

**ORIGINAL ARTICLE**

# The role of men and women in agriculture and agricultural decisions in Vanuatu

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**Abstract**

This study uses a unique data set of 106 cocoa-growing households in Epi, Vanuatu, to study men's and women's participation in decision-making concerning 17 agricultural activities. Women participate in many aspects of the production and postharvest activities of food and cash crops. However, women are disempowered when it comes to participating in, influencing, and having autonomy over decisions about agricultural activities and income from crop sales. This article also presents an index summarising the decision-making data. The findings do not suggest associations between the index and variables expected to correlate with women's empowerment (e.g., education, household assets). The study does find that participation in community activities correlates with the decision-making index for both men and women. The data presented in this article provides useful sex-disaggregated data capturing intra-household agricultural decision-making, and a solid platform for further work on understanding intra-household decision-making processes concerning cash and food crops in Vanuatu.

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**KEYWORDS**

agriculture, decision-making, gender, Vanuatu, women's empowerment and agency

## 1 | INTRODUCTION

Improving gender equality and women's empowerment in agriculture is considered essential to economic development (Duflo, 2012; FAO, 2011) because it can improve women's and children's health and household productivity (Anderson et al., 2021). Agriculture is the main economic activity in many Pacific nations (Reddy, 2007) and women contribute significant time and labour in planting, tending and harvesting the crops that ensure food security and income for their households. Nevertheless, in many Pacific nations, women's time and labour tend to be overlooked, and their role in agriculture is often not formally recognised. To address this issue, gender equality and women's empowerment have driven the policy agenda of several Pacific nations in recent years and they have enacted policies aimed at improving the status of women in the agricultural sector. As a key example, the Pacific Leaders' Gender Equality Declaration (Pacific Islands Forum, 2012) identified the need for sex-disaggregated data to better design, implement and evaluate gender initiatives. This article provides sex-disaggregated data for the Vanuatu context, and is therefore an important first step towards addressing current information gaps around women's participation in agricultural activities and decision-making.

I use Kabeer's (1999) definition of agency as a form of empowerment, where agency refers to any capacity of individuals to set their own goals and take action to achieve them. Women's agency has been linked to their participation in intra-household decision-making, which in turn is associated with their access to education and control over physical resources, earned income, and capacity to participate in community life and have their voice heard (Ibrahim & Alkire, 2007). One of the domains of agency that has attracted attention in agriculture is instrumental agency, or the 'power to' take action, measured as participation in decision-making at the household level.

This study provides information on current agricultural activity and decision-making via a representative sample of 106 cocoa-growing households in Epi, Vanuatu. Cocoa is the third most important source of cash income in Vanuatu, providing a source of livelihood for 9000 households (Vanuatu National Statistics Office [VNSO], 2017a). Cocoa growers in the sample from Epi are typical of cocoa growers from the archipelago. The data set contains detailed and sex-disaggregated information about men and women's participation in 17 agricultural activities, as well as their participation in decisions regarding these activities. The agricultural activities relate to growing, harvesting and selling food crops (mostly tubers) and cash crops (cocoa, copra and kava), as well as decisions about the use of income from sales of food and cash crops.

The data provide a measure of women's intrinsic agency and take into consideration the nuances of gendered participation in decisions. Specifically, I answer the following research questions within the context of cocoa-growing households in Vanuatu: What is the level of women's involvement in agricultural activities? What is the level of participation by women in intra-household decision-making concerning agricultural activities and their share of income from crop sales? Finally, what are the individual and household characteristics of women with higher and lower levels of participation in intrahousehold decision-making?

To answer these questions, I use detailed data about men's and women's agricultural participation and decision-making. I compare the perceptions of men and women, and construct a decision-making index to comprehensively summarise the data. Finally, I study the correlation between the decision-making index and women's individual and household characteristics.

Unsurprisingly, in the agricultural context of this study, I find women participate in many of the physical aspects of the production and postharvest of food and cash crops, but are disempowered and less involved in decision-making processes relative to men. That said, my results suggest that individual and household socio-economic characteristics among cocoa farmers are not associated with the variables commonly correlated with empowerment. Rather, the results suggest an association between women's involvement in community life and greater values of the index. This association holds for men, but more research is required to establish whether there is a causal relationship between involvement in community activities and women's empowerment.

The remainder of this article proceeds as follows: Section 2 provides context about the motivations for this study and Section 3 outlines the theoretical considerations that inform the study design. Section 4 describes the broader context of agriculture in Vanuatu, including the role of women, focusing on cocoa farming. Sections 5 and 6 describe the data and methods, followed by the results of the study in Section 6, and discussion and conclusions in Section 7.

## 2 | MOTIVATION AND GENERAL LITERATURE REVIEW

The motivation for this study stems from prevailing perceptions of women in agriculture across many Pacific nations. These perceptions include that women are not significantly involved in cash crop production and postharvest activities, and that the role of women is less significant than that of men (UN Women, 2012). It is also commonly thought that women market and sell the vast majority of food crops (mostly yams) while men overwhelmingly produce and control the incomes earned from cash crops (i.e., cocoa, copra, kava; Martyn, 2015). Further, women and girls are commonly perceived as taking primary responsibility for household food security by growing crops in homestead gardens, rearing small livestock and producing handicrafts. Conversely, men are perceived to be principally engaged in cash cropping, inter-household transfers and activities associated with accumulating social status for the household (Martyn, 2015).<sup>1</sup> This results of this study contradict some of these views.

Most of the literature about the role of women in Vanuatu is found in ethnographic studies conducted by anthropologists (some examples include Jolly, 1994, 2015; Taylor, 2008, 2016). These ethnographic studies mainly discuss the ideologies underlying the role of women in their households and the community, and the conflict between traditional gender norms and more modern ideologies (Taylor, 2008). More recently, broader information on gender roles in Pacific nations has become available via a new series of the Country Gender Assessment of Agriculture and Rural Sector, conducted between 2018 and 2019, for Fiji, Papua New Guinea, the Solomon Islands and Vanuatu (FAO, 2019, 2020; FAO & SPC, 2019a, 2019b). While the assessments are informative, they are limited in their scope due to limited data availability.

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<sup>1</sup> In Vanuatu, men allocate labour to group activities and cultural ceremonies. They allocate time to the production of local public goods, such as construction and maintenance of village common areas. This labour time is usually allocated once a week on the 'day for the chief'. This labour sharing is a traditional land tax that allows access to tribally owned land granted by the village's chief. Households may increase their labour participation or engage in gift giving (usually pigs or yams) to negotiate access to land (see Martyn, 2015).

