related initiatives are found in Annex C. Organic certification was included if it was paired with another VSS; however, studies that looked at the impact of organic certification alone were excluded. Related supply chain initiatives, including company sourcing codes, public or quasi-public sustainability standards, commodity-specific bans or moratoria, and supply chain investment programs, were also investigated. The impacts of these supply chain tools are examined separately from the VSS findings.

As noted earlier, the examined outcomes were yield, price, cost of inputs, crop income (net and gross), and net household income.

Search Strategy

The search strategy was designed to take advantage of the fact that the inclusion parameters listed above very closely matched those used in the Oya et al. review. Thus, in order to avoid repeating the literature search for the years covered in the Oya et al. review (1990 to November 2015), for that time period the list of papers that passed Oya et al.'s screening process – made available through the generosity of the report authors – was used as the list of papers that would be screened for the present review. Because the review by Oya et al. covered more outcomes than this one, only the subset of

[4] These study types correspond to the following Evidensia evidence typology categories: 'empirical study – matched control, data collected before and after intervention,' 'empirical study – matched control, data collected post-intervention,' 'empirical study – control not matched, data collected before and after intervention,' 'modeling study - two scenario comparison,' and 'empirical study – randomized control trial.'

papers that addressed the five outcomes of interest were included. In addition, Oya et al.'s meta-analysis involved extracting information about effect size and variance that was not necessary for this narrative review and visual summary.

For consistency, the search strings published in Oya et al.'s protocol (with some modifications) were repeated for the time period November 2015 to April 2019. These search strings are provided in Annex A; the list of academic databases used, and sources of gray literature searched, are shown in Annex B. The search results were cross-checked against a list of 'golden papers' to ensure that they were comprehensive. Only English-language papers were included, due to time and resource constraints.

The papers identified for the 2015-2019 period were screened first by title and then by abstract. The full text of the resulting list of eligible papers was acquired, along with those identified in Oya et al.'s original search. Those papers were read at the full text level. A record of articles excluded at the full text level, including the reason for exclusion, was maintained.

The search and screening strategy described above was adapted for non-VSS supply chain initiatives, such as public or quasi-public sustainability standards, company sourcing codes, and supply chain investment or training programs, which had not been included in the Oya et al. review. The search for studies related to these initiatives covered the period 1990 to April 2019.

Results Extraction

Resources that met the inclusion criteria were coded in an Excel database. If a resource included more than one 'study', each study was coded separately. A single study could contain results for multiple outcomes.

One of three team members coded each paper. For each result, the coder determined which of the five target outcomes was examined; which VSS or related initiative (or combination thereof) was examined; which specific metric was used; which statistical test was used (and the p-value, if provided); and the author's conclusion about the relationship between the treatment and outcome. When discussing the results in this report, the term 'statistically significant' is based on the study author's conclusion; for the vast majority of cases this indicates a p-value of 0.05 or less. Coders also recorded contextual information such as location, crop, date of data collection, and other variables.

To assess and ensure the consistency of coding among the multiple coders, Kappa tests were conducted at both the title and abstract screening level. At the full text level, periodic coding of the same article was done to ensure consistency. If a coder was affiliated in any way with an organization that commissioned or published an article, or with an initiative that was examined in the research, that article was coded by one of the other team members.

Results

Overall, 39 resources detailing 49 individual studies on VSS participation published between 1990-2019 met the inclusion criteria. The number of qualifying studies on related supply chain initiatives was substantially lower, at three. Due to this low number, the results on non-VSS supply chain initiatives are discussed at the end of the *Results* section, separately from the VSS findings.

VSS Research Trends Over Time

The number of studies that qualified for inclusion increased over time, with more studies published between 2015-2019 (29 studies) than in the previous 25 years (20 studies; Figure 1). Based on the inclusion criteria, the number of qualifying studies peaked in 2016 (13 studies).

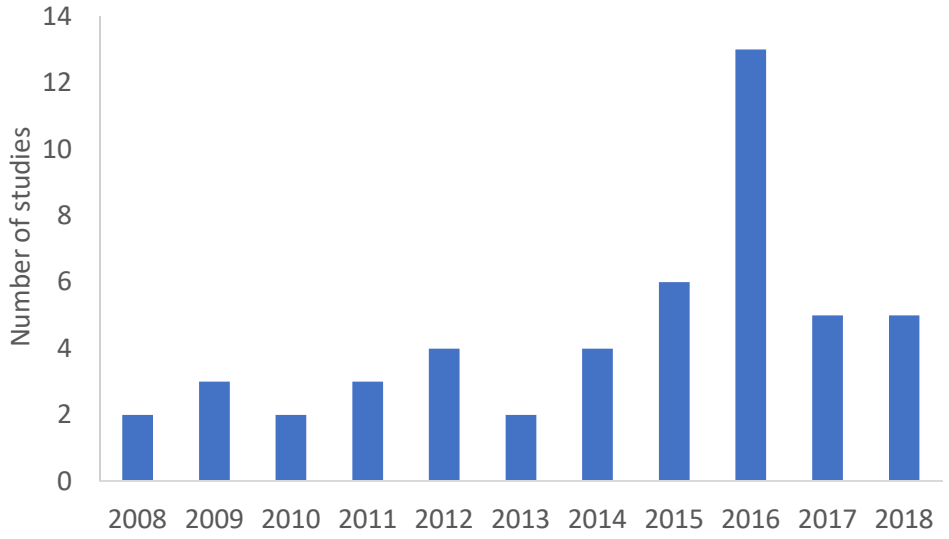

Figure 1. Number of studies included in this review, by publication year.

The review includes studies from low- and mid-income countries, which fell into five major tropical and subtropical regions:[5] Africa, Asia, South America, North America (Mexico only), and Central America/ Caribbean. There were no qualifying studies from Oceania, the Middle East, or Eastern Europe. Africa was the region with the highest number of qualifying studies, at 27. Asia was the second-most frequently studied region, with 11 studies. While the number of studies in Africa remained fairly consistent over time, studies focusing on Asia were rare prior to 2015 and peaked in 2016 (Figure 2). Combined, Central America/Caribbean and South America were the site of research in nine studies, and Mexico in two.

[5] The regional groupings correspond to those used in the ITC Sustainability Map: https://sustainabilitymap.org/

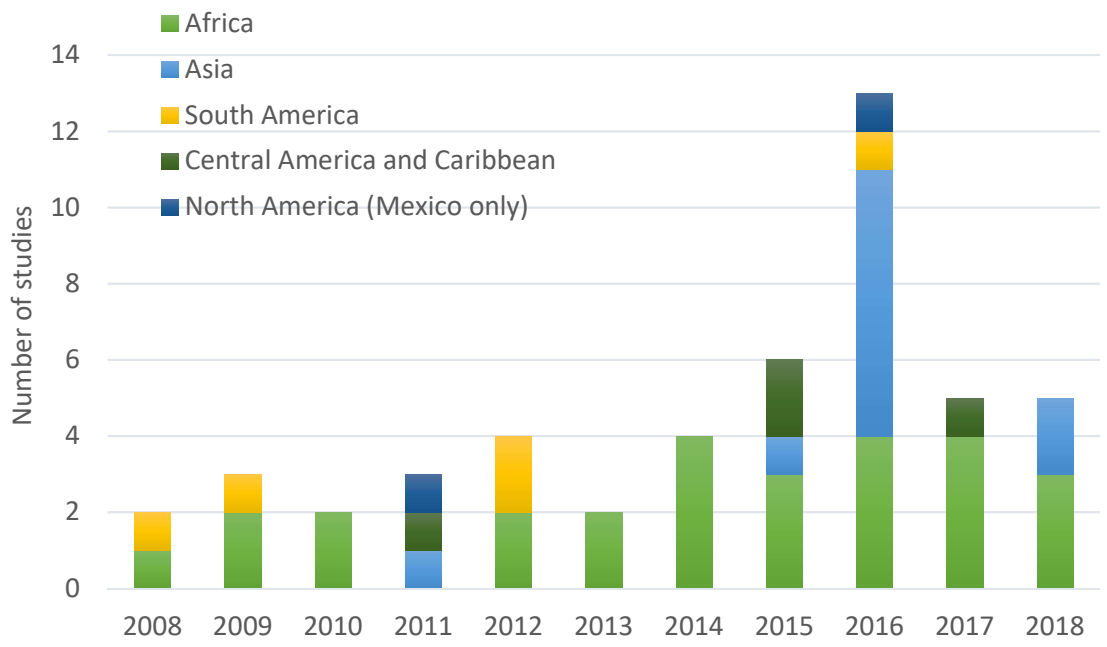

Figure 2. Number of qualifying studies by region. No resources were found in Oceania, the Middle East, or Eastern Europe.

In total, 12 agricultural crops were analyzed in the studies that qualified for inclusion in this synthesis. Coffee was the most frequently-studied crop, appearing in 29 studies, and was the subject of 158 individual results. The number of coffee-focused studies peaked in 2016, with eight studies (Figure 3). The second-most commonly studied crop was cocoa, which appeared in seven resources and 23 individual results. Tea was investigated in four studies and 10 results, while bananas and palm oil were the focus of one study each. The remaining seven crops were grouped in an 'other' category, and included black pepper, cotton, honey, lychee, peas, rice, and one study that addressed 'all agriculture.' Combined, 'other' crops were the focus of nine studies and 22 individual results.

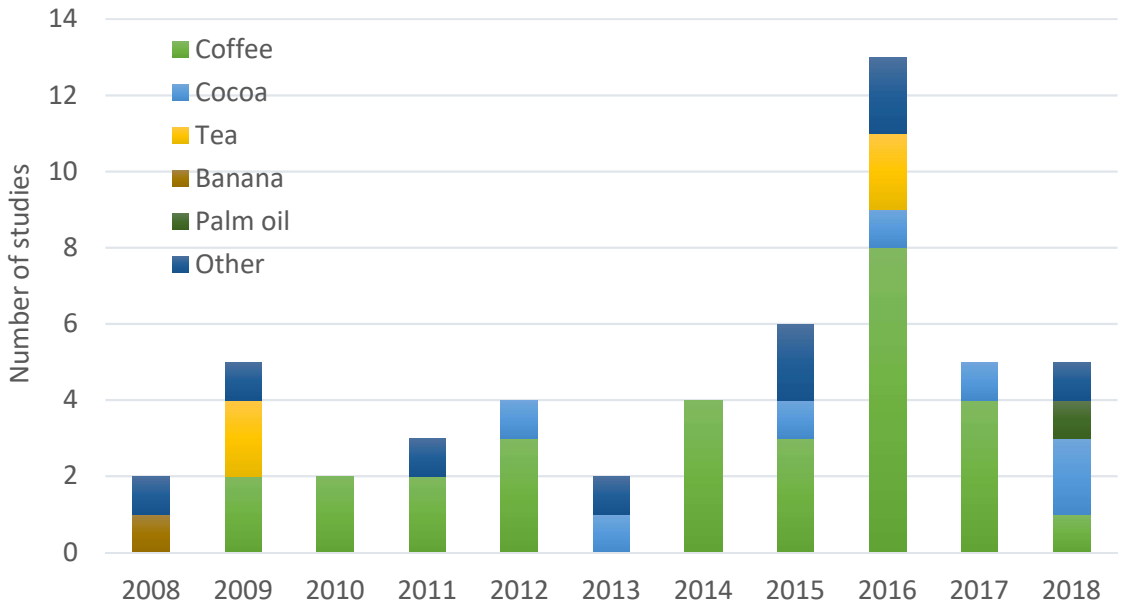

Figure 3. Number of qualifying resources by crop studied, over time. One resource, from 2009, addressed two crops (coffee and tea). 'Other' includes black pepper (three resources), cotton, honey, lychee, peas, and rice (one resource each), and one resource that addressed 'all agriculture.'

