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Review

Indigenous Knowledge, Gender and Agriculture: A Scoping Review of Gendered Roles for Food Sustainability in Tonga, Samoa, Solomon Islands and Fiji

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Abstract: This scoping review examines the state of academic knowledge around gender and its role in Indigenous/traditional knowledge for food sustainability in Tonga, Samoa, Solomon Islands and Fiji. The different roles played by all genders—men, women and non-binary—in the Pacific Islands can contribute to climate adaptation and knowledge preservation for sustainable food production. The gender lens is especially relevant given the fact that women's knowledge has, in recent years, been disregarded and marginalised as a consequence of colonial influences and increasing reliance on imported foods. We analysed 14 studies published in English between 2015 and 2024—six from refereed journal articles and eight from grey literature. Three themes emerged linking agriculture, gender and traditional knowledge, as follows: (1) there is a gendered division of labour and culturally defined roles between women and men, although the roles played by non-binary groups remain unclear; (2) intergenerational traditional knowledge transmission has declined; (3) climate change adaptation could be reinforced through passing on traditional knowledge. The findings demonstrate that gendered knowledge is distinct and complementary, and this knowledge should be integrated into Pacific agricultural production to achieve resilient and sustainable farming in the face of climate change.

Keywords: Pacific Islands; gender; agriculture; food security; Indigenous knowledge; traditional knowledge

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1. Introduction

This article presents and synthesises existing academic knowledge on the linkage between gender and the role of Indigenous/traditional knowledge for food production in Tonga, Samoa, Solomon Islands and Fiji. These are four independent Pacific Islands states all of which had populations in 2021 of under one million [1]. They are generally regarded as 'small states' due to their geographic size, population and limited economies. They represent four of the 22 Pacific Islands Countries and Territories (PICTs), which are themselves often divided into three subgroupings: Polynesia (many islands), Micronesia (small islands) and Melanesia (black islands) [2]. The largest PICT, Papua New Guinea, contains 83.5% of the entire PICT land area and has a population of almost nine million (2021 figure); all other PICTs are far smaller and have populations under one million. The smallest of the Melanesian PICTs (Vanuatu) is still four times larger than the largest Polynesian

PICT (Samoa). Polynesia is geographically diverse, including volcanic archipelagos and low-lying atolls. The states studied are from Melanesia (Solomon Islands and Fiji) and from Polynesia (Tonga and Samoa), however Fiji exhibits attributes of Polynesian social structure (Table 1).

Table 1. Land area and populations in select PICTs [1].

PICT	Population (2021)	Land Area (in km^2)
Papua New Guinea	8,934,475	462,840
Fiji	898,402	18,333
Solomon Islands	728,041	28,230
Vanuatu	301,295	12,281
Samoa	199,853	2934
Tonga	99,532	749

On average, 80% of people living in PICTs grow most of their own food or are engaged in family farming for subsistence and to support livelihoods [2,3]. This reliance on home-grown produce makes the smaller PICTs vulnerable to the adverse effects of climate change and climate-related natural disasters. Such challenges contribute to the degradation of natural ecosystems and resources, thereby posing a significant threat to sustainable agriculture, resulting in food insecurity and livelihood challenges for affected communities [4]. As climate impacts increase and intensify, numerous scholars argue that understanding traditional and Indigenous knowledge and practices is crucial for responding to the various climate effects that impact agricultural production [5–9].

A focus on gender in agriculture is of relevance for two reasons: (1) historically, European administrators looked to men rather than women to discuss agriculture [10], and post-colonial states continued this error [11]; (2) an increasing reliance on imported foods has led to disengagement in agriculture [12]. Together, these factors have led women's knowledge to be disregarded and marginalized.

These links between gender and Indigenous/traditional knowledge for agricultural production are important for PICTs as Indigenous agricultural knowledge emphasises sustainable food production methods that are adapted to local environmental conditions. These methods include crop diversification, intercropping, and water management systems that contribute to food security by reducing vulnerability to climate-related disruptions in food supply [13]. As researchers, we are engaged in a funded project to explore how gender roles and traditional knowledge can assist communities to be strategic about community planning for sustainable food production in the face of climate change, hence our focus on just the four PICTs of Tonga, Samoa, Solomon Islands and Fiji. We adopt the UNESCO definition of 'Traditional Knowledge' as it acknowledges the cultural dimensions of agricultural production:

> . . .knowledge, innovations, and practices of Indigenous and local communities around the world. It is developed from experience gained over centuries and adapted to the local culture and environment; traditional knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language, and agricultural practices including the development of plant species and animal breeds. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health,

horticulture, forestry, and environmental management in general (Secretariat of the Convention on Biological Diversity, 2007).

Indigenous knowledge extends into cosmology. Vunibola, et al. (2024) observe that Indigenous agricultural practices often emphasise a holistic understanding of the interconnectedness between humans, nature and the spiritual realm [13]. They further argue that this worldview guides sustainable resource management, respect for the land and a deep appreciation for the natural environment, fostering resilience by promoting harmony between people and their surroundings [13].