Several recent studies have focused on the position of women in decision-making; for example, their bargaining power with regard to agricultural activities in developing countries and the effect of women's intra-household bargaining power on welfare-related outcomes (e.g., nutrition, health, education) for women and their families (Alex, 2013; Cunningham et al., 2015; Gupta et al., 2019; Komatsu et al., 2018; Seymour, 2017). However, most of these recent studies focus on sub-Saharan Africa and South Asia, with relatively little study on the cultural context of the Pacific. Some studies have explored the roles of men and women in cash crop production, the income from these activities (Koczberski, 2002, 2007), the time spent in agricultural activities, and the burden of drudgery for women in Papua New Guinea (Echevin et al., 2018). Some analysts have also investigated challenges to women participating in economic activities in urban Vanuatu (Ellis et al., 2009). However, there has been relatively little attention paid to women's decision-making and the economics of intra-household bargaining power in rural Vanuatu (and other Pacific nations); such information is required to inform current gender equality initiatives in the country. The role of women in agriculture and the household, and their bargaining power, is likely to be changing, so there is an urgent need for sex-disaggregated data on intra-household participation in decisions regarding agricultural activities. This article aims to fill these knowledge gaps.

### 3 | THEORETICAL CONSIDERATIONS

This section presents a brief discussion of cooperative intra-household decision-making models and, as a basis for the research, the concept of agency, which is a form of women's empowerment.

Intra-household economic models have moved away from the premise of the unitary model (Becker, 1981), which assumes that all individuals within a household have the same preferences. Browning and Chiappori (1998) developed a cooperative intra-household bargaining power model where the utility of the household is equal to the weighted sum of the utility of the female and male household heads:

$$U_t(.) = \theta U_f(.) + (1 - \theta) U_m(.) \quad (1)$$

where  $t$  means total,  $f$  female and  $m$  male. The weights  $\theta$  and  $1 - \theta$  in Equation (1) represent female and male bargaining power within the household, which depends on an individual's earned income and their fallback position (e.g., women earn off-farm income). These weights measure a form of agency, which is the capacity of individuals to influence/make household-related decisions. A recent development of this model incorporates social and cultural norms and psychosocial factors affecting men and women as additional coefficients that affect bargaining power. All of these factors can be expressed by weights in the model (Laszlo et al., 2020). In such models, women's bargaining power is negatively influenced by social and cultural norms that favour men over women. Conversely, women's bargaining power can be positively influenced by women's income, threats to leave the household and self-esteem. All of these aspects relate to the concept of agency.

Agency is a form of empowerment. According to Kaber (1999), agency refers to any capacity by individuals to set their own goals and take action to achieve them. Agency entails: motivation; meaning and purpose (power within); the ability to make one's own life choices and pursue goals (power to); and to have control over one's own life decisions (power over). Finally, agency is both individually and collectively applicable (power with). Women's agency has been linked to

participation in intra-household decision-making, which in turn is influenced by women's access to education and control over physical resources, earned income, and their ability to participate in community life and to have their voice heard (Ibrahim & Alkire, 2007).

One of the domains of agency that has attracted attention, particularly in agriculture, is instrumental agency, or the 'power to'—measured as participation in decision-making at the household level. Several studies have explored women's ability to make decisions with respect to agricultural activities and the individual, household and spouse characteristics influencing women's participation in those decisions (see Alwang et al., 2017; Ambler et al., 2019; Anderson et al., 2017). Interest in decisions about agricultural activity stems from the importance of this economic activity in developing countries' rural areas (FAO, 2011), and the relationship between women's participation in decision-making and economic development outcomes (Duflo, 2012). A recent review of the literature supports links between women's participation in decisions in agriculture and economic benefits for themselves and their households (Anderson et al., 2021). Further, women's participation in decisions related to agricultural production and management, the use of income from agricultural activities, and the use of agricultural inputs has also been shown to bring economic benefits, such as improved health outcomes and increased household productivity (Alkire et al., 2013; Anderson et al., 2021; Malapit et al., 2019, 2020).

The literature on intra-household decision-making also discusses how participation in, influence on, and autonomy over decisions are affected by context. Agarwal (1997) argues that social perceptions and social norms are factors affecting women's ability to influence agricultural decisions. Social perceptions based on gender can affect judgements about the value of what women do and their ability to perform agricultural activities. However, it can also result in discounting women's preferences when making decisions because they are perceived as less deserving, or their needs are not prioritised. As an extension of social perceptions, norms include a wide range of accepted customs and practices justified by tradition, which in some contexts may also be legitimised by religion, and are therefore not to be contested or changed. These rules are also likely to affect the extent of women's participation in decisions with respect to agricultural activities (Maiorano et al., 2021; UNDP, 2020).

Finally, access to land and production assets, and formal education or agricultural extension services all are associated with women's ability to influence agricultural decisions. These issues are particularly relevant in rural settings because social norms that favour men can restrict women's access to extension services and agricultural development programs, reducing their influence on decisions concerning agricultural activities (Agarwal, 1997).

## 4 | THE STUDY CONTEXT

### 4.1 | Agriculture in Vanuatu

Agriculture is Vanuatu's main economic sector. About 88% of the total population, and 97% of rural households, are engaged in agricultural production (VNSO, 2017a). Most of this production is conducted by smallholder farmers with tribally owned land where family labour is one of the main inputs (Martyn, 2015). Households produce vegetables and tubers in food gardens for home consumption and cash crops such as cocoa, coconut and kava for commercial sale, with around 74% of rural households engaged in the production of at least one of these cash crops (VNSO, 2017a).

Cocoa is the third most important source of cash income in Vanuatu. It provides a source of livelihood for 9000 households (VNSO, 2017a). Most of the cocoa in Vanuatu is produced on the islands of Malekula, Epi and Santo (VNSO, 2017a). Like other farmers in Vanuatu, cocoa producers mostly use family labour and tribal land as the main inputs for cocoa production (Martyn, 2015).

## 4.2 | Women and agriculture in Vanuatu

Women in Vanuatu lack access to resources and social roles in many aspects of life. This prevents women as individuals, rather than as spouses, from fully being recognised for their contribution to agricultural and community activities, which are influenced by tradition or *kastom*,<sup>2</sup> religion and history (Cummings, 2013; Eriksen, 2012). The transition from food to cash crop production in colonial times, and its consequences for the perceptions of the role of women in agriculture and their loss of status in Vanuatu, are documented by Nash (1984). Colonial policies removed important productive tasks from women. Modern and prestigious forms of work were thought to belong to men, with a resultant loss of status for women, who were relegated to food production, which is perceived as a less prestigious activity. Men were exposed to new technologies and practices and cash crops therefore became an activity that provided status for men. In many instances, women became labour for male-dominated crop production, and had to provide labour in addition to food production and other household tasks, caring and/or community activities. Christian missionaries promoted the idea that women needed to stay away from ‘unladylike’ activities and engage in sewing and making crafts. They also endorsed the idea of women being submissive to men (Douglas, 2002; Eriksen, 2012; Jolly, 1997).