Of the VSS that were assessed for this review, Fairtrade was the most common, appearing in 33 qualifying studies, and was the intervention under study in 146 results. Organic was the second-most commonly studied VSS, appearing in 25 studies and 107 results. In keeping with the methodology applied by Oya et al. (2017), this synthesis did not include any studies where organic was the only VSS applied. That is, all studies that address organic agriculture also include a co-certification scheme (e.g., Fairtrade-organic). UTZ certification appeared in 18 studies and 94 results, while Rainforest Alliance (RA) was studied in 12 studies and was the subject of 65 results. 4C Association certification appeared in four studies, all of which were published in 2016 or later, and was the subject of 22 results (Figure 4). Finally, 'other' VSS, which included Global GAP, Better Cotton Initiative, and Roundtable on Sustainable Palm Oil (RSPO) appeared in five resources and 10 results.

Notably, many resources addressed multiple VSS (i.e., multiple certification). The most common multiple certification was Fairtrade-organic, which was investigated by 11 studies. Fairtrade-organic-UTZ was the subject of five studies, and Fairtrade-organic-RA certification was the subject of two studies.

Although the inclusion criteria permitted research conducted with any of five different *Evidensia* evidence typology categories, only studies from two categories ultimately passed the inclusion criteria. Forty studies used rigorous matching methods to establish control groups and involved data collection post-intervention only, while nine used rigorous matching methods but involved data collection both before and after the intervention (Figure 5). There were no eligible randomized control trials, no eligible studies that used unmatched controls and collected data before and after the intervention, and no

eligible modeling studies that compared treatment and control scenarios. There do not appear to be any temporal trends in the frequency of the two evidence typology categories of the included studies.

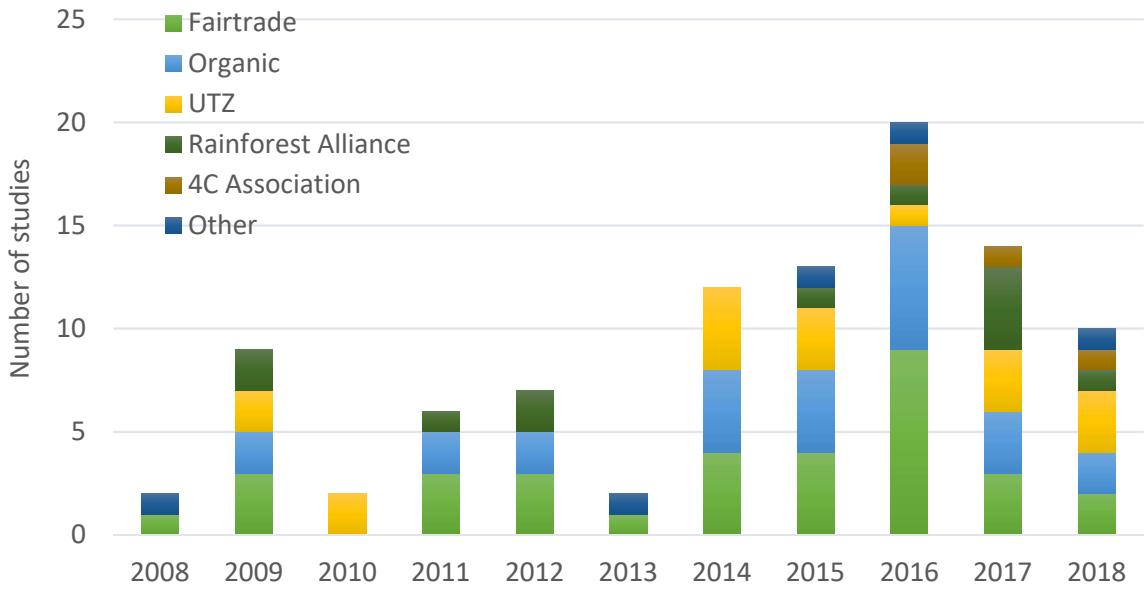

Figure 4. Number of qualifying studies by voluntary sustainability standard (VSS) addressed, over time. Many resources addressed multiple VSS schemes (i.e., multiple certification). 'Other' includes Global GAP (three resources), Better Cotton Initiative, and Roundtable on Sustainable Palm Oil (one resource each).

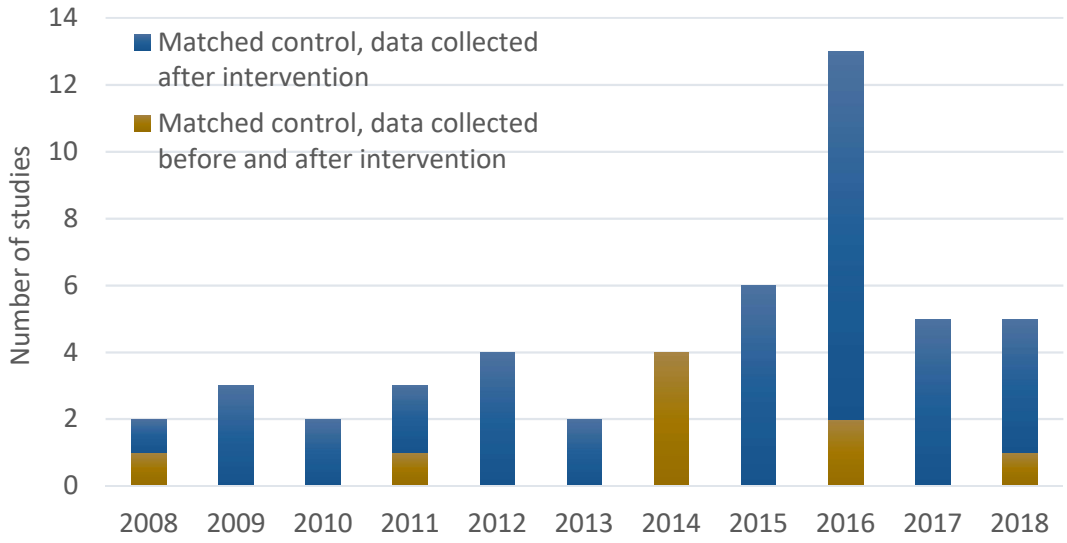

Figure 5. Number of qualifying resources by evidence type, over time. No studies were found in the eligible categories 'empirical study - randomized control trials,' 'empirical study - control not matched, data collected before and after intervention,' and 'modeling studies - two scenario comparison.'

Evidence Hotspots and Gaps

As noted above, coffee dominated as the crop most frequently addressed by studies included in the review (Table 1). However, only 5% of the 158 results for coffee investigated the effect of VSS participation on household income, which was by far the least studied outcome overall. The remaining 150 coffee results were fairly evenly split between studies on yield, input costs, price, and crop income. A matrix showing the number of results for each combination of crop and outcome (Table 1) illustrates that yield was the only outcome studied for all crops. Coffee and cocoa were the only two crops with results available for all five outcome categories.

Table 1. Gap map matrix showing the number of results for each combination of outcome and crop.

		Coffee	Cocoa	Tea	Banana	Palm oil	Other
Participant Costs and Benefits	**Yield**	40	7	2	1	1	3
	Input costs	29	4	4	0	0	4
	Price	41	3	0	1	0	4
	Crop income	40	8	4	1	0	9
	Household income	8	1	0	1	0	2

A matrix showing all VSS-outcome combinations (Table 2) reveals that Fairtrade, organic, UTZ, and Rainforest Alliance (RA) were each the intervention of interest for a large number of results across the four most frequently-studied outcomes (yield, input costs, price, and crop income). Often, these four VSS (and, less frequently, 4C Association) were combined in multiple certification schemes, which explains the consistent distribution of results between VSS. Again, household income was by far the least-studied outcome, followed by input costs. For example, only ~6% of the 146 results from Fairtrade participation addressed household income, while approximately 25% looked at each of yield, price, and crop income.

In the 'other' category, Global GAP was the VSS program behind five results and Better Cotton Initiative was behind four results. Only one result (concerning yield) looked at the impact of Roundtable on Sustainable Palm Oil.

Table 2. Gap map matrix showing the number of results for each combination of outcome and voluntary sustainability standard (VSS).

		Fairtrade	Organic	UTZ	RA	4C	Other
Participant Costs and Benefits	**Yield**	36	24	23	18	6	2
	Input costs	23	21	21	14	4	2
	Price	37	25	21	13	4	2
	Crop income	41	28	24	18	6	4
	Household income	9	9	5	2	2	0

Effects of VSS Participation on Outcomes of Interest

This review focused on five livelihood-related outcomes: yield, input costs, price, crop income, and household income. These outcomes are discussed individually in sections below.

Of the five outcomes, crop income was the most frequently assessed, with 60 results addressing this outcome (Figure 6). Yield was the second-most frequently studied, with 52 results, followed by price (49 results), input costs (39 results), and household income (12 results).

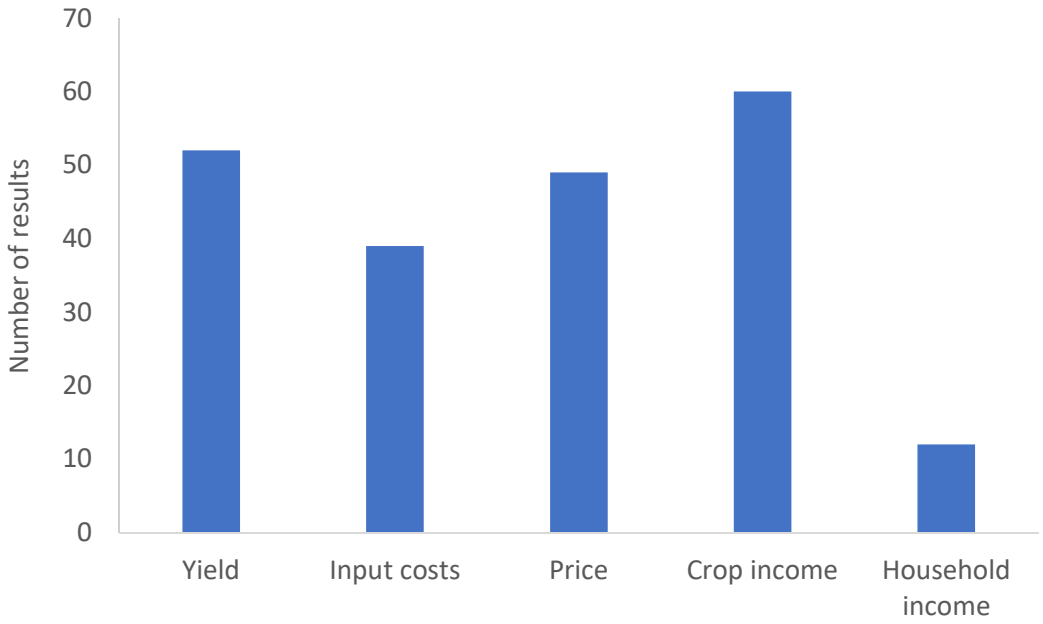

Figure 6. Number of results in each outcome category.