A significant portion of traditional knowledge in PICTs is dedicated to the preservation of terrestrial biodiversity. This includes efforts to protect native and endemic species, particularly in response to the negative impacts of introduced species, as well as the upkeep and restoration of diverse native ecosystems that are more beneficial to communities reliant on subsistence living. Given the close proximity of many people in PICTs to the ocean and their use of marine resources, there is a wealth of traditional knowledge focused on the sustainable management of marine ecosystems, particularly for those near the shore, which is heavily utilised [8]. This knowledge encompasses practices related to mangrove ecosystems, which historically adhered to strict guidelines aimed at maintaining productivity but have since been lost. [8].

Our focus, however, is on the land, particularly on agricultural production, as Pacific communities have traditionally relied on agriculture to ensure food security and reduce their dependency on external sources. Ferguson et al. (2022) note that during the COVID-19 pandemic, traditional practices and local knowledge were vital in enhancing the resilience of Pacific food systems by promoting community cohesion, supporting local food production and fostering adaptive capacity in the face of external shocks [14]. They found that despite challenges such as market integration and changing values associated with modernity, the cultural rootedness of traditional social systems provided a foundation for resilience in Pacific communities. Local knowledge and traditional agricultural practices facilitated increased local food production, which served as a key adaptation strategy during the pandemic. Meanwhile, the reciprocal exchange of resources and knowledge through food-sharing networks helped communities cope and recover [14].

When commenting on sustainable agricultural production, McMillen et al. (2014) note that the integration of biocultural diversity into agricultural production systems is crucial for enhancing resilience and adaptive capacity in the face of climate change and effective education and knowledge transmission efforts on sustainability and resilience are necessary for adapting to climate change in agriculture [6].

Yet, while it is important to acknowledge the key roles and functions of traditional/Indigenous knowledge in maintaining and supporting food production across the Pacific, it is also critical to recognise that within PICTs, food production is itself highly gendered. While the female/male gender binary is well known, it is an imposed concept, and in the Pacific Islands, gender is complex and multifaceted.

In Western societies, gender is understood as a binary system of male or female that is heavily intertwined with norms of heterosexuality, and it is often based on the idea that gender is determined by biological sex [15]. We acknowledge this understanding is often contested by gender activists and advocates. In the Pacific Islands, gender is, however, defined by one's role in social life and is centred on the individual's expected contribution to collective life [16]. A focus on gender identity is particularly appropriate for the Pacific region as there are several groups in Pacific societies—*fa'afāfine* and *fa'afatama* (Samoa), *fakaleitī* (Tonga), *mahu* (Tahiti), *pinapinaaine* (Kiribati), *vakasālewalewa* (Fiji) and *'akava'ine* (Cook Islands)—that do not conform to the binary Western understanding of gender [17]. In Pacific societies, gender identities vary from culture to culture and are embedded in

cultural identities and roles that may not equate to recognised multi-country identities (i.e., transgender or intersex) [18]. Wilson (2022, 20 citing New Zealand Human Rights Commission, 2020, p. 62) notes that "identities such as *whakawāhine* (Māori), *fakaleitī*, also called *leitī* and *fakafafine* (Tonga), *fa'afāfine* (Samoa), may be more closely associated with 'familial, genealogical, social, and cultural selfhood'" than centring around an individual's gender identity, that underpins Western concepts of gender [19]. A full explanation of all of these Pacific non-binary genders is beyond the scope of this paper. We refer interested readers to a source that contests the universality of Western gender binaries that contains a discussion of third and fourth genders in Samoa that explains that, "Fa'afafine and fa'afatama are fluid gender roles that move between male and female worlds." [20].

It is well known that women and men in the Pacific Islands often have very specific roles within agricultural production, including when working with particular crops [2,21,22]; at other times, men and women work together to harvest or plan the growth and sale of new crops [23]. In attempting to understand how binary and non-binary genders articulate with agricultural production, we have surveyed the existing literature to seek studies on how non-binary genders contribute to agricultural production. Moving past a gender binary promotes gender inclusivity, social justice, and accurate representation of cultures and practices. A gendered lens enables a more nuanced understanding of local cultures, social structures and agricultural practices, which leads to more effective and sustainable food outcomes.

2. Methodology and Methods

This scoping review is informed by an understanding of society as non-binary in terms of gender, wherein we assert that society is not merely divided into two gender groups—male and female—but also encompasses those whose gender identity exists outside of this binary man/woman. With this starting point, we adopt the standard Preferred Reporting Items for Systematic Reviews and Meta-Analyses extension for scoping review (PRISMA-ScR) [24].

This scoping review uses the PCC (population or participants/concept/context) framework to identify the main concepts in the primary review question and informs the search strategy [25].