Even now, women also lack access to other resources, such as agricultural information, have less access to extension services, and participate less in agricultural interventions compared to men (FAO, 2020). Agricultural extension services, such as technical advice and training on agronomic techniques, are very limited in Vanuatu; since the 1990s these government services have been under-resourced, and most of the efforts are focused on improving cash crop production—further excluding women, who are assumed to be occupied with food crops (FAO, 2020). In part, this may be because women have limited access to land compared to men. Land tenure in Vanuatu is customary and the rights to land are mostly inherited by sons from fathers (FAO, 2020). Some islands follow matrilineal systems. However, the interpretation of the matrilineal system does not provide more rights for women over decisions about the use of land. Even if land rights are transmitted from mother to daughter, decisions about the use of land will often be made by a brother or other male family member (Nagarajan & MacDermott, 2013; Naupa, 2017; Stege & Huffer, 2008).

Encouragingly, the Country Gender Assessment of Agriculture and Rural Sector (FAO, 2020) findings indicate that some programs are demonstrating increased participation by women; specifically, NGO initiatives that allow women to earn an income and gain some independence. However, more broadly, gender-inclusive government interventions in agriculture remain under-resourced and there is a lack of clear action to empower women in the sector. Finally, FAO (2020) highlights that the lack of sex-disaggregated data in the agricultural sector

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<sup>2</sup> Brimacombe (2016) indicates that *kastom* is frequently translated as ‘custom’ or ‘tradition’. It encapsulates a wide range of knowledge, practices and traditions that persist from an ancestral point in time to the present day.

constrains the design, targeting, implementation and evaluation of gender-inclusive government interventions.

## 5 | DATA

### 5.1 | Sample design and household survey

The data set used in this study consists of a representative sample of small cocoa growers in Epi, Vanuatu. Evidence from focus group discussions conducted with small cocoa farmers from the three main cocoa production areas in Vanuatu (Epi, Malekula and Santo) suggests that Epi growers are typical of smallholder cocoa farmers across the archipelago. Additionally, this evidence suggests that cocoa growers are similar to other smallholder farmers on the archipelago with respect to other crops, such as tubers for food consumption and coconut, coffee and/or kava for cash.<sup>3</sup>

According to the Vanuatu National Statistics Office (VNSO, 2017b), in 2016 there were 562 households producing cocoa in Shefa Province, which includes the islands of Efate and Epi, and the Shepherd Islands. Out of those households, 152 were producing cocoa on Epi. The total sample corresponds to 106 couples<sup>4</sup> in nine villages in West Epi, or about 70% of the population of cocoa-growing households on the island.

The sample design employed purposive sampling of households that grew cocoa on the island at the time of the study. First, we listed cocoa producing villages in West Epi, where cocoa production is concentrated. Then we randomly selected households from a list provided by the Epi Cocoa Producers Association (ECPA) and lists of non-ECPA cocoa farmers that we gathered from ECPA members and chiefs in cocoa-growing villages. For each household, we collected information, including the names of the male head of the household and their spouse's name. We selected the number of households for each village proportional to the population of cocoa growers of each village and the total cocoa growers' population on the island.

The cocoa-growing households in our sample were mostly members of the ECPA.<sup>5</sup> The ECPA had 130 members across 13 villages on the West Epi coast in 2018. ECPA membership required an annual fee, determined by the amount of cocoa produced and delivered to the association.<sup>6</sup> Membership benefits include training by more senior ECPA members (not trained extension officers) and market access. Anecdotal evidence suggests that despite membership being granted to the household, mostly men attended ECPA meetings and training sessions. According to ECPA members, women are allowed to attend, but it is unclear how often women were given the opportunity to participate.

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<sup>3</sup> We visited the VNSO offices in Port Vila ahead of fieldwork in 2018. The data for the 2016 mini census, the most recent census with data on agriculture in Vanuatu, were not available. To date, these data remain unavailable. The reports on the VNSO website contain aggregated information not suitable for statistical comparison.

<sup>4</sup> The total sample included 119 households; however, there were 11 cases where information for women was incomplete, and two households with men who were widowed. The characteristics of the 13 households excluded from the analysis are not statistically significantly different from the characteristics of the 106 included in the analysis.

<sup>5</sup> During the survey we learned that most non-ECPA households in our lists were not growing cocoa. The main project this data comes from focuses on cocoa-growing households in Vanuatu.

<sup>6</sup> In 2018, farmers producing one metric ton or more of dry cocoa beans paid VUV2500/year for membership, less than one ton and more than half a ton paid VUV1500/year and less than half a ton paid VUV1000/year (AUD1 = VUV81.4 in 2018).

The survey was conducted over eight weeks between September and October 2018. Dates for data collection were agreed upon with village chiefs and individual appointments were made with male and female heads of households. Men and women were interviewed separately, and enumerators were the same sex as the people they were interviewing. Interviews with men and women were completed in more than one visit. The survey included questions on farmers' socio-economic and farm characteristics and were answered by the male in charge of managing the farm. The survey also included male and female modules on participation in cocoa-related activities, intra-household decision-making and participation in community activities.

## 6 | METHODOLOGY

The Women's Empowerment in Agriculture Index (WEAI) uses a set of questions to elucidate women's agency across five domains in agriculture: decisions about agricultural production; access to and decision-making power about productive resources such as land; control of use of income; leadership in the community; and allocation of time to productive and domestic tasks (see Alkire et al., 2013).

It has been argued that the inclusion of some of these domains—such as control over land and assets and access to income—as a measure of agency is problematic because it is unclear whether access to resources and control over assets empowers women, or if women gain access to resources and control over assets because they are empowered (Maiorano et al., 2021).

In this study, the focus is on specific questions regarding participation, influence and autonomy in decision-making as proxies for women's intrinsic agency. Therefore, I modify the standard WEAI production domain measures and link them to 17 agricultural activities, namely: growing, harvesting and selling food crops (mostly tubers); weeding, pruning, harvesting, fermenting and drying cocoa; selling wet cocoa beans; selling dry cocoa beans; cocoa-related training; growing and harvesting coconut; selling copra; and growing, harvesting and selling kava. These are used instead of more generic questions about food and cash-crop farming typically included in the WEIA.

The draft survey questions were pre-tested with 20 households (20 men and 20 women) and were designed to ensure understanding of the meaning of decision-making, input into decisions, and autonomy in decisions by respondents. The field test revealed that the questions about input in decision-making were not well understood by participants. We therefore tested understanding of influence in decision-making as an alternative, which was clearer for respondents and was still consistent with the literature on women's empowerment. For example, Kabeer (1999) argues that there are informal means by which women can negotiate intra-household relations, using private influence at the household level, particularly in contexts where women have more to lose from disruptions to social norms about gender, as is likely the case in rural Vanuatu.