Below, the review findings are presented by indicating, for each outcome, how often the VSS intervention was significantly higher, no different, or significantly lower than control (i.e., farms not applying the subject VSS). Generally, 'significantly higher' implies that the certified crop/farm outperformed the conventional farm, while 'significantly lower' implies the opposite. For example, significantly higher yields, prices, and incomes are desirable. The one exception is for input costs, where 'significantly higher' is not necessarily preferred. While significantly higher labor costs *might* mean that farms are more financially stable and can afford to hire non-family labor (i.e., a financially positive development), it could also mean that farms are required to implement more labor-intensive farming practices and have higher costs (i.e., a financially negative development). Similarly, significantly higher fertilizer costs *might* mean that farms are optimizing their soil health and improving yields, or it might mean that farmers are required to use more or costlier fertilizers to meet VSS requirements. Therefore, care must be taken when interpreting the results associated with input costs.

Combining all outcomes except input costs, participation in a VSS resulted in significantly higher outcomes than control farms for 49% of results (85 results). A similar number of results showed no significant difference between VSS and control crops (77 results; 45%). Outcomes from VSS interventions were significantly lower than control crops in 11 results, or 6% of the total.

Price and crop income had the largest proportions of 'significantly higher' results, with 59% and 55%, respectively (Figure 7). These were the only two outcome categories where the intervention performed significantly better than the control in the majority of results. Input costs had the largest proportion of 'significantly lower' results (26% of input costs results). But, as noted above, the directionality of input costs (i.e., higher or lower) does not have a consistent relationship to the desirability of the outcome (i.e., better or worse performance). Household income had the largest proportion of 'no difference' results at 67%. This outcome also had the fewest data points as only 12 results addressed household income.

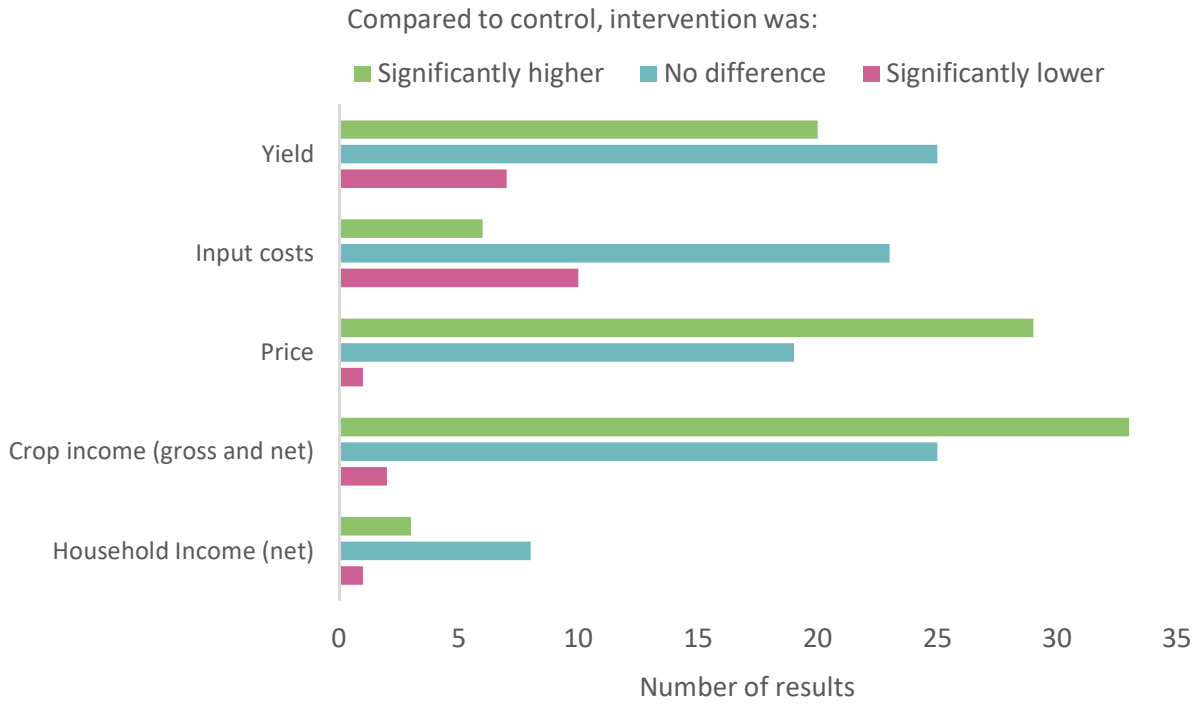

Figure 7. Outcomes (yield, input costs, price, crop income, and household income) by directionality of results.

Yield

Yield refers to the quantity of crop harvested from a given producer and is most often reported with a per-area metric (e.g., kg/ha). Thirty-eight percent of results that examined this outcome found that yield was significantly higher on VSS-certified farms; 48% found no difference; 14% found that yield was significantly higher on non-certified farms.

Most qualifying yield results were from studies carried out in Africa, and most addressed coffee as the crop of interest (Figure 8). Of all crops investigated for the yield outcome, coffee was the only crop with any instances where control yields were significantly higher than yields from a VSS-certified crop (seven of 40 results). However, the majority of results from coffee showed that VSS yields either outperformed or were not significantly different from control yields. Of the studies from Asia and North America (Mexico only), no results revealed instances where control yields outperformed yields from a VSS-certified crop.

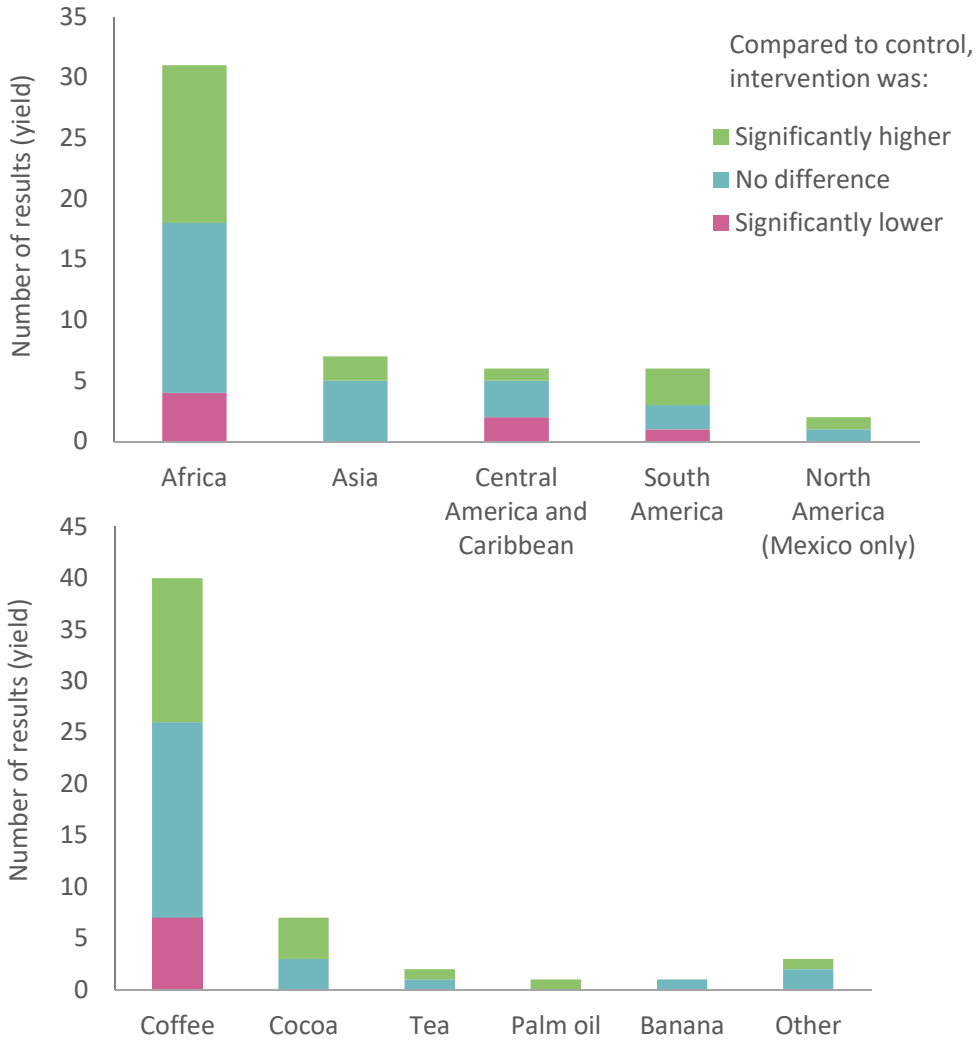

Figure 8. Directionality of yield results by geographic region (top) and crop (bottom).

Input Costs

Input costs describe the money that goes towards planting, managing, and/or harvesting a given crop. For example, these costs can include fertilizer, pesticides, and equipment, in addition to labor costs (i.e., wages paid to farm workers). Studies that qualified for inclusion in this synthesis differed in terms of how they measured input costs, with some including a more comprehensive set of cost indicators than others. As noted above, while lower input costs may seem to be preferable over higher ones, this is not always the case and thus the data presented here should be interpreted carefully. Most results from the analysis of input costs revealed no significant difference between VSS and control crops (59% of results). There were six results where input costs under a VSS scheme were significantly higher than the control group (15%), and 10 results where input costs for certified farms were significantly lower than the control group (26%).

Input costs were addressed in studies from every geographic region except North America (Mexico only; Figure 9). Africa was again the region with the highest number of qualifying studies that addressed input costs (24 results). There were no qualifying studies that examined input cost for palm oil or bananas, and most studies investigating the effect of VSS participation on input costs addressed coffee.