2.1. Eligibility Criteria

2.1.1. Participants

In this review, we focus on Pacific gender identities and not sexual identities, as gender identities are culturally embedded and emphasised over sexual identities [19]. Apart from the usual male/female binary, Pacific Islands societies have several well-established non-binary genders—in Samoa, *fa'afāfine* and *fa'afatama*; in Tonga-*fakaleiti*; and in Fiji-*vakasalewalewa*—which, despite the efforts of missionaries, still maintain a high degree of social acceptance [17]. With respect to Solomon Islands, we have not yet encountered any literature that relates to a non-binary group in the same sense as in Polynesia; however, we are aware of gender-diverse communities, especially in Honiara.

2.1.2. Concept

The main aim of this article is to identify and explore the influence of gender on Indigenous/traditional knowledge and practices that shape food production systems in the Pacific, particularly in agricultural production, including cultivating, planting, raising and harvesting crops. As our focus is on gender and agricultural production in the food system, non-agricultural food sources, such as fisheries, animal husbandry and shops/markets, are not included in this review, with one notable exception (see below in study selection).

2.1.3. Context

The data and findings from this review inform an Australian–Canadian co-funded aid project on food loss—ACIAR/CS/2020/191: Adopting a gender-inclusive participatory approach to reducing horticultural loss in the Pacific. CS/2020/191 is a project supported by the Australian Centre for International Agricultural Research (ACIAR) and Canada's International Development Research Centre (IDRC). It aims to reduce post-harvest agricultural waste in four Pacific Island countries—Samoa, Tonga, Fiji and the Solomon Islands [26]. This review is thus restricted to these four states.

2.2. Search Strategy

An initial limited search of ProQuest Central was undertaken to identify articles on the topic. Studies published in English were included as the majority of literature across the Pacific on this topic is published in English. Studies published from 2015 to 2024 onwards were considered for the scoping review as that year marks the beginning of the United Nations Sustainable Development Goals (SDGs), which has had considerable influence on global and regional policies, research agendas and funding priorities [27]. The SDGs provide a comprehensive framework for addressing global challenges, including SDG5: Gender Equality and SDG2: Zero Hunger. Further, SDG2 has as its target Goal 2.4 of 'Sustainable food production and resilient agricultural practices', which provides scope for the contributions of traditional/Indigenous knowledge.

This scoping review considered peer-reviewed articles and other scholarly studies, such as reports and working papers. Scholarly studies included all study designs, i.e., quantitative, qualitative and mixed methods approaches. Grey literature sources, such as project reports, evaluation reports and other relevant documents, were also included. In line with the method outlined by Hilary Arksey and Lisa O'Malley (2005) [28], editorials, reviews, opinion pieces, news articles, dissertations and theses and books were excluded.

- The databases searched were Scopus, ProQuest Central, ProQuest Agricultural and Environmental Science Collection, Science Direct and Taylor & Francis Journals. The journals that were searched were the *Journal of Agriculture and Food Security, Regional Environmental Change, and Journal of Sustainability.* Lastly, a search was conducted of the websites of the following organisations, due to their specific programmatic focus on gender in agriculture in the Pacific:
- Development of Sustainable Agriculture in the Pacific;
- Food and Agriculture Organisation (FAO);
- Secretariat of the Pacific Community (SPC);
- United Nations in the Pacific;
- United Nations Women;
- International Women's Development Agency.

2.3. Exclusion Criteria

Studies were excluded if they were:

- Published outside the time frame of 2015–2024 or conducted in countries outside of Fiji, Tonga, Samoa or Solomon Islands;
- Published in languages other than English;
- Editorials, reviews, opinion pieces, news articles, dissertations and thesis and books;
- Did not assess the influence of gender dynamics on Indigenous knowledge on agricultural production and sustainable food systems.

2.4. Search Terms

A full search strategy for ProQuest Central was developed using the text keywords contained in the titles and abstracts of relevant articles. The search strategy, including all identified keywords, was adapted for each database and journal. The reference lists of all included sources of evidence were screened for additional studies.

The following keywords were used to search the databases to identify relevant studies:

(gender OR male OR men OR female OR women OR third gender OR *fa'afafine* OR *fa'afatama* OR *fakaleiti* OR *vakasalewalewa* OR trans-diverse)

Inclusion of 'trans-diverse' as a search term recognises the broader spectrum of gender identities, such as gender fluidity, transgender and non-binary identities, in Pacific Island societies, which reflects traditional and cultural practices [29,30].

AND

(food security OR agriculture OR horticulture OR small holder farm OR small holder agriculture OR fresh food OR local OR sustainable agriculture OR family farming OR fresh produce OR crops OR vegetables OR food systems)

AND

(Indigenous knowledge OR Traditional knowledge OR knowledge OR practice OR share OR local knowledge)

AND

(Pacific Island OR Tonga OR Samoa OR Fiji OR Solomon Islands OR Melanesia OR Polynesia)

2.5. Study Selection

All identified studies in the search were imported into EndNote, and EndNote software was then used to remove duplicates. The selection of studies for analysis was conducted by (1) manually screening the titles to remove any obviously irrelevant studies, (2) reading abstracts to confirm eligibility and relevance, and (3) reviewing the full texts of remaining studies against the inclusion criteria, pending final inclusion. One grey literature study on non-binary gender and fisheries was included, as it had directly relevant information on agriculture; indeed, it was the only source located that made these linkages.