The module on intra-household decision-making included questions about 17 agricultural activities, asked separately of men and women, for the period June 2017 to June 2018:

- (i) Did you participate in [ACTIVITY] between June 2017 and June 2018? 1 = Yes; 0 = No
- (ii) When decisions are made regarding [ACTIVITY], who is it that normally makes the decision? 1 = Self only; 2 = Spouse only; 3 = Self and spouse together
- (iii) How much influence did you have in decisions about [ACTIVITY]? 1 = High influence; 2 = Some influence; 3 = Little influence; 4 = No influence

- (iv) When your spouse was away, and you had to make decisions about [ACTIVITY], you:  
1 = Decided by myself; 2 = Called my spouse to discuss; 3 = Waited until my spouse was back

The literature on intra-household decision-making and empowerment discusses the limitations of answers to questions about who makes decisions (self, spouse, both) as the responses may not reflect the nuances of the decision-making process (Acosta et al., 2020). Limiting the analysis to answers to the question of ‘who’ does not necessarily provide information about the ‘how’.

Using the answers to questions (i) to (iv) for 17 agricultural activities, I constructed the following decision-making index (DM) and applied it separately to men and women, which allows me to calculate women’s intrinsic agency compared to men’s:

$$DM_i = \frac{\sum_{j=1}^{17} D_{ij}}{\sum_{j=1}^{17} A_{ij}} \quad (2)$$

where,  $D_{ij} = 1$  if individual  $i$  reported that they make decision  $j$  by themselves/with spouse AND if individual  $i$  reported high/some influence in decision  $j$  AND if spouse away individual  $i$  can decide  $j$  by themselves, AND if individual  $i$  has high/some influence in decisions on income; 0 otherwise.  $A_{ij} = 1$  if individual  $i$  reported participation in activity  $j$ , 0 otherwise.

Because the index is a ratio, its value is a proportion between 0 and 1. It estimates the proportion of activities where men and women reported participation in decisions (individual or joint) that they can influence, and where they have autonomy to decide with respect to the activities in which they were involved. A higher index value is interpreted as ‘higher’ levels of instrumental agency; that is, the ability to make choices and pursue own goals.

Additionally, I estimated a gender gap indicator as follows:

$$\text{Gender gap}_i = DM_{i\text{men}} - DM_{i\text{women}} \quad (3)$$

which elicits differences in the decision-making index between men and women.

The index intends to capture information on individual perceptions of participation in decisions, influence on decisions and autonomy to make decisions. This captures the concept of instrumental agency, considering men’s and women’s participation, their influence and autonomy in decision-making, and their ability to influence strategic decisions regarding expenditure from the income of the activities in which each is involved. When applicable, the index also includes whether individuals influence decisions on expenditure over income from agricultural activities. Decisions over income are likely to have repercussions for women and other members of the household.

## 6.1 | Estimation of assets index

I estimated two household wealth indexes following a widely used method using principal component analysis (PCA; Filmer & Pritchett, 2001; McKenzie, 2005). I estimate the level of wealth of each household for non-production and production assets. The index is constructed to aggregate assets while taking into consideration the differences between owning different types

of assets. The details of the assets included in these two measures and the PCA loadings are available in Supporting Information, Appendix 1.

## 6.2 | Multivariate analysis

To investigate the determinants of the decision-making index for both men and women separately, an exploratory analysis of individual and household socio-economic characteristics was also undertaken as follows:

$$DM_i = \alpha + \beta_1 \text{individual}_i + \beta_2 \text{diffspouse}_i + \beta_3 \text{household}_i + \beta_4 \text{village} + \varepsilon_i \quad (4)$$

where  $DM_i$  is the decision-making index for individual  $i$ , and the explanatory variables include a set of characteristics found in the literature to correlate with decision-making (Alwang et al., 2017; Anderson et al., 2017; Doss, 2013; Eriksen, 2012).  $\text{Individual}_i$  is a vector of women's individual characteristics, consisting of age, education, health status, spousal migration, participation in community activities such as the 'day for the chief' and the 'day for the church',<sup>7</sup> and whether the spouse had migrated in the past 12 months. Health status is likely to affect involvement in agriculture and the capacity to participate in decision-making. If the spouse had migrated this could affect participation in both agricultural activities and in decision-making for the spouse remaining at home. Participation in community activities is also likely to influence women's status in the community and at the household level. In Vanuatu, it is common for households to be involved in community activities. The roles of men and women in these are also linked to *kastom* and religion.  $\text{Diffspouse}_i$  is a vector of the differences of individual and spouse characteristics to capture inequalities among spouses that are likely to give women weaker bargaining power. It contains differences in age, education, participation in the 'day for the chief' and the 'day for the church', between women and men.  $\text{Household}_i$  is a vector of household characteristics consisting of household size, number of children younger than five years of age, whether parents live in the house, whether parents-in-law live in the house, a production and a non-production asset index, and the time it takes to travel from the homestead to the closest dirt road. Village consists of a set of eight village dummies to capture village-level differences in the decision-making index. Finally,  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$  and  $\beta_4$  are vectors of parameters to be estimated and  $\varepsilon_i$  is the error term. The descriptive statistics for these variables are available in Supporting Information, Appendix 2.

Since the dependent variable is a fraction from 0 to 1, Equation (4) is estimated for men and women using fractional response models with a logit regression. Robustness checks are conducted using Tobit and OLS (ordinary least square). The results from the fractional response model estimates present the marginal effects of each variable on the decision-making index for men and women, which are the effects of an increase by one unit in the value of each independent variable on the index.

<sup>7</sup> Households allocate labour one day a week to activities for the 'day for the chief', a form of land taxation to gain access to tribal land. Households also allocate one day a week to the 'day for the church', which includes service and other church-related activities.

## 7 | RESULTS

### 7.1 | Husbands' and wives' participation in food garden and cash crop-related activities

The findings suggest that women participate almost equally with men in all agricultural activities. The responses on men's and women's participation in food garden crop-related activities and cash crop-related activities are presented in Table 1. Labour is scarce and expensive on the islands of Vanuatu and agricultural activities rely on the use of family labour (Martyn, 2015). However, women participate more than men in selling food crops, whereas men participate more in pruning cocoa trees and in fermenting cocoa. These latter activities may be perceived as more physically demanding and therefore as needing to be conducted by men (FAO, 2020). A woman in a focus group mentioned that the location of boxes for fermenting cocoa beans was often quite high, making it difficult for women to turn the beans during fermentation. These characteristics of the technologies employed for some cocoa-related activities might also explain lower levels of participation by women.