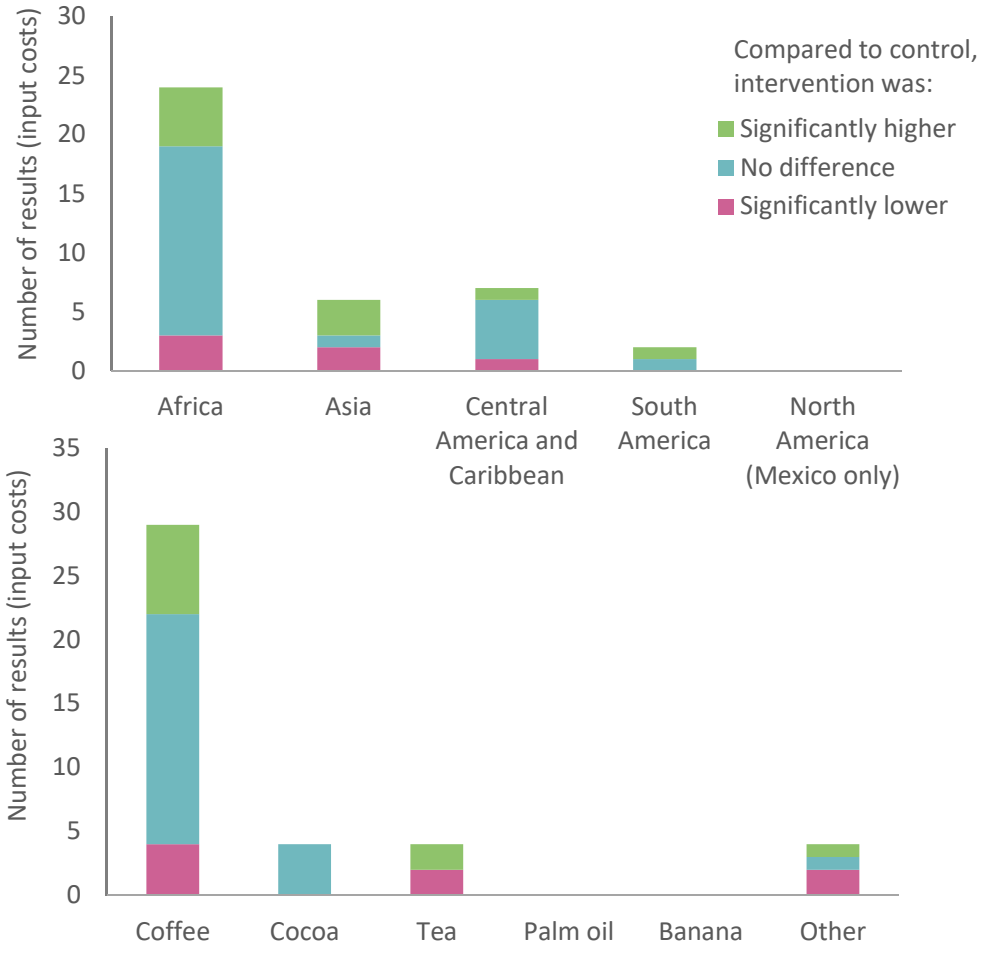

Figure 9. Directionality of input cost results by geographic region (top) and crop (bottom).

Price

Price refers to the money paid to the producer for a given crop, often measured in a per-weight or per-volume metric (e.g., USD/kg). When VSS-certified crops are purchased for a higher price than their non-certified counterparts due to their certified status, the difference in purchase price is known as a price premium. Notably, only one result revealed an instance where VSS-certified crops received a significantly lower price than conventional crops (Figure 10). The majority of results (59%) for the price outcome showed that VSS-certified crops received a significantly higher price than non-certified crops; 39% of results showed no significant difference.

Studies addressing the impact of VSS participation on crop price were most frequently from Africa, and the number of price results that addressed coffee (41 results) far outnumbered other crops (eight results). No results were available about price for certified tea or palm oil.

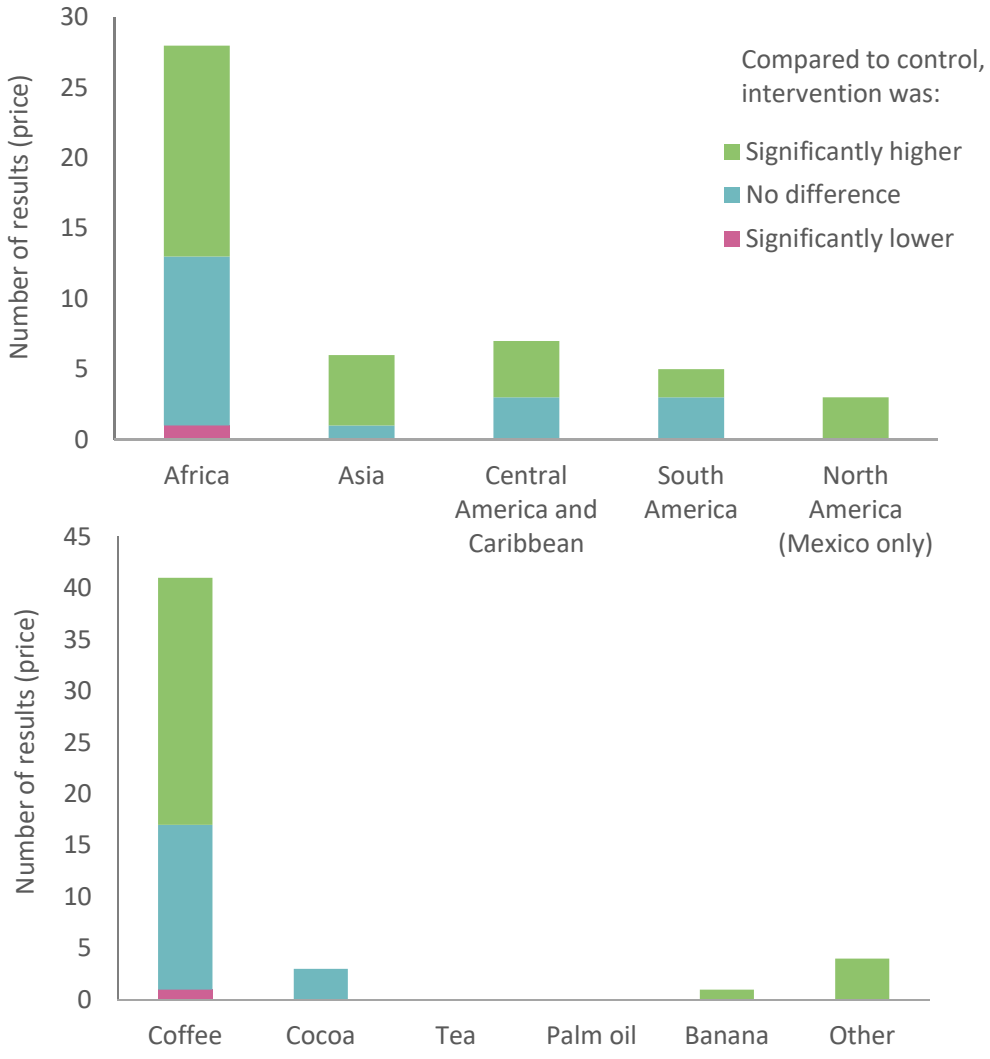

Figure 10. Directionality of price results by geographic region (top) and crop (bottom).

Crop Income

Both gross and net crop income were included in this review. Gross crop income refers to total income derived from a given crop, while net income is profit from that crop (i.e., gross income minus costs). A weakness of the 'crop income' outcome is that it reveals only one component of farm finances, which may or may not be directionally related to the farm's overall profitability. For example, a farmer who chooses to spend more time cultivating her certified crop and less time pursuing off-farm employment might see improvements in crop income, but reductions in total household income (discussed in the next section).

For this outcome overall, 55% of results showed that VSS participation resulted in significantly higher crop income compared to non-certified farms. No significant difference between certified and non-certified crop income was found in 42% of results. There were very few instances where the control farm provided higher crop income than the VSS-certified farm; coffee is the only crop where this occurred, and it was observed in only two out of 40 results for coffee (Figure 11)

There were no qualifying studies that addressed the impact of VSS on palm oil income. For all other crops, more results revealed a significantly positive effect of VSS participation on crop income than showed a neutral effect.

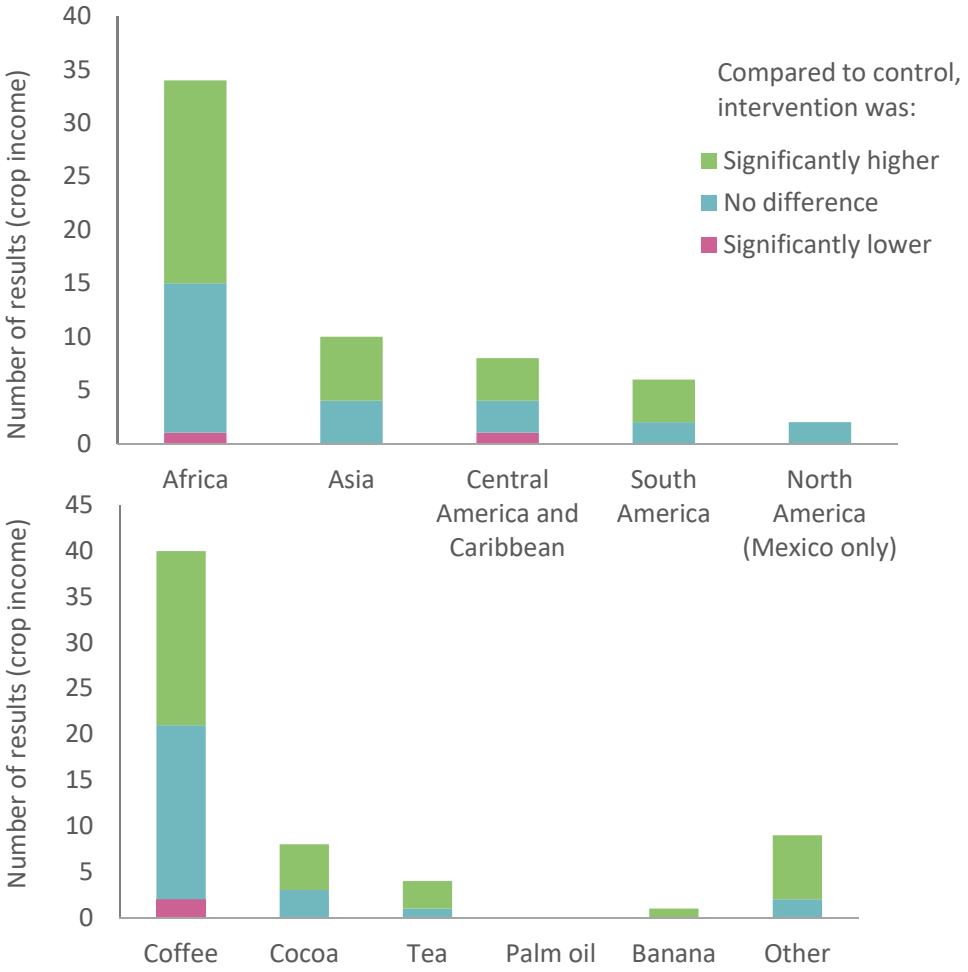

Figure 11. Directionality of crop income results by geographic region (top) and crop (bottom).