The final studies selected were then imported into a Microsoft Excel data sheet. The final listed studies were then screened, and the reason for excluding any studies was noted in the Excel sheet. One author made the final selection of articles and studies for the scoping review, and the lead author was consulted in any case of uncertainty.

2.6. Data Extraction

Data were extracted from papers included in the scoping review using a piloted form developed by the authors. The data extraction flow is summarised in Figure 1. The data extracted included specific details about participants, concepts, context, study methods and key findings relevant to the review question. All study details are captured in Table 2. The final number of records analysed was 14, with 6 academic papers and 8 studies from the grey literature. The larger number of germane studies from grey literature may be explained by the fact that most research on linkages between gender, agriculture and food production in the Pacific Islands is performed by international agencies such as UN Women as part of their remit to empower women economically and politically.

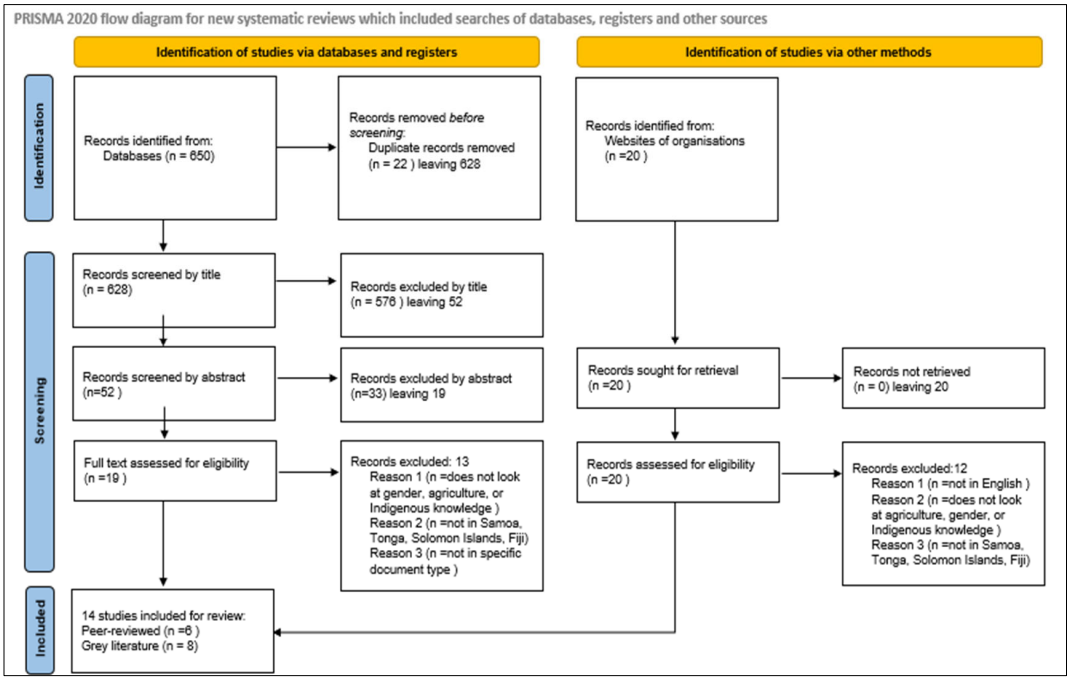

Figure 1. Study selection flow chart.

2.7. Data Analysis and Presentation

A thematic and comparative analysis was used for the scoping review. We utilised Braun and Clarke's (2011) [31] coding process to identify relevant themes to summarise the common aspects of the data. Data were coded using the six-step process: (i) familiarisation with the data by reading and re-reading the included studies; (ii) generating initial codes; (iii) grouping the codes into developing relevant themes; (iv) reviewing the themes against the coded extracts and the data extracts and create a thematic 'map'; (v) defining and naming the themes and sub themes; and (vi) writing the results. The final analysis entails a description and explanation of the similarities and differences of the gender dynamics in Indigenous and traditional knowledge of agricultural production and sustainable food systems across Tonga, Samoa, Fiji and the Solomon Islands. Similarities and differences are thematically organised based on the cross-cutting themes identified.

3. Results

This scoping review employed a gendered analysis to examine the social roles of different genders in agricultural production and the impact of these roles on food security across the four Pacific Islands countries: Samoa, Tonga, Fiji and Solomon Islands. Examining the data through a gendered lens provided valuable insights into social constructs, gender and responsibilities that influence the development of agricultural knowledge and skills that shape decision making across all stages of agricultural production, processing, and market participation, consumption and well-being outcomes. By recognising and valuing these different forms of knowledge, we can then promote more sustainable agricultural practices that are rooted in local contexts and responsive to community needs.

Three main themes emerged from the literature:

1. Gendered division of labour and culturally defined gender roles;
2. Decline in intergenerational traditional knowledge transmission; and
3. Climate change adaptation and traditional knowledge.