Men also participated more in selling dry cocoa beans, training in cocoa production and in selling copra. However, the gender difference for selling dry beans is only significant at the 10%

TABLE 1 Men's and women's participation in agricultural activities, Epi, Vanuatu, 2018

Agricultural activities	Men		Women		t-test men-women
	Mean	Standard deviation	Mean	Standard deviation	
<b>Food gardens</b>					
1 Growing food crops	0.81	(0.39)	0.84	(0.37)	-0.03
2 Harvesting food crops	0.75	(0.43)	0.71	(0.46)	0.05
3 Selling food crops	0.37	(0.48)	0.59	(0.49)	-0.23***
<b>Cash crops</b>					
4 Weeding cocoa	0.73	(0.45)	0.69	(0.47)	0.04
5 Pruning cocoa	0.76	(0.43)	0.63	(0.48)	0.13**
6 Harvesting cocoa	0.64	(0.48)	0.65	(0.48)	-0.01
7 Fermenting cocoa	0.40	(0.49)	0.31	(0.47)	0.08*
8 Drying cocoa	0.34	(0.48)	0.30	(0.46)	0.04
9 Selling wet cocoa beans	0.61	(0.49)	0.57	(0.50)	0.04
10 Selling dry cocoa beans	0.39	(0.49)	0.30	(0.46)	0.08*
11 Training in cocoa	0.21	(0.41)	0.05	(0.21)	0.16***
12 Growing coconut	0.47	(0.50)	0.36	(0.48)	0.11*
13 Harvesting coconut	0.48	(0.50)	0.40	(0.49)	0.08
14 Selling copra	0.53	(0.50)	0.34	(0.48)	0.19***
15 Growing kava	0.42	(0.50)	0.38	(0.49)	0.04
16 Harvesting kava	0.31	(0.47)	0.24	(0.43)	0.08
17 Selling kava	0.28	(0.45)	0.23	(0.42)	0.06

Note: Number of observations: 106.

\*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

level. At the time of the survey (2018), the price of dry beans was VUV150 per kilogram, whereas the price of wet beans was VUV55 per kilogram—almost three times lower (AUD1 = VUV81.4 in 2018). Since the sale of high-value products is mostly managed by men, this may also explain some of these differences.

In addition to this, women have low levels of participation in training activities. This is possibly due to the assumption that women do not participate in cash crop production and postharvest activities (Ragasa, 2014), or that they are more time-poor than men. If women participate almost equally in agriculture, compared to men, excluding them from training is an inefficient strategy. There is no guarantee that men will share information with women, and therefore women are less likely to adopt new practices, resulting in lower product quality and yields.

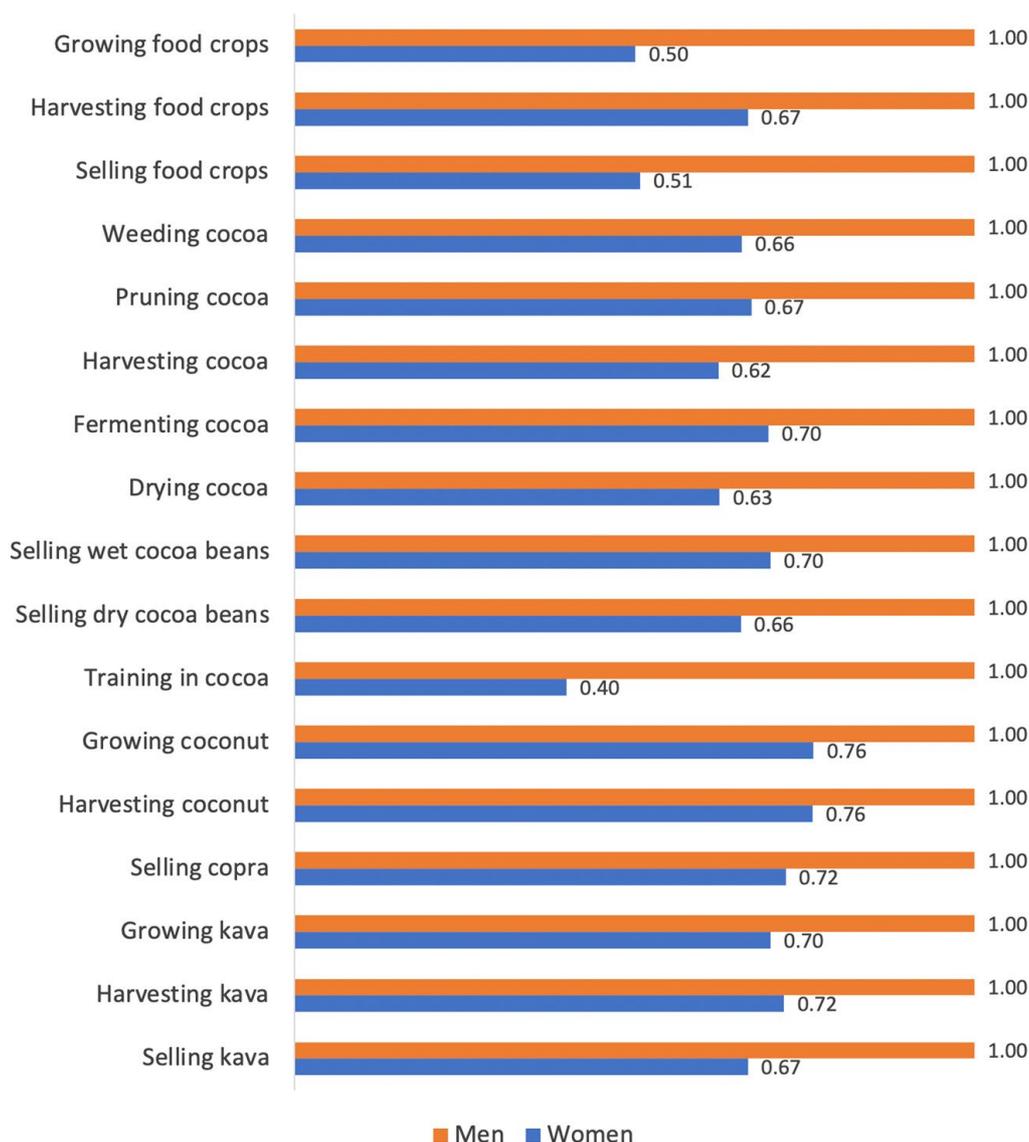
## 7.2 | Husbands' and wives' participation in decision-making

Women's participation in intra-household decision-making on agriculture is much lower than men's, even for activities in which women participate the most and that are considered within women's domain. A summary of the responses about participation in decision-making is presented in Figure 1. Proportions correspond to the share of total individuals who reported participation in decisions for these agricultural activities during the study period.