Household Income

Net household income refers to income from all crops and other sources (including off-farm employment), minus household expenses and the costs of crop production. The outcome 'gross household income' was excluded from this review since it has the potential to mask some of the important tradeoffs that VSS compliance can cause. Net household income, on the other hand, indicates the total profitability of the household's economic activities – it reflects the capital that is available to farmers for savings, new farm investments, and loan repayments, among other uses of funds.[6] As a result, poverty experts agree that net income is a better indicator of household wellbeing than other common measures, such as gross income, assets, access to credit, or debt.

Net household income was the least-addressed outcome of interest in studies that qualified for inclusion in this synthesis – only 12 results addressed this outcome. As a result, the interpretability of these findings is hindered by the small sample size and lack of data from certain regions and crops. For example, there were no qualifying results from North America (Mexico), none for tea or palm oil, and only one each for cocoa and banana. Coffee was by far the most frequently addressed crop for this outcome, accounting for 67% of results.

Overall, the majority of results (eight results; 67%) that addressed household income showed no significant difference between farms certified under a VSS scheme and non-certified farms; 25% showed that VSS-certified farms had higher household income; eight percent showed that household income was significantly higher on non-certified farms.

Five of the 12 results were from studies that took place in Africa, and all results from Africa showed that the VSS intervention resulted in either significantly higher household income than control farms, or similar household income (Figure 12). Similarly, all results from Asia and Central America/Caribbean (four results total) revealed either significantly positive impacts of VSS schemes on household income or neutral impacts. One result from South America showed than VSS participation resulted in a significantly lower household income compared to non-certified farms.

[6] Moran, J. 2009

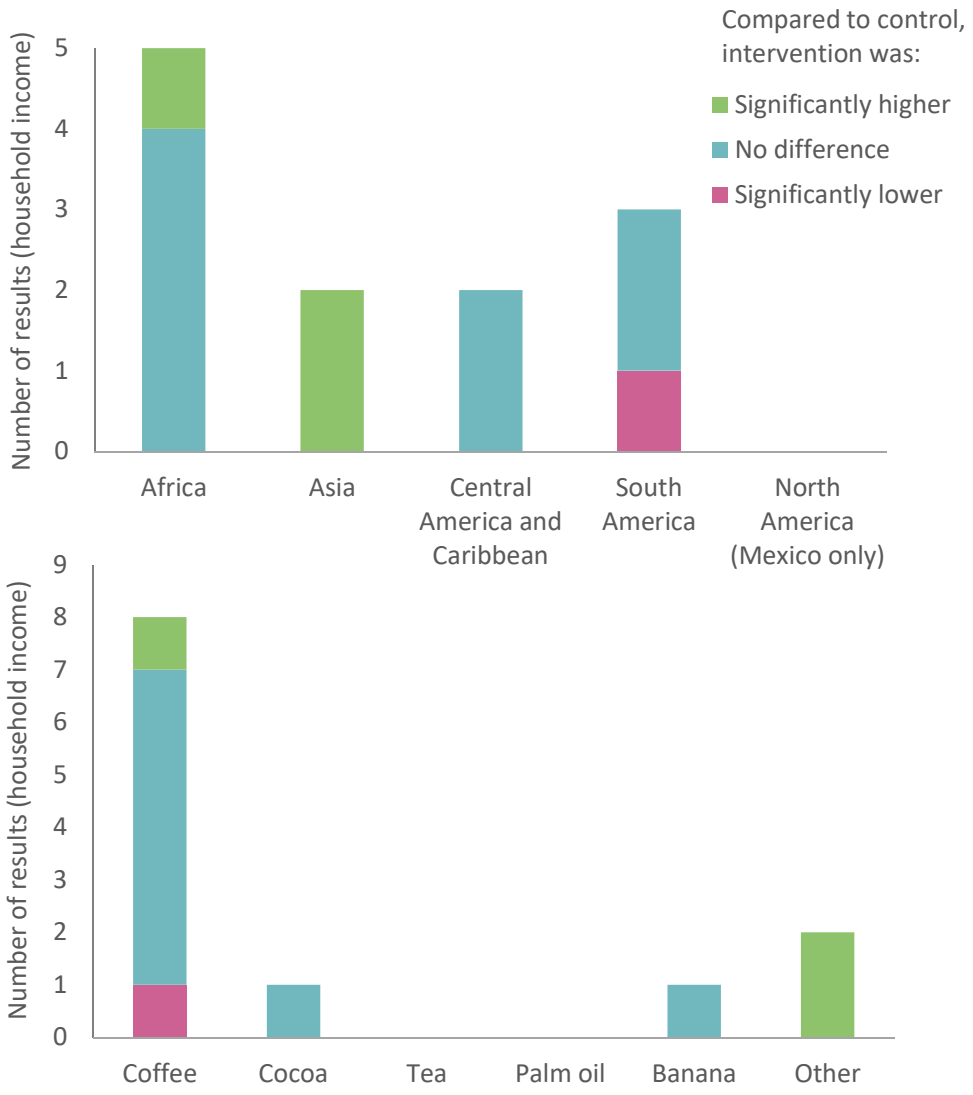

Figure 12. Directionality of net household income results by geographic region (top) and crop (bottom).

Building on Previous Reviews

The systematic reviews by Oya et al. and DeFries et al. both applied rigorous, systematic approaches to comprehensively survey available literature published before November 2015 and February 2016, respectively (in this section, the studies published since these reviews are referred to as 'post-2015 studies'). As a result, these previous reviews act as a valuable baseline for subsequent analyses and provide context and important points of comparison for the current synthesis. In this section, the findings of those reviews related to the outcomes of interest are summarized. This section also includes a reflection on the extent to which the post-2015 studies reinforce findings of these prior reviews.

While both reviews employed systematic methodologies, they differed in their scope and focus. Oya et al. sought to answer the question of whether VSS impact the wellbeing of agricultural producers of any crops, in low- and middle-income countries. This study involved the extraction of both qualitative and

quantitative information and resulted in a meta-analysis of outcomes for which enough quantitative data were available. Oya et al.'s review drew from books, conference proceedings, theses, and grey literature published in five languages, in addition to peer-reviewed primary literature. In total, Oya et al. analyzed 43 quantitative studies.

DeFries et al. analyzed the effect of VSS on economic, environmental, and social outcomes for smallholder farmers of bananas, coffee, tea, palm oil, and cocoa in the tropics. The authors of this review grouped a wide range of response variables into four broad categories, 'economic,' 'environmental,' 'social' and 'other,' and indicated what percentage of each category's comparisons found that VSS-certified farmers performed significantly better, worse, or the same as a non-certified control group. DeFries et al. included English-language peer-reviewed papers in their analysis, for a total of 24 quantitative studies.

The reviews by Oya et al. and DeFries et al. both found a predominance of studies that were carried out in Latin America and Africa. In studies published since these reviews' cutoff dates, Africa continued to be the focus region in a large proportion of studies (48% of post-2015 studies), and the number of studies occurring in Asia increased considerably, to 39% in the years since Oya et al. and DeFries et al.'s reviews. Only three post-2015 studies (13% of total) took place in Latin America. Of the certification schemes analyzed in the two previous reviews, Fairtrade was the most common, and coffee was the most commonly assessed commodity. Since then, Fairtrade remained the most frequently-assessed VSS, appearing in 61% of post-2015 studies and coffee was still the most commonly-studied crop, appearing in 57% of post-2015 studies.

In both the Oya et al. and DeFries et al. reviews, the majority of results revealed non-statistically significant effects of VSS on economic outcomes. In papers published since those reviews, the VSS group performed significantly better in 57% of the comparisons, there was no difference between the VSS and control groups in 34% of comparisons, and the control group performed significantly better in 9% of comparisons (the outcome 'cost of inputs' was excluded from this tabulation, as the designation of 'better' or 'worse' performance for this outcome is difficult to assign, as previously noted).

Oya et al. did find statistically significant effects for certain economic indicators. Specifically, their meta-analysis showed a significantly positive effect of VSS on price paid to farmers (14% higher than non-certified, on average), and a significantly positive effect on product income (11% higher than non-certified, on average). However, there was not strong evidence that these economic benefits translate into higher household income: their analysis revealed that certified producers had 6% higher household incomes, but this result was not significant. The results showed no clear effect of VSS on yield.

DeFries et al. employed a different approach to their analysis, which did not allow for assessment of the significance of individual outcomes. However, their analysis revealed that 56% of studies addressing net income from the focal crops showed a significantly positive effect of VSS, while 24% of studies that addressed household income had a significantly positive effect. Again, this result suggests that although certification may result in higher crop-related income, it translates into higher household income less frequently.

The results of the present review are very consistent with these findings of the two prior reviews. Post-2015, approximately two-thirds of the comparisons between VSS and non-VSS farmers found that VSS-certified farmers had significantly higher prices and crop income. However, the effect of VSS on net

household income was weaker: only one-fifth of the comparisons found that VSS participation increased net household income; 80% of comparisons found no difference.

The reviews by Oya et al. and DeFries et al. both emphasize that very few rigorous quantitative studies were available. For example, neither review found any studies that used an experimental approach (e.g., randomized control trial), but rather a preponderance of quasi-experimental studies (e.g., comparison of certified and non-certified farms through matching). While the number of quasi-experimental studies increased post-2015, no experimental studies were found in that time period. This is not surprising given the well-documented challenges of conducting such research on VSS, including the operational and ethical difficulties of randomly assigning farmers to treatment and control groups.

Although both previous reviews set out to answer relatively simple questions about the influence of VSS on specific outcomes, the authors found that context was pivotal to the effectiveness of the intervention. Ultimately, they found that the complex socio-economic factors and environmental conditions that interact with VSS can make it challenging to generalize about their effects. The influence of intervening variables was also observed on the outcomes of interest in the post-2015 studies; these observations are presented in *Further Exploration*, below.

Evidence from Related Supply Chain Initiatives

Our review of non-VSS supply chain initiatives revealed that these programs generally have a neutral to positive impact on economic outcomes. From the three empirical studies that qualified for inclusion in our analysis, we found 11 results that addressed the five outcomes of interest. All three studies focused on coffee as the crop under study but spanned three geographical areas: Asia, South America, and Central American/Caribbean. Two of the studies investigated the impact of C.A.F.E. Practices and the third addressed Nespresso AAA, which are sustainable sourcing codes managed by Starbucks and Nestlé, respectively.

All results from these studies showed either a neutral or positive influence of program participation on economic outcomes. In particular, all results for price (two results total) and two out of three results for crop income showed that certified farms performed better than non-certified farms. Further, all results for input costs (two results total) showed lower costs for certified farmers. Yield results suggested a weaker effect: two out of the three results showed no difference between certified and uncertified farms. Only one result looked at the impact on net household income and revealed no significant difference between certified and uncertified households.