3.1. Theme 1: Gendered Division of Labour and Culturally Defined Gender Roles

In the Pacific Islands, agricultural production is intertwined with gendered roles and responsibilities, and these vary across different Pacific cultures and communities. Specific gender roles are shaped by historical, cultural and social factors, and understanding these roles is key to developing effective agricultural policies and practices that are inclusive and equitable. In agriculture, men's roles are oriented around work such as clearing and ploughing land and planting root crops. In contrast, women's roles are commonly centred around household food production as well as planting and harvesting in gardens that are run by their families or community members [32–35].

In Pacific Islands communities, men and women play distinct roles in agricultural decision making, production, and market sales. Across various Pacific societies, cultures, and geographies, individuals possess knowledge and skill sets derived from their varied gendered experiences and roles in agricultural production. Exploring agricultural production through a nuanced gendered perspective elucidates gendered knowledge of indicators of change or environmental stress, highlighting diverse insights and capabilities, as well as complementary resources in responding to climate change, thereby enriching the overall resilience of the community. We suggest that these different knowledge sets show interdependence rather than hierarchy to produce symbiotic knowledge sets.

When considering how to create sustainable food systems for people living in PICTs, it is important to acknowledge that interventions can affect gender relations and gender roles. For example, a program that introduces high-value cash crops into a family farming situation might reinforce male economic and decision-making dominance, which can negatively impact gender relations [36].

In Pacific Islands, agricultural roles are influenced by factors such as age, geography, gender, culture and ethnicity. This is also the case when an individual is residing in their own village or the village of their spouse [37]. This is evident in Tonga, where the influence of Christianity has greatly impacted culture and gender roles. Men are primarily responsible for labour work in the fields, while women are expected to take care of the household. This cultural norm has also affected agricultural practices [34].

3.1.1. Gendered Roles and Responsibilities

Traditional knowledge about agricultural practices has been transmitted orally through generations. It is place-specific and critical for managing sustainable agricultural production in a specific place. Historically, village elders taught young people which practices were appropriate for each situation. Knowledge sharing was often passed down through new generations learning gender roles. For example, women elders would teach girls how to garden, prepare meals and conduct household chores, while male elders taught young boys the skills of hunting and harvesting. Along with these practical skills, elders would also share stories, traditions, and knowledge about biodiversity utilisation [38]. This intergenerational passing of knowledge therefore supported and perpetuated a gendered division of labour around particular activities.

The gendered division of labour can be explored through the different roles and responsibilities held in agricultural production. Notably, in Solomon Islands, although there is nearly an equal number of women and men actively working in subsistence farming, there is still a gendered division of tasks, responsibilities, and knowledge; for instance, men engage in heavy planting and harvesting tasks while women tend to home gardens and domestic work which involves caring for their immediate household and extended family members [33]. Across Fiji, Samoa, Solomon Islands and Tonga, women typically undertake labour-intensive tasks such as garden maintenance and weeding, while men undertake sporadic, strenuous work such as clearing gardens and harvesting [2].

In Fiji, the traditional gender role for men in agriculture involves clearing and ploughing land, cash cropping, post-harvest processing, market sales and raising livestock [35], while women's roles include weeding, maintenance, processing of subsistence crops, raising household livestock, niche agricultural ventures and handicrafts [35].

In Samoa, there are gendered social norms in agriculture: men's roles are considered to be labour-intensive, and activities include planting taro and clearing land [32]. Samoan women have traditional community roles, including responsibilities in reproductive tasks around the house and vegetable gardens, as well as productive tasks [39]. Their contribution to agriculture is tending to vegetable gardens and subsistence farming aimed at feeding their family [32]. With respect to village gardens, both men and women contribute—men conduct the initial set-up of gardens, such as digging the area for land preparation, while women plant, maintain and harvest [32].

In Samoan culture, the *Fa'afafine* play an important role in performing traditionally female tasks such as subsistence farming and reproductive duties within their families. They learn these practices from their grandmothers and mothers, who pass down the knowledge of agricultural activities and other domestic skills [17]. *Fa'afatama* are more limited in their roles and may have restricted access to certain activities, including those traditionally seen as exclusive to men or women [17].

In Solomon Islands, men and women engage in similar agricultural work. Men's roles focus on clearing gardens, heavy planting, harvesting tasks, and production, and they are involved in the growth and sale of profitable cash crops such as watermelon [23]. Women are responsible for the production of the majority of subsistence foods in Solomon Islands [23]. They also have ongoing and labour-intensive tasks involving post-harvest processing and maintenance of seedlings and traditional gardens [33].

In Tonga, the division of labour is steadily becoming fluid. Both men and women perform the majority of agricultural tasks including clearing land, ploughing, planting crops (taro, cassava, tree fruits, and coconuts), post-harvest processing, and harvesting materials for handicrafts [34]. Additional men's roles include constructing sheds and agricultural infrastructure. In contrast, women's roles involve weeding and maintaining subsistence gardens, as well as holding primary responsibility for household labour [34].