Men and women responded that women do not make any decisions by themselves; that is, the responses indicate that men participate in all of the decisions, whereas women do not. A comparison of participation in decision-making (self and together with spouse) between the answers of men and women reveals that all these differences are statistically significant at the 1% level (see detailed figures in Supporting Information, Appendix 3). Men have the dominant role in decision-making, even in activities related to food crops. Women do not make any of these decisions alone; their husbands decide with them, or instead of them. These results are similar to other studies that reveal low levels of women's empowerment, or high levels of conformity with social norms about gender that dictate that women should be submissive and follow their husband's lead (Douglas, 2002; Eriksen, 2012; Jolly, 1994). Women reported higher percentages of mutual decision-making when compared to their spouses, also consistent with the literature (Alwang et al., 2017; Anderson et al., 2017), which demonstrates differences in perceptions about how decisions are made within a marital unit.

Participating in decision-making does not necessarily mean that men and women have the same level of influence and autonomy. The results suggest that women have less influence and autonomy in decisions compared to men. The responses to the levels of influence on decisions and autonomy to decide are presented in Figures 2 and 3, respectively. For all activities, the proportion of men who responded that they have high or some influence in decisions is between 0.80 and 1.00, whereas for women these proportions are between 0.40 and 0.76 (see Figure 2). Looking closely at the data, the only instance where both men and women reported similar influence in decision-making is in the sale of food crops. This is not the case for decisions related to the sale of cash crops (see Figure 3 and Supporting Information, Appendix 4). Almost all men reported that they can make decisions about any activity when their spouse is away, whereas a lower proportion of women reported the same (between 0.20 and 0.83).

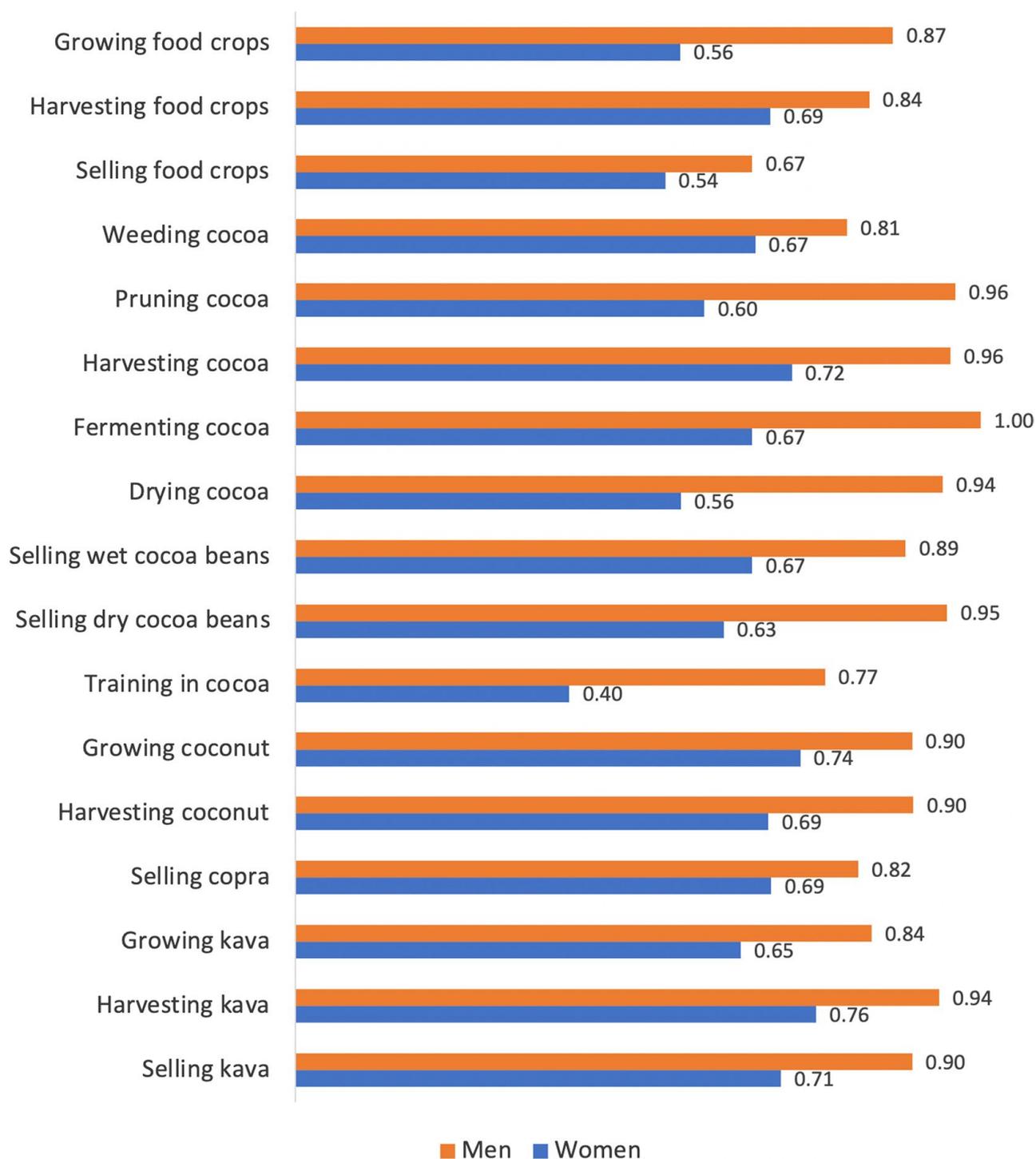
Overall, women tend to have high/some influence and have choices in relation to growing and harvesting food crops and can make decisions by themselves. But this is not the case for selling these crops. A lower proportion of women reported influence on and autonomy in decisions concerning sales of cash crops compared to food crops, and women have little to almost