Overall, we found very few empirical studies of non-VSS supply chain initiatives that met the inclusion criteria for this review. However, multiple studies provided descriptive evidence of the effect of these programs on the economic wellbeing of farmers, which made it possible to draw tentative conclusions about their impact. For example, in keeping with the empirical findings above, Macdonald (2007) found that growers certified by C.A.F.E. Practices generally received a price premium, although high input costs associated with the program prevented some smallholders from participating. In contrast, in the palm oil sector, quasi-public sustainability standards such as the Indonesian Sustainable Palm Oil Standard (ISPO) and the Malaysian Sustainable Palm Oil Standard (MSPO) have generally failed to confer a price premium to smallholders (Larsen 2018; Gnych 2015). In addition, multiple studies noted high input costs associated with sustainable palm oil schemes because of the need to upgrade farming systems and

improve farm management to meet the criteria of these programs (Larsen 2018; Hutabarat 2017; Gnych 2015; Neilson 2008).

Similar to our findings from the VSS analysis, we found that the impact of non-VSS supply chain initiatives such as sustainable sourcing codes, specific national policies, and quasi-public sustainability standards is varied and further complicated by pre-existing social and economic dynamics. We also found that social and financial barriers often prevent smallholders from participating in these programs. These issues are discussed further in the section below.

Further Exploration

The goal of this report was to systematically search for and extract information from rigorous scientific studies on specific economic outcomes: yield, input costs, price, crop income (gross and net), and net household income. The findings of that effort – described in terms of the directionality and significance of each result, broken down by crop, region, and year – are summarized in previous sections of this report and can be interactively viewed in the corresponding *Evidensia* visual summary.

Although it was not an explicit part of the review methodology, during the screening and coding of papers the research team also made observations about the effects of contextual variables such as cooperative group characteristics, farm size, and sources of off-farm income, and how they affected the outcomes of interest. While the papers were not systematically reviewed to identify such relationships, in this section these observations are explored to enhance the quantitative findings and identify future areas of research.

The Role of Groups

For VSS-certified smallholder farmers, group membership is virtually ubiquitous. Often these farmer groups have existed for many years or even decades before certification; in other cases, previously-unaffiliated smallholder farmers have been organized into groups with the main purpose of administering and sharing the costs of certification. Most groups are cooperatives, which are member-owned business organizations that allow groups of smallholders to oversee crop production and marketing while providing a collective structure to help manage these activities.[7] The services provided by cooperatives are variable but can include technical assistance and training, financial services and loans, provision of market information, distribution of farm inputs, and, in some cases, provision of processing equipment. Cooperatives also lend bargaining power to smallholders, minimizing the risk they would otherwise face entering the market on their own. VSS-certified cooperatives are typically required to use democratic principles for decision-making and are responsible for distributing any premiums gained from certification to its members.

Some of the studies examined for this review shed light on the role that cooperatives play in the financial health of their members and suggest that cooperatives can 'make or break' the financial utility of VSS participation for group members. There are many examples of the positive effects of group membership. A study by Ingram et al. (2017) reveals that 77% of UTZ-certified smallholders felt that being a member of a cooperative had helped them get a good price for their certified cocoa. Further, 90% of UTZ-certified farmers stated that cooperative membership had facilitated selling of their certified product (Ingram et al. 2017). In addition, as suggested in Oya et al., integration into VSS-certified

[7] Ahmed and Mesfin, 2017

cooperatives allows smallholders to gain access to export markets that would be inaccessible to individual farmers. This finding is supported by a recent study of black pepper in India that found that Fairtrade cooperatives improved business opportunities for members by forging long term relationships with importers in developing countries (Parvathi and Waibel 2016).

In addition to increasing market access and providing technical, business, and financial support, the provision of training to members is often cited as a major benefit of membership in a VSS cooperative. Training can cover topics such as farm management, cooperative capacity building, business education, and training on improved agricultural practices. Ingram et al. (2018) found that 86% of UTZ-certified cocoa cooperative members had accessed training programs and, on average, farmers were satisfied with these programs. However, in their review, Oya et al. found that training interventions are typically not effective in increasing farmers' yields, or when they do increase yields, the impacts of those improvements are offset by other contextual factors. The authors note that this failure of training might be due to a lack of effective implementation, or because of the costs or unavailability of inputs. Ingram et al. (2018) compared the efficacy of different types of training packages and found that farmers receiving a 'complete agro-service package' (consisting of training on good agricultural practices combined with training on pesticides and fertilizers) did have higher net income than those that received no or incomplete packages.

However, the weaknesses identified by Oya et al. in the functioning of many cooperatives – namely, elite capture and a disproportionate influence of larger or more powerful group members on decisions – are echoed in some of the studies assessed for this review. Specifically, the ability of cooperatives to fairly and transparently pass price premiums and other benefits to members is quite variable. In a study of Fairtrade cocoa cooperatives in Ghana, researchers found that the vast majority of the premium awarded to the cooperative went to projects, management, and other services, with very little directly reaching the farmer as cash payment (by adding the premium, the value received by farmers per bag of cocoa increased by just under one percent, or 2 GHC – about $0.40 USD) (Nelson et al. 2013). In a study of UTZ-certified cocoa farmers in Cote d'Ivoire, 33% of group members thought that their cooperative needed to improve transparency on prices and premiums, and 20% indicated that they wanted more information on how premiums retained by the cooperative are used (Ingram et al. 2018).

In addition, cooperatives struggle to consistently confer benefits across groups and farms of variable size. A study of coffee in Mexico found that growers in Fairtrade-organic cooperatives with many members received lower prices than those in cooperatives with fewer members (Weber 2011). Another study of Global GAP-certified lychee farmers in Madagascar found that group members with the smallest farm plots did not receive higher prices for their crop, primarily because of their inability to transport their own products to market (Subervie and Vagneron 2013).

An in-depth examination of a Fairtrade cooperative in Ethiopia illustrates some of the structural challenges in the cooperative model (Jena et al. 2012). Here, through focus group discussions, researchers found that certified farmers viewed their cooperative solely as a buyer of their crop, and not as a supportive institution in which they could work together with other farmers to increase revenues, reduce costs, or reduce individual risks. Farmers reported relying on each other rather than the cooperative for price information, usually did not have written contracts with the cooperatives, and did not learn the price they would be paid for their crop until they brought it to the cooperative for purchase. Because the cooperative often didn't have enough funds to buy more than one-quarter of

their members' crops, the farmers sold the remaining crop to private traders, who did not pay a premium (and in fact paid less to certified farmers). Private traders also filled a gap that the cooperative often could not: the provision of credit. Farmers accessed loans from these traders, which were repaid in coffee during the next harvest season based on prices that were set by the trader and were typically lower than the prevailing market price. The authors also report that government-supported finance, where available, was a better source of credit than the cooperatives.

The Relative Importance of Yield and Price

As the number of steps between an intervention and an outcome increases, so does the influence of contextual factors. The current synthesis illustrates that this is indeed the case with the outcome 'net household income,' which at its most basic is calculated by subtracting all household expenses from all sources of household income. The complex relationship between the two variables that largely determine the gross income component of the net income equation for smallholder farmers – crop yield and price – has been quantified and discussed frequently in the literature.

The debate around the importance of price versus yield often centers on the relative effectiveness of two different (but not mutually exclusive) approaches: one that contends that guaranteed premium and minimum prices are the most effective way to safeguard smallholder financial viability, and one that contends that helping farmers access inputs and training to increase their yields is preferable. Each variable – price and yield – obviously can strongly influence total gross and net household income.

Some studies that have compared the relative roles of these two variables have concluded that improved yields are more important that price premiums for increasing coffee farmers' net income (Barham and Weber 2012; Ruben and Fort 2012). In a study of over 3,000 coffee farmers in Colombia, Garcia et al. (2014) found that farmers participating in VSS and related supply chain initiatives had stagnant yields over time, and that this was the main factor limiting the ability of these programs to provide an overall economic benefit to farmers. Another study found that reduced yields are typically not compensated for by a price premium: in a study of Fairtrade-organic certified coffee in Uganda, Vanderhaegen et al. (2018) found that on average only 40% of the income loss from yield reduction associated with use of the VSS was compensated by a price premium.

It is unclear whether this effect is due to the premium simply being too low to compensate for reduced yields, or whether not enough of the premium ultimately reaches the farmers. Difficulties in the transfer of premiums to producers has been frequently cited as an issue with VSS, with one study finding that exporters receive a significant premium for Fairtrade-organic coffee, but that producers receive less than one-third of that premium (Minten et al. 2015). This trend also holds true for related supply chain initiatives. For example, in a study of sustainable palm oil schemes in Indonesia, Larsen et al. (2018) found that prices are often set by intermediaries without farmer input, which limits farmers' bargaining power and leads to inequitable transmission of premiums down the value chain. Further, in places where there are limited markets for sales of certified product, or high local coffee process, the incremental benefit of a premium may be less (Ruben and Fort 2012). The challenges observed in the management of premiums by some cooperatives, noted above, can also limit the benefits of a premium.

Farmer Specialization and Substitution

Evidence suggests that the relationship between yields, prices, and income is made even more complex by specialization and substitution. Numerous studies found that farmers certified under VSS and related

supply chain initiatives such as C.A.F.E. Practices and Nespresso AAA tend to increase their specialization in coffee production at the expense of other activities on the farm (such as food production) and off the farm (such as non-agricultural employment) (e.g. Vellema et al. 2015; Ruben and Fort 2012). Some researchers have asserted that farm-level specialization allows the development of more effective market institutions, bringing down costs and increasing profitability within the local value chain. Ruben and Fort (2012) suggest that specialization is likely the result of the change in risk attitudes and increased entrepreneurial approach of farmers, which they say might be one of the most important benefits of VSS participation.

On the other hand, Vellema et al. (2015) found that specialization increased coffee income but not total household income. The time and effort required to specialize meant that farmers had to give up other activities. This substitution effect canceled out the income effect, in particular because non-agricultural activities were relatively lucrative compared to on-farm labor. They found that education and access to credit positively affected farmers' participation in and income from non-agricultural activities, and that a lack of access to land constrained specialization. In contrast, Kamau et al. (2010) found that participation in UTZ certification led not only to higher coffee prices and income but also to increased income from other crop enterprises or off-farm activities.

Government Support

In addition to the complex social and economic factors outlined above, lack of government support is also often highlighted as a major barrier to smallholder adoption of non-VSS supply chain initiatives, especially in the palm oil sector in Indonesia and Malaysia. Uptake of programs such as ISPO and MSPO, which are mandatory for large-scale producers but voluntary for smallholders, tends to be concentrated in the largest producers, who are most resilient to economic risk and who can handle the high input costs (Gnych et al. 2015). While smallholders produce almost half of all palm oil, complying with sustainable palm oil programs is often technically infeasible and prohibitively expensive for them (Ni et al. 2016; Gnych et al. 2015).