3.1.2. Complementary Knowledge

The different roles of men and women result in differing experiences, knowledge, and skill sets that contribute to agricultural production [37]. When managing natural resources, adapting to climate change, and sustainably engaging in agricultural practices, men and women all possess distinctly valuable and complementary knowledge of their specific roles in agricultural production and of agricultural production and adaptation more broadly within their community.

The literature indicates men and women notice different indicators of stress and change in the environment, with the two knowledge sets complementing each other to contribute to better development and ideas. The examples below show how the gendered knowledge systems complement each other and work together to develop innovative solutions that cater to the diverse needs of their communities. For instance, women possessed a deep understanding of seasonal weather changes and were able to utilise this knowledge to determine which crops would grow better in the garden in various weather conditions. This enabled them to ensure a consistent supply of food and maintain food security for their families and communities [33]. In Solomon Islands, continuous rainfall and flooding have caused many common crops to fail. In response to the situation, male farmers started planting swamp taro on swampland for consumption [33].

The assignment of gendered activities within agricultural production means that people of different genders may notice and respond to conditions in unique ways. According to UN Women (2022), in Tonga, men may be more likely to recognise soil degradation on farming land than women, who are less likely to work on agricultural land. However, women have a strong connection with home gardening, as they inherit knowledge from their elders about the importance of gardening and growing staple crops such as traditional root crops (yam, sweet potato and cassava) [40]. This has led to women becoming experts in home gardening and playing a crucial role in ensuring food security in their households and communities. Similarly, in Fiji and Solomon Islands, since the COVID-19 pandemic of 2020–2022, there has been an increase in food received from home gardens (fruits, vegetables and root crops), which demonstrates the cultural practice of sharing resources and knowledge [41]. Crop diversification is a direct result of social and cultural participation in sharing knowledge [2]. On Savo Island, Solomon Islands, subsistence production is organised, and food crops are grown by all members of the household, including children [23], thus allowing for different knowledge sets to be recognised and implemented.

Due to the different types of knowledge held by women and men, a gendered perspective is essential for making better decisions about agricultural production. Since people have different experiences and knowledge of a situation, a gendered perspective can offer a unique and beneficial insight. Making workable adjustments to things that may not be otherwise working can assist in the long term and can lead to sustainable practices [42]. While all members of a community already are involved, it is crucial to ensure and enable the active participation of members in the planning and decision making of agricultural production.

3.1.3. Gender Inequality in Agricultural Decision Making

Across the four countries in the study, women held important roles in agricultural production. However, their contributions within the household and in agricultural production were not considered to be 'real work'; rather, these responsibilities were assumed to be a woman's duty. For example, in Samoa, women are not recognised as farmers; instead, due to the strong gendered norms and practices, they are viewed as 'helpers' of men in agriculture [32]. In Tonga, although women comprise 51% of the agricultural workforce, there is little recognition of women farmers in decision-making, as it is customary for men to hold decision-making power [34]. In Solomon Islands, at the household level, although husbands consult with their wives about decisions on agricultural resources and production, the ultimate decision-making power lies with the husband, even if the woman is the traditional landowner [23,33]. At the community level, decision-making positions are male-dominated, and women generally do not have a voice regarding agricultural planning and production. Participation in decision making is also limited for women in Fiji, who are usually excluded from formal decision processes concerning production and land, despite their participation in agricultural work—rural women worked (and were paid) for an average 28.3 h while rural men worked 35 h a week. However, women also engaged in unpaid household responsibilities for an average of 26 h per week, while men contributed only 10 h a week of unpaid work to the household [35]. As is the case in Africa and Asia, in the Pacific region, the lack of recognition of women's roles within the household and in agricultural labour is a direct result of cultural systems and traditional social norms and rules of community governance that create challenges for the advancement of equality for women. According to the Pacific Community report published in 2015, in Samoa, "at the community level, due to traditional stereotypes and cultural attitudes, women lack the confidence and self-esteem to undertake decision-making responsibilities, and that community attitudes can constrain women from participating" [39]. Women's access to

productive resources and opportunities, including assets, services, and interventions across a wide range of contexts, is hindered because their knowledge, skills, and participation in agricultural production are often overlooked [39].

The literature indicates that women are drivers of change as they tend to think about the future and plan accordingly [34]. However, it is also clear that women's knowledge is an underused asset in rural communities, and existing gender roles and power relations linked to decision making can constrain positive development [35]. Not acknowledging the full scope of the multiple roles conducted by women, particularly their traditional knowledge of agriculture and adaptation practices, can undermine food security in Tonga, Samoa, Solomon Islands and Fiji.