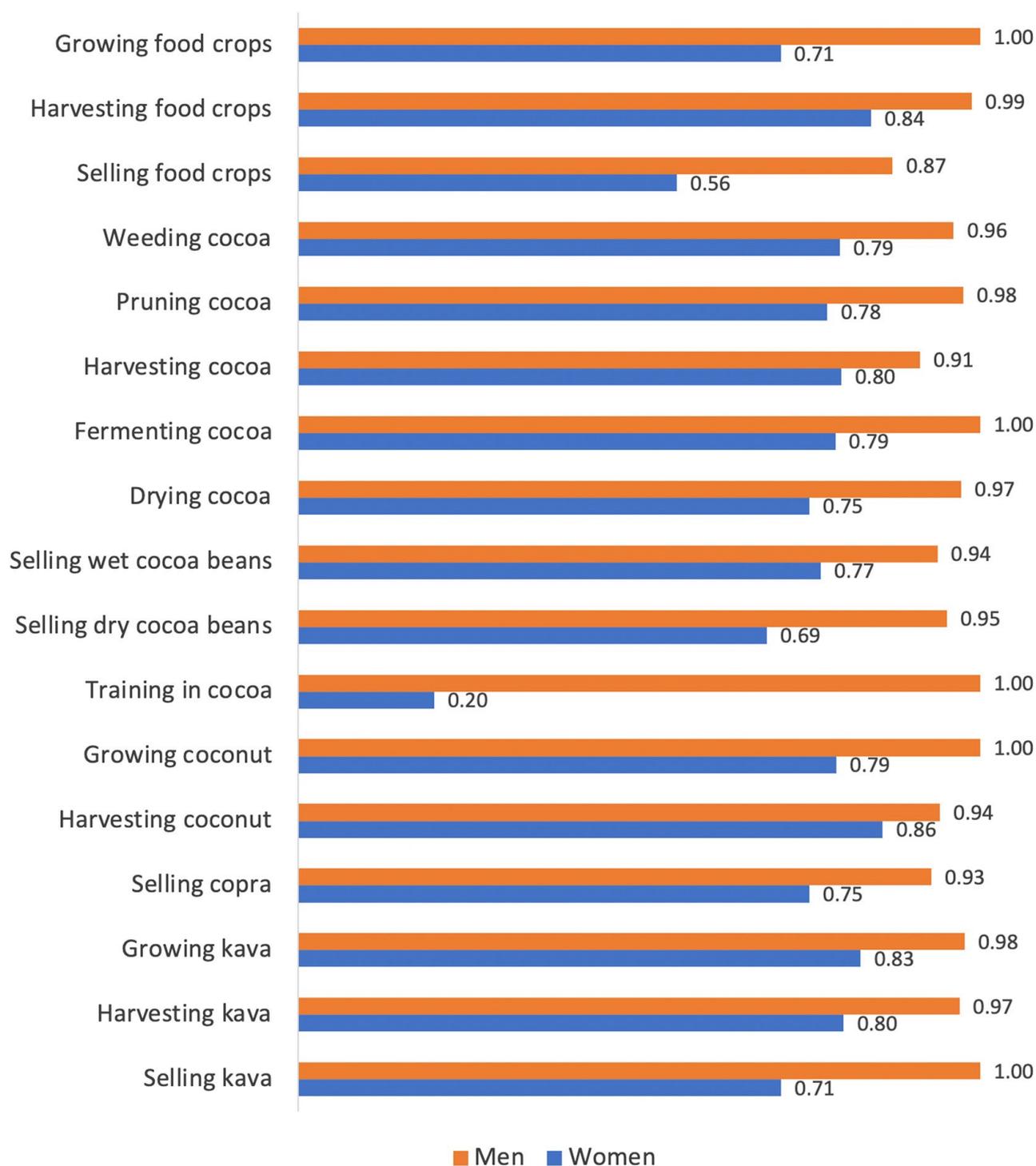
**FIGURE 1** Proportion of men and women participating in decisions (individually or jointly) concerning agricultural activities, Epi, Vanuatu, 2018. Total number of observations: 106. Observations for each activity correspond to the number of men and women who reported participation in each agricultural activity between June 2017 and June 2018. The differences between men and women participation in decisions are all statistically significant ( $p$ -value < 0.01). Men did not respond ‘Spouse only’ for any of the decisions, women did not respond ‘Self only’ for any of the decisions

no influence and cannot decide by themselves whether to participate in cocoa training activities when their husband is away.

Women also lack influence in decisions regarding the allocation of resources from sales of agricultural products. The level of influence in the use of income from the sale of food crops and cash crops is presented in Table 2. A higher proportion of women reported a high/some level of influence in decisions about the use of income from the sales of food crops, whereas a higher proportion of men reported a high/some level of influence in decisions about the use of income from sales of cash crops.



**FIGURE 2** Proportion of men and women influencing decisions (some or high influence) concerning agricultural activities, Epi, Vanuatu, 2018. Total number of observations: 106. Observations for each activity correspond to the number of men and women who reported participation in each agricultural activity between June 2017 and June 2018. The proportions correspond to men and women who reported some or high influence in decisions. The differences between men and women are all statistically significant ( $p$ -value < 0.10) with the exception of selling food crops and selling copra



**FIGURE 3** Proportion of men and women with autonomy to make decisions concerning agricultural activities (can decide by themselves when spouse away), Epi, Vanuatu, 2018. Total number of observations: 106. Observations for each activity correspond to the number of men and women who reported participation in each agricultural activity between June 2017 and June 2018. The proportions correspond to men and women who reported some or high influence in decisions. The differences between men and women are all statistically significant ( $p$ -value  $< 0.05$ ) with the exception of harvesting coconut

### 7.3 | Decision-making index

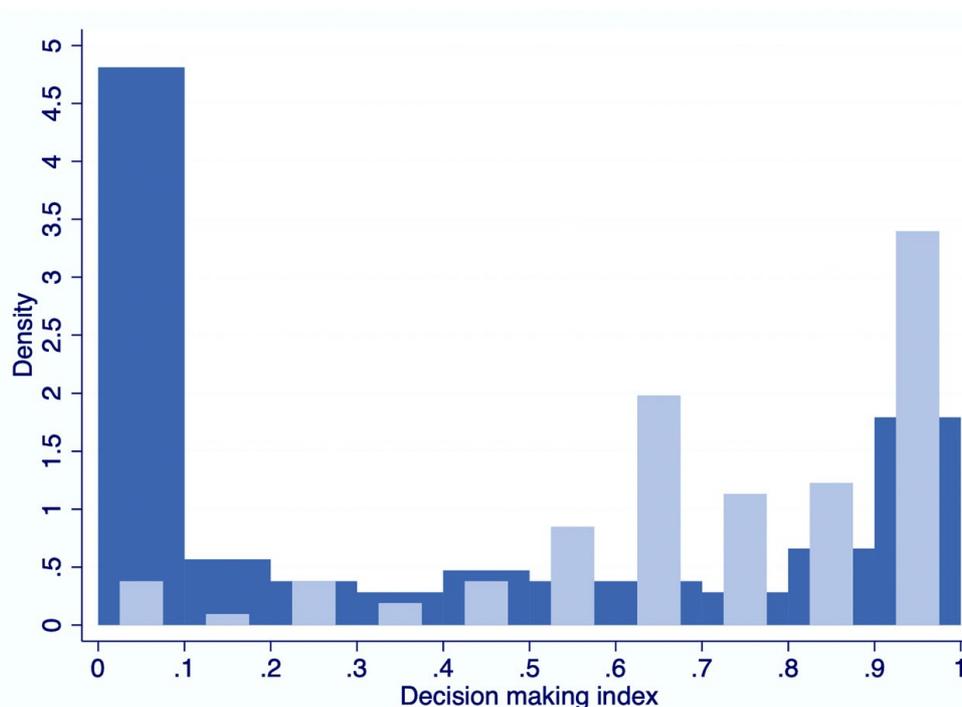
The decision-making index distributions for men and women are presented in Figure 4. The values of the index reveal information about women's (dis)empowerment in agriculture. The index is zero for 46% of women. That is, almost half of the women in the sample who took part in agricultural activities do not participate in, or have any influence or autonomy over, decision-making and the use of income derived from agriculture; whereas this is true for only 4% of men. The index takes the value of one for about 33% of men, where they reported that they decide, influence, and have exclusive autonomy over decisions and use of income for all agricul-