Studies suggest that concerted government efforts are needed to facilitate investment into training and engaging smallholders in the process of becoming ISPO and MSPO certified in order to make these programs cost-effective for farmers (Pacheco et al. 2017; Gnych et al. 2015). For example, a survey of smallholders in Malaysia showed that farmers would be willing to join the MSPO program with government support (Ni et al. 2016). Similarly, Millard (2017) found that successful voluntary certification programs in the coffee sector need government buy-in, since governments play an important role in improving infrastructure and facilitating training. Developing policy, regulations, and legislation that focuses on improving the technical and managerial skills of smallholders can lay the groundwork for voluntary adoption of sustainability certifications (Millard 2017). Further, for palm oil, government intervention to harmonize voluntary (e.g., RSPO) and mandatory sustainability standards (ISPO and MSPO) could lower input costs and improve program uptake among large-scale and smallholder producers alike (Pacheco et al. 2017; Pirard et al. 2017).

Conclusion

This review finds that VSS participation is associated with statistically significant increases in livelihood-related outcomes in nearly half of cases, but that in roughly the same number of cases no effect on outcomes is seen. The findings are consistent with those of previous reviews conducted by Oya et al. and DeFries et al. and published in 2017. Specifically, the present review found additional evidence that VSS participation leads to increases in prices and crop income, but that improvements in these intermediate outcomes do not necessarily translate to higher net household income. Yields from VSS-certified farms were shown to be higher than those from non-certified farms in over one-third of cases, but, similar to Oya et al., the majority of evidence showed no effect. The result was similar for related supply chain tools and initiatives: while only 11 results were available for this portion of the analysis, almost all results for price, crop income, and input costs showed that farms participating in related supply chain initiatives performed better than non-participating farms. For yield and net household income, most results showed no effect.

Although other crops play an important role in sustaining the livelihoods of millions of smallholders worldwide, coffee was by far the most widely-studied crop in the research that qualified for inclusion in this review. This finding is consistent with the results from Oya et al. and DeFries et al.'s reviews. Of the nine VSS schemes that appeared in the present review, Fairtrade was most common and appeared in 67% of the studies. Also similar to the two previous reviews, most studies that qualified for the present review were carried out in Africa, though a large number of studies from Asia were also found, suggesting that research focused on Asia has increased after 2015.

Overall, the current review reiterates Oya et al.'s conclusion that net household income is understudied as an outcome, despite its importance in assessing the overall economic wellbeing of smallholders. Net household income is one of the more difficult livelihood-related outcomes to study because it does not only reflect income from the VSS-certified crop, but rather encompasses a complex array of income sources and costs that are central to managing a smallholder farm. There is also a paucity of studies on non-coffee crops, despite the large number of smallholders who rely on production of cocoa, tea, bananas, palm oil, and other crops.

The current review further highlights the complex relationships between yield, price, and income. Of particular interest is the finding that off-farm activities are often more lucrative than on-farm specialization (e.g., Vellema et al. 2015), which raises the question of whether VSS programs should continue to encourage crop specialization. Indeed, Ingram et al.'s (2018) study of cocoa smallholders in Cote d'Ivoire found that most farmers (both certified and non-certified) want their children to pursue off-farm employment and not continue cocoa production, despite believing that cocoa farming was financially stable.

In addition, price premiums afforded to certified products often do not compensate for reduced yields. This finding suggests that either premiums need to be higher, or certified cooperatives must be managed more effectively to ensure that premiums are equitably distributed to individual farmers. VSS programs and related supply chain initiatives should also focus on improving training and access to other inputs to help certified farmers prevent yield reductions. Similarly, given the importance of certified cooperatives to the success of smallholders, VSS programs should pursue methods to improve the structure and management of cooperatives. Efforts should focus on improving the ability of cooperatives to purchase certified product; inform members about prices and markets; provide credit,

training, and technical support where needed; and improve transparency concerning the use and distribution of premiums.

Essentially all VSS programs aim to improve the economic wellbeing and financial stability of agricultural producers and workers, while preserving the environment and protecting human health. The current review, focusing on a subset of livelihood outcomes, suggests that participation in VSS and related supply chain initiatives can improve certain components of economic wellbeing, including prices and crop income. However, given the presence of confounding social, economic, and environmental factors, the relationship between participation and specific outcomes is rarely straightforward and is difficult to study. Future research efforts should focus on disentangling the complex relationships between yields, price premiums, and income, especially in the context of certified cooperatives, and should center on net household income as an important measure of overall economic wellbeing. Doing so will greatly improve the understanding of how these programs can be optimized to meet the needs of agricultural producers in low- and middle-income countries.

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Annex A – VSS Search Strings for CABI and Web of Science

The literature searches on CABI and Web of Science were conducted on April 11, 2019. As Google Scholar is limited to less targeted searching capabilities than the other platforms, the search on that platform was limited to the first 500 citations.

CABI, 2015-2019

1 = ("certification" or "quality standards" or "quality label?ing" or “sustainability standards”) = 5827

2 = ((fair* or ethic* or alternative or sustainab* or responsib* or specialty or eco or ecologic or ecological or organic) W/3 (certifi* or standard* or label* or seal* or scheme* or trad* or market* or "value chain*" or commodit* or product*)) = 8607

3 = ("fair trade" or fairtrade or fair-trade or transfair or "fair for life" or "Rainforest Alliance" or "Sustainable Agriculture Network" or "UTZ Certified" or "UTZ" or "Global Partnership for Good Agricultural Practice" or "Global GAP" or "GlobalGAP" or "4C Association" or "Better Cotton Initiative" or "BCI" or "Cotton made in Africa" or Bonsucro or "Ethical Tea Partnership" or Trustea or "International Federation of Organic Agriculture Movements" or IFOAM or "soil association" or "IOAS" or "Linking Environment and Farming" or "Union for Ethical BioTrade" or "UEBT" or "Roundtable on Sustainable Palm Oil" or "RSPO Fair Flowers Fair Plants" or "ProTerra" or "ISO 14001") = 630

4 = or/1-3 = 14,754

5 = (Farmer* or farming or agricultur* or horticultur* or grower* or producer* or worker* or labo?rer* or smallholder* or small-holder* or cooperative* or co-operative* or syndicate* or ((trade or labo?r) W/1 union*) or "agricultural sector" or "agricultural trade" or "floriculture" or "crop production" or "agricultural products") = 455,476

6 = (coffee or cocoa or tea or infusion* or "yerba mate" or "camomile" or sugar* or fruit* or banana* or pineapple* or mango* or coconut* or apricot* or nut* or cashew* or "shea butter" or argan or rice or quinoa or bean* or chickpea* or "red kidney" or lentil* or soy* or herb* or spice* or "olive oil" or olive* or wine or honey or cotton or flower* or floriculture or "palm oil" or (crop* W/2 produc*)) = 493,432

7 = or/5-6 = 763,500

8 = (income* OR yield* OR productivity* OR economic* OR livelihood* OR price* OR premium* OR well$being) = 499,393 hit

9 = 4 and 7 and 8 = 4,505

10 = "aa000" or "dd100" or "dd500" or "uu000" or "uu450" or "uu460" or "uu470" or "cc000" or "ee110" = 87,179

11 = or/9-10 = 1154

Web of Science – SSCI, 2015-2019

1

TS=("certification" or "quality standards" or "quality label?ing" or "sustainability standards") = 3,633

2

TS=((fair* OR ethic* OR alternative OR sustainab* OR responsib* OR specialty OR eco OR ecologic OR ecological OR organic) NEAR/3 (certifi* OR standard* OR label* OR seal* OR scheme* OR trad* OR market* OR "value chain*" OR commodit* OR product*)) = 8,459

3

TS=("fair trade" or fairtrade or fair-trade or transfair or "fair for life" or "Rainforest Alliance" or "Sustainable Agriculture Network" or "UTZ Certified" or "UTZ" or "Global Partnership for Good Agricultural Practice" or "Global GAP" or "GlobalGAP" or "4C Association" or "Better Cotton Initiative" or "BCI" or "Cotton made in Africa" or Bonsucro or "Ethical Tea Partnership" or Trustea or "International Federation of Organic Agriculture Movements" or IFOAM or "soil association" or "IOAS" or "LEAF" or "Linking Environment and Farming" or "Union for Ethical BioTrade" or "UEBT" or "Roundtable on Sustainable Palm Oil" or "RSPO" "Fair Flowers Fair Plants" or "ProTerra" or "ISO 14001") = 1,644

4

#3 OR #2 OR #1= 12,312

5

TS=(Farmer* or farming or agricultur* or horticultur* or grower* or producer* or worker* or labo?rer* or smallholder* or small-holder* or cooperative* or co-operative* or syndicate* or ((trade or labo?r) NEAR union*) or "agricultural sector" or "agricultural trade" or "floriculture" or "crop production" or "agricultural products") = 66,391

6

TS=(coffee OR cocoa OR tea OR infusion* OR "yerba mate" OR "camomile" OR sugar* OR fruit* OR banana* OR pineapple* OR mango* OR coconut* OR apricot* OR nut* OR cashew* OR "shea butter" OR argan OR rice OR quinoa OR bean* OR chickpea* OR "red kidney" OR lentil* OR soy* OR herb* OR spice* OR "olive oil" OR olive* OR wine OR honey OR cotton OR flower* OR floriculture OR "palm oil" OR (crop* NEAR/2 produc*)) = 36,939

7

#6 OR #5 = 96,295

8

TS=(Afghanistan or Angola or Albania or "American Samoa" or Argentina or Armenia or Armenian or Azerbaijan or Bangladesh or Belarus or Belize or Benin or Bolivia or Bosnia or Herzegovina or Botswana or Brazil or Bulgaria or Burkina Faso or Burkina Fasso or Burundi or Urundi or Cambodia or Cameroon or Cameroons or Cameron or Camerons or Central African Republic or Chad or Chile or China or Colombia or Comoros or Comoro Islands or Comores or Congo or Costa Rica or Cuba or Zaire or Cote d'Ivoire or Ivory Coast or Djibouti or Dominica* or East Timor or East Timur or Timor Leste or Ecuador or Egypt or United Arab Republic or El Salvador or Eritrea or Ethiopia or Fiji or Gabon or Gambia or Gaza or Georgia Republic or Georgian Republic or Ghana or Grenada or Guatemala or Guinea or Guiana or Guyana or Haiti or Honduras or Hungary or India or Indonesia or Iran or Iraq or Kazakhstan or Kenya or Kiribati or Korea or Kosovo or Kyrgyzstan or Kirghizia or Kyrgyz Republic or Kirghiz or Kirgizstan or Lao PDR or Laos or Lebanon or Lesotho or Liberia or Libya or Macedonia or Madagascar or Malagasy Republic or Malawi or Malaysia or Maldives or Marshall Islands or Mali or Mauritania or Mauritius or Agalega Islands or Mexico or Micronesia or Moldova or Moldovia or Moldovian or Mongolia or Montenegro or Morocco or Ifni or Mozambique or Myanmar or Myanma or Burma or Namibia or Nepal or Nicaragua or Niger or Nigeria or Pakistan or Palau or Palestine or Panama or Paraguay or Peru or Philippines or Philipines or Phillipines or Phillippines or Romania or Rwanda or Ruanda or Samoa or Samoan Islands or Sao Tome or Senegal or Serbia or Seychelles or Sierra Leone or Sri Lanka or Solomon Islands or Somalia or South Africa or St Lucia or St Vincent or Grenadines or Sudan or Suriname or Swaziland or Syria or Tajikistan or Tadzhikistan or Tadjikistan or Tadzhik or Tanzania or Thailand or Tonga or Togo or Togolese Republic or Tunisia or Turkey or Turkmenistan or Tuvalu or Uganda or Ukraine or Uruguay or Uzbekistan or Uzbek or Vanuatu or Venezuela or New Hebrides or Vietnam or Viet Nam or West Bank or Yemen or Zambia or Zimbabwe) = 176,820