3.2. Theme 2: Decline in Intergenerational Traditional Knowledge Transmission

Knowledge transmission efforts on sustainability and resilience are necessary for adapting to climate change. Pacific communities place strong importance on the roles and responsibilities played in reviving culture and traditional agricultural practices. There has, however, been a decrease in the reliance on subsistence food sources due to the high consumption of processed foods, and this has led to a decline in knowledge transfer in PICT communities. In 2018, Samoa's communities reported a high overconsumption of imported food for each meal compared to 10 years ago, when most food was locally sourced and produced [32]. There has also been a shift from using produce from the family farming garden to buying produce and imported food, reflecting a shift from food use by necessity to food use by choice, which has resulted in losing traditional farming knowledge as young people, who are also increasingly pursuing formal education, are opting not to farm [40] and are seeking higher status jobs in urban centres. In Fiji, many communities are less reliant on home gardens, where local Indigenous knowledges and practices are shared, and they are increasingly relying on processed foods [32,40].

In the Solomon Islands, climate change is disrupting traditional knowledge and specific knowledge of local agrobiodiversity, as inconsistent seasonal weather patterns and periods of heavy rains challenge traditional Indigenous agricultural practices. Men and women connected climate change to biodiversity loss and shifting dietary practices. They also highlighted how this aligns with the growing dependence on imported foods, noting that this has led to the loss of traditional hunting methods and food preparation skills [39].

Another problem identified in Solomon Islands is that insufficient traditional knowledge is being transmitted between older and younger generations. The elders stated that young people are not interested in learning traditional knowledge and activities about agricultural practices and local food systems [38]. However, in the same focus area, young people emphasised the importance of learning traditional practices and wanted to learn how to grow crops on their family farms [38]. This disjuncture between older people's perceptions and younger people's values highlights a disruption in the oral traditions of knowledge sharing and points to a need to document traditional knowledge to preserve and transfer it to future generations. In Samoa, there is a strong presence of a cash-oriented production system where the majority of men go to work on plantations that focus on the export of cash crops such as cocoa, banana, noni, coffee, turmeric, breadfruit and taro [39]. Oral customs and teaching young men how to practice agriculture are declining. It is now mostly the older generation that remembers and practices traditional farming methods [39].

3.3. Theme 3: Climate Adaptation and Traditional Knowledge

The Pacific Island countries are experiencing an increase in 'slow-onset' impacts of climate change, such as rising sea levels, increased temperatures, the number of hot days and changes in precipitation patterns. These hazards can cause severe losses to the yields

of traditional food crops and increase the risks of famine and food insecurity in Pacific Island communities [41]. Traditional gender roles shape how people interact with the environment. Cassinat et al. (2022) reported that men were more likely than women to prioritise agricultural adaptation in a survey when disasters or environmental changes occur [42].

Changing weather patterns have led to a decrease in garden productivity, increased fallowing times and an increase in pressure on land use. Knowledge of when to plant root crops and other crops is required, especially when weather changes are affecting the soil fertility in agriculture. However, weather changes are challenging Indigenous agricultural practices, especially knowledge of planting seasons and crop harvests [38]. For example, a village elder recalled that traditional Samoan crops, such as swamp taro, which were traditionally grown and eaten, are no longer farmed due to the changing nature of the soil in the village [32].

Iese et al. (2021) [41] observed that the COVID pandemic heightened vulnerabilities and economic challenges, and agricultural sectors in PICTs are likely to suffer from reduced investment, labour shortages due to illness or mobility restrictions, and potential supply chain disruptions. In turn, this can lead to decreased agricultural productivity [41]. They also found that as a means to protect food security, new farmers are practicing unsustainable and non-resilient cropping systems. They noted that the intense cultivation of land to increase crop production in the short term can cause the decline of soil fertility and reduce/affect long-term agricultural production in the area.

Resilient Cropping and Farming

The effects of climate change have resulted in some farmers returning to Indigenous and traditional methods of agriculture, such as planting climate-resilient crops and conserving seeds [43]. A traditional agricultural practice is fallowing—leaving one area unplanted (or 'fallow') for a period of time—which enables land nutrients to regenerate after a harvest, ensuring restoration of soil fertility for the next crop [43]. Some 62% of men are likely to practice fallowing as they work on large agricultural land where crop spacing, mixed cropping and intercropping are used; in comparison, 33% of women practice fallowing as the majority of agriculture undertaken is in home gardens [43].

In Fiji, agricultural production is shifting from intensive cultivation to sustainable farming. Farmers are relocating to new land after two to three cropping sequences, which involve a vegetable harvest, followed by a root crop and a fallow period that allows for the future use of the land [35].

In terms of climate resilience, men and women harvest crops while they are still edible and plant crops that will mature the fastest (roughly three months) [34]. The choice of crop or vegetable depends on the temperature; in Fiji, men and women harvest taro and cassava as the warmer temperatures permit for a better harvest of these crops [35].

Crop diversification is being practised to combat climate change pressures. In Solomon Islands, farmers are growing more sweet potato (*kau kau*) than in previous years due to the high yield after a short fallow period, and because *kau kau* requires less weeding and maintenance than yam [2]. Planting non-seasonal crops that can grow well in poor or sandy soils, is an important adaptive strategy, especially if they are drought-tolerant and resistant to pests.