**TABLE 2** Men's and women's participation in decision-making on income from agricultural activities, Epi, Vanuatu, 2018

		Some/high influence in use of income from activity				
		Men		Women		<i>t</i> -test men-women
Agricultural activities	Mean	Standard deviation	Mean	Standard deviation		
3 Selling food crops	0.38	(0.49)	0.55	(0.50)	-0.17	
9 Selling wet cocoa beans	0.41	(0.50)	0.32	(0.47)	0.08	
10 Selling dry cocoa beans	0.46	(0.50)	0.20	(0.41)	0.26***	
14 Selling copra	0.46	(0.50)	0.25	(0.43)	0.22***	
17 Selling kava	0.43	(0.50)	0.31	(0.47)	0.13	

Note: Total number of observations: 106. Observations for each activity correspond to the number of men and women who reported participation in each agricultural activity between June 2017 and June 2018.

\*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.



**FIGURE 4** Men's and women's decision-making index. The thinner light blue bars correspond to the values of the index for men, and the thicker dark blue bars correspond to the values of the index for women

tural activities included in the survey. This is the case for only 15% of women. The data reveal the levels of gender disparity and women's disempowerment related to their ability to make, influence and have autonomy over decisions related to the agricultural activities they undertake for their household.

## 7.4 | Correlates of decision-making power

The findings also suggest that women's participation in community activities is correlated with their participation in decision-making, and that variables found in other studies, such as education and household wealth, are not correlated with the decision-making index. The results for the multivariate analysis using fractional response models are presented in Table 3. The regressions are presented for both men and women, and the coefficients represent the marginal effects of an

**TABLE 3** Correlates of the decision-making index for men and women (marginal effects after fractional response model)

Explanatory variables	Decision-making index for men (DM <sub>men</sub> )	Decision-making index for women (DM <sub>women</sub> )
Age in years	-0.006* (0.003)	-0.001 (0.004)
Education in years	0.013 (0.019)	0.023 (0.031)
Health condition = 1	-0.098 (0.072)	-0.123 (0.098)
Attendance day for the chief	-0.028 (0.032)	0.157*** (0.041)
Attendance day for the church	0.036 (0.051)	0.180** (0.086)
Spouse migrated = 1	0.093 (0.067)	0.048 (0.076)
Difference in age (men-women)	0.004 (0.004)	0.002 (0.007)
Difference in education (men-women)	-0.032* (0.017)	0.025 (0.023)
Difference in health condition (men-women)	-0.068 (0.066)	-0.007 (0.081)
Difference in attendance day for the chief (men-women)	0.059** (0.028)	0.019 (0.035)
Difference in attendance day for the church (men-women)	0.039 (0.050)	0.026 (0.041)
Household size	0.008 (0.017)	-0.033 (0.031)
Children less than 5 years of age = 1	-0.044 (0.050)	-0.014 (0.058)
Parents live in house = 1	0.107 (0.086)	-0.124 (0.113)
Parents-in-law live in house = 1	-0.137 (0.107)	0.239 (0.175)
Production assets index	-0.040 (0.065)	0.071 (0.081)
Non-production assets index	0.001 (0.050)	-0.198*** (0.068)
Travel time to dirt road in minutes	0.003* (0.002)	0.000 (0.002)
Village dummy variables	Yes	Yes
Pseudo R <sup>2</sup>	0.0912	0.2717
Log likelihood	-55.370	-49.886

Note: Number of observations: 106. For attendance at community activities: 1 = never; 2 = less than once every month; 3 = once a month; 4 = once every two weeks; 5 = twice per week; 6 = every week.

\*\*\*, \*\* and \* denote statistical significance at the 1%, 5% and 10% levels, respectively.

increase in one unit of the value of the regressor in the decision-making index (see tables with different specifications in Supporting Information, Appendix 5).

The results suggest that the variables that correlate with the decision-making index for women are the frequency of their participation in community-related activities. These activities refer to their participation in the ‘day for the chief’ and the ‘day for the church’. A possible explanation for these results is that participation in these activities translates into women’s higher visibility in the community and closer relations with the village chief and other villagers. These may translate into women’s higher participation, influence and autonomy in decisions for the household. Variables expected to influence the decision-making index, such as education and the presence of parents in the household, are not statistically significant, contrary to literature that traditionally finds such correlations (Alwang et al., 2017; Anderson et al., 2017). An additional unit in the value of non-production assets is correlated with a lower decision-making index for women by 0.20 points, perhaps indicating that in households that are wealthier, as measured by these assets, women tend to have lower participation, influence and autonomy in agricultural decisions.

For the decision-making index for men, men’s higher participation in community activities compared to women is positively and significantly correlated with the index. One more year of education of men compared to women reduces the decision-making index for men by 0.032 points, but this variable is only significant at the 10% level. The results from fractional response models are robust (see Supporting Information, Appendix 6).

## 8 | DISCUSSION AND CONCLUSION

The results highlight the high level of physical involvement by women in agricultural activities among cocoa-growing households in Epi, Vanu. Women participate in many aspects of the production and postharvest of food and cash crops, contradicting some common beliefs about their role in agriculture in Vanuatu. However, despite high levels of participation by women in agricultural activities, they are less involved in decision-making processes. Further, women are highly involved in growing, harvesting and selling food crops, but they do not tend to decide (by themselves) on how these activities are conducted or prioritised. Also, women have little say about the sale of cash crops and decisions regarding income from agricultural activities. This means they have little say in decisions that are likely to affect intra-household allocation of resources, such as the use of income from high-value cash crop sales. I find that in agriculture women are disempowered compared to men. That said, typical individual and household socio-economic characteristics of importance in other studies are not correlated with the decision-making indexes in this case. Instead, the results suggest an association between women’s higher involvement in community life and higher levels of agency. This is also true for men.

This study provides sex-disaggregated data capturing intra-household gendered decisions and activities. This information has been identified as lacking by decision-makers in Vanuatu (and other countries in the Pacific). Despite attempts by international organisations, such as the FAO, quantitative detailed sex-disaggregated information on intra-household decision-making for Vanuatu is still unavailable. These data can help improve the design of programs to empower women in agriculture, and to capture changes in men’s and women’s participation in agricultural activities and involvement in intra-household decision-making processes. Therefore, as a basis for additional work, this study provides a solid platform for further investigation and analysis.

The study has limitations. For instance, only one aspect of women's empowerment (instrumental agency) is analysed, and the data do not allow for causal inference. To address this, future research will require the inclusion of different domains of women's agency and the collection of data that allows for analysis of causal relationships between empowerment and women's participation in community activities.

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## DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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## SUPPORTING INFORMATION

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