9

TS=((developing or "less* developed" or "under developed" or underdeveloped or "middle income" or "low* income" or underserved or "under served" or deprived or poor*) NEAR (countr* or nation? or population? or world or economy or economies)) = 34,642

10

TS=(low NEAR (gdp or gnp or "gross domestic" or "gross national" or GNI)) = 463

11

TS=(lmic or lmics or "third world" or lamicountr*) = 1,434

12

TS=(low NEAR/3 middle NEAR/3 countr*) = 4,183

13

TS="transitional countr*" = 65

14

TS=((developing or "less* developed" or "under developed" or underdeveloped or "middle income" or "low* income") NEAR (economy or economies)) = 3,147

15

#14 OR #13 OR #12 OR #11 OR #10 OR #9 OR #8 = 194,637

#16

TS=(income* OR yield* OR productivity* OR economic* OR livelihood* OR price* OR premium* OR (input* NEAR/2 cost*) OR wellbeing) = 205,972

17

#16 AND #15 AND #7 AND #4 = 806

Annex B – Grey Literature Searches

Grey literature was searched on the following websites and databases. For databases that were included in the Oya et al. review, searches included only literature published after the Oya et al. search date.

- JOLIS (WB/IMF; http://external.worldbankimflib.org/external.htm), visited 5/7/2019, searched for reports published on 16/09/2015 – onwards
- British Library for Development Studies (BLDS; (http://blds.ids.ac.uk/) visited 5/7/2019, searched for reports published on 21/07/2015 – onwards
- IDEAS repec (https://ideas.repec.org/), visited 5/7/2019, searched for reports published on 10/10/2015 – onwards
- International Institute for Environment and Development (http://www.iied.org/), visited 5/7/2019, searched for reports published on 12/09/2015 – onwards
- 3ie systematic reviews and impact evaluations database (http://www.3ieimpact.org/evidence-hub/publications), visited 5/8/2019, searched for reports published on 03/08/2015 – onwards
- The Campbell Library (http://www.campbellcollaboration.org/lib/), visited 5/8/2019, searched for reports published on 18/08/2015 – onward
- Agra.org (http://www.agra.org/), visited 5/8/2019, searched for reports published on 18/10/2015 – onwards
- AGRIS / KOHA / FAO (http://agris.fao.org/agris-search/index.do / http://unfao.koha-ptfs.eu/cgibin/koha/opac-search.pl / http://www.fao.org/home/en/), visited 5/8/2019, searched for reports published on 28/12/2015 – onwards
- Canaan (https://www.canaanusa.com), visited 5/8/2019, searched for reports published on 24/08/2015 – onwards
- Catholic Relief Services Fair Trade (http://www.crsfairtrade.org/), visited 5/8/2019, searched for reports published on 24/08/2015 – onwards
- Centre for Fair and Alternative Trade (http://cfat.colostate.edu), visited 5/8/2019, searched for reports published on 05/09/2015 – onwards
- CGIAR (http://www.cgiar.org/), visited 5/8/2019, searched for reports published on 24/12/2015 – onwards
- COSA (http://thecosa.org), visited 5/8/2019, searched for reports published on 24/08/2015 – onwards
- ELDIS/Institute of Development Studies (IDS; (http://www.eldis.org/), visited 5/8/2019, searched for reports published on 22/12/2015 – onwards
- ESRC (Economic and Social Research Council; http://www.esrc.ac.uk/), visited 5/8/2019, searched for reports published on 30/11/2015 – onwards

- European Fair Trade Association, 04/10/2015 (https://www.newefta.org/) – visited 5/8/2019; private website, requires login info
- Fair Trade Institute (http://www.fairtrade-institute.org/), visited 5/8/2019, searched for reports published on 23/07/2015 – onwards
- Fair Trade USA (http://fairtradeusa.org/), visited 5/8/2019, searched for reports published on 27/08/2015 – onwards
- Fairtrade Foundation (http://www.fairtrade.org.uk/), visited 5/8/2019, searched for reports published on 20/08/2015 – onwards
- Fairtrade International (http://www.fairtrade.net), visited 5/8/2019, searched for reports published on 04/10/2015 – onwards
- GlobalGAP (http://www.globalgap.org/), visited 5/8/2019, searched for reports published on 27/08/2015 – onwards
- IFPRI (http://www.ifpri.org/), visited 5/8/2019, searched for reports published on 28/08/2015 – onwards
- MPS (Fair flowers fair plants; http://fairflowersfairplants.com/en/home-2/ / http://www.ecas.nl/en/), visited 5/8/2019, searched for reports published on 25/08/2015 – onwards
- Oxfam (https://www.oxfam.org/), visited 5/8/2019, searched for reports published on 25/08/2015 – onwards
- R4D, DFID (http://r4d.dfid.gov.uk/), visited 5/8/2019, searched for reports published on 02/10/2015 – onwards
- Rainforest Alliance (http://www.rainforest-alliance.org/) visited 5/8/2019, searched for reports published on 26/08/2015 – onwards
- Soil Association certification (ethical trading; http://www.soilassociation.org), visited 5/8/2019, searched for reports published on 26/08/2015 – onwards
- Traidcraft (http://www.traidcraft.co.uk/), visited 5/8/2019, searched for reports published on 25/08/2015 – onwards
- TWIN (www.twin.org.uk), visited 5/8/2019, searched for reports published on 24/12/2015 – onwards
- USAID (https://dec.usaid.gov/dec/home/Default.aspx), visited 5/8/2019, searched for reports published on 19/09/2015 – onwards
- Wageningen University and UR (http://www.wageningenur.nl/en/), visited 5/8/2019, searched for reports published on 23/12/2015 – onwards
- World Fair Trade Organisation (http://wfto.com/), visited 5/8/2019, searched for reports published on 09/09/2015 – onwards

Annex C – List of Eligible VSS and Related Supply Chain Initiatives

Voluntary Sustainability Standards

4C Association
Better Cotton Initiative (BCI)
Bird Friendly Coffee
Bonsucro
Cotton made in Africa
EnVeritas
Equitable Origin
Fairtrade International
Fairtrade USA
Field to Market
Food Alliance Certified
Global GAP
International Federation of Organic Agriculture Movements (IFOAM)
LEAF Marque
Linking Environment And Farming (LEAF)
Local Food Plus (LFP) Certified
Max Havelaar
Potato Sustainability Initiative
Proterra
Rainforest Alliance
Roundtable on Responsible Soy (RTRS)
Roundtable on Sustainable Biomaterials (RSB)
Roundtable on Sustainable Palm Oil (RSPO)
SAI Platform
Smithsonian Bird Friendly Quality Certification Services
Social Accountability Accreditation Services (SAAS)
Sustainable Agriculture Network
Trustea
Union for Ethical BioTrade (UEBT)
UTZ

Bans, moratoria, and multi-party agreements (for specific commodities/areas)

Amazon Soy Moratorium
Ban on Uzbekistan Cotton
Better Growth with Forests
Brazil Cattle Agreements
Cocoa and Forests Initiative (CFI)
Commitment to Action (C2A)
Dolphin Safe/ Dolphin Friendly
Financial Sector Engagement initiative
Joint Solutions Project (Chile)

Singapore Alliance for Sustainable Palm Oil
Value Beyond Value Chains

Specific national plans, policies and platforms

Africa Palm Oil Initiative (APOI) - TFA 2020
Blue Swimming Crab & Octopus Philippines Platform
Colombia D-free palm oil pledge and program
Global Coffee Platform (GCP)
Indonesia Sustainable Palm Oil Platform (FoKSBI)
Large Pelagic Sustainable Fisheries Platform - Costa Rica
Latin America Initiative - TFA 2020
Papua New Guinea Sustainable Palm Oil Platform (PNGPOP)
Small and Large Pelagic Fisheries Platform - Ecuador
Southeast Asia Initiative - TFA 2020
Sustainable Coffee Challenge
Sustainable Commodities National Platform - Paraguay
Sustainable Pinneaple National Platform Initiative - Costa Rica
Tuna & Blue Swimming Crab Platform Indonesia

Sustainable sourcing codes

C.A.F.E. practices
Consumer Goods Forum (CGF)
Ethical Trading Initiative (ETI)
Marks and Spencer Sourcing Code
Nespresso AAA
Nike Code of Conduct
Partnership for Sustainable Textiles
Sainsbury's Sourcing Code
Starbucks CAFÉ practices
Unilever sustainable agriculture code
Walmart sustainable sourcing programs (incl Project Gigaton)

Jurisdictional approaches

IDH Verified Sourcing Areas

Public or quasi-public sustainability standards

Indonesia Sustainable Palm Oil Standard (ISPO)
Malaysia Sustainable Palm Oil Standard (MSPO)
Sistem Verificasi Legalitas Kayu (SVLK)

Supplementary VSS tools

EnVeritas
Palm oil innovation group (POIG)
RSPO Jurisdictional Palm Oil Certification

RSPO Next
SAI Platform

Supply chain investment programs
Asia Pacific Resources International Holdings Limited (APRIL)
Asia Pulp & Paper Group (APP)
Cocoalife (Mondelez)
Coffee Made Happy (Mondelez)
Ethical Tea Partnership (ETP)
Fair Wear Foundation
Novo Campo
Sustainable Fisheries Partnership (SFP)

Sustainability requirements within trade or procurement policies
Amsterdam Declaration
EU biofuels requirements

Specific global or regional implementation norms for responsible supply chains
Accountability Framework initiative
Collaboration for Forests and Agriculture (CFA)
Global Roundtable for Sustainable Beef (GRSB)
High Carbon Stock Approach (HCSA)
High Conservation Value approach
UN Global Compact
UN Guiding Principles on Business and Human Rights

Sustainability performance and progress reporting
CCBA Sustainable Landscapes Rating Tool
CI Landscape Assessment/ Accounting Framework
Field to Market
GCF Impact Platform
Global Reporting Initiative (GRI)
Global Salmon Initiative (GSI)
Seafood Watch (SW)
Sustainable Apparel Coalition (SAC)
US State Dept. Commodities/Jurisdiction Approach