Table 2. Summary of included studies.

Peer-Reviewed Journal Articles					
No.	**Author/Year/Title**	**Study Objective**	**Population or Region**	**Study Methodology**	**Key Findings**
1	Cassinat et al. (2022) [42] 'Traditional village roles and gender shape Samoan perceptions of climate change'	- Examine how gender and traditional village roles shape perceptions of climate change and adaptation response	Fa'asalele'aga district in Savaii, Samoa. Participants: 12 women and 15 men.	Semi structured interviews	- How people interact with the environment is shaped by their traditional village role. - Pay attention to the environment and it will assist in long-term planning and sustainability. - Men were more likely to put agricultural adaptation as a higher priority than females due to their role in agricultural production.
2	Georgeou and Hawksley (2017) [23] 'Challenges for sustainable communities in Solomon Islands: Food production, market sale and livelihoods on Savo Island'	- Examines the challenges of community sustainability	Savo Island	-Focus groups -1-on-1 semi structured interviews -Observations	- Subsistence farming is organised by all members of a household (deciding what will be grown and working together). - Men and women engage in similar agricultural work. - Women are responsible for the production of the majority of subsistence foods. - Men focus on clearing gardens, heavy planting, harvesting tasks and sale of profitable cash crops.
3	Georgeou et al. (2022) [2] 'Food Security and small holder farming in Pacific Island countries and territories: a scoping review'	- Assess the relationship between smallholder farming and food security	Pacific Island countries and territories	Scoping review of literature	- Gendered division of activities. - Women and children undertake labour-intensive tasks, while men undertake sporadic strenuous work. - Crop diversification is a result of sharing knowledge and increased social, cultural, economic and political participation. - More research is needed on the role of gender in agricultural production in the Pacific.
4	Guell et al. (2021) [40] '"We used to get food from the garden." Understanding changing practices of local food production and consumption in small island states'	- Aim to understand the interlinkages and dynamics of local food production, preparation and consumption	Urban and Rural Fiji Participants: 76 men, women and youth.	Focus groups	- Participants credited their knowledge of home gardens and food to their forefathers, where knowledge was passed down from generations. - Importance of growing staple food/crops such as traditional root crops. - Shift from home gardens/farming to buying processed and imported foods. - Shift from necessity to a choice of farming.
5	Iese et al. (2021) [41] 'Impacts of COVID-19 on agriculture and food systems in Pacific Island countries (PICs): Evidence from communities in Fiji and Solomon Islands'	- Understand the implications of COVID-19 for Pacific Island countries - Identify knowledge gaps requiring further research and policy attention	Fiji and Solomon Islands	-46 focus group discussions -425 household interviews -Literature review	- Covid-19 led to 'new farmers' practicing unsustainable cropping systems, reducing short- and long-term agricultural production. - Covid-19 prompted traditional knowledge and practices to be implemented as well as emphasis on sharing knowledge/resources. - Traditional knowledge is a better alternative, which focuses on the resilience of agricultural production. - In Fiji and Solomon Islands, increase of food received from home gardens (fruits, vegetables and root crops).
6	Vogliano et al. (2021) [38] 'Dietary agrobiodiversity for improved nutrition and health outcomes within a transitioning indigenous Solomon Island food system'	- Assess dietary agrobiodiversity's relationship with nutrition indicators related to diet quality and anthropometrics - Evaluate the contribution of agrobiodiversity from the local food system to diet quality	Baniata village, Solomon Islands Participants: 14 groups with men, women and youth	-Survey -Focus group discussions	- Weather changes are challenging Indigenous agricultural practices including knowledge on planting seasons and crop harvests. - Traditional knowledge occurs for women during gardening and cooking and for men during hunting and harvesting. - Traditional knowledge and knowledge of local agrobiodiversity is declining. - Men and women stated traditional language, hunting techniques and food preparation techniques are being lost due to increase of reliance and consumption of imported foods.

Table 2. *Cont.*

Grey literature					
No.	**Author/year/title**	**Objective**	**Population or region**	**Methodology**	**Key findings**
1	FAO & SPC (2019) [35] 'Country gender assessment of agriculture and the rural sector in Fiji'	- Analyse the agricultural and rural sector in a gender perspective at the policy, institutional, community and household levels	Rural Fiji (Ba Province and Viti Levu) Participants: men, women and 11 representatives	- Desk review of literature - Focus group discussions - Stocktake of policies and strategies - Consultations with civil society organisations	- Gendered division of labour activities. - In Fiji, decrease in reliance of subsistence food sources due to high consumption of processed foods. - Knowledge on when to plant root crops/other crops is required, especially when weather is frequently changing. - Women's knowledge is an underused asset in rural communities. - Gender roles and power relations can constrain positive development. - Women and men recognise different indicators of environment stress/change. The two knowledge sets complement each other.
2	FAO & SPC (2019) [32] ' Country gender assessment of agriculture and the rural sector in Samoa'	- Aims to identify ways in which socially constructed gender roles and patriarchal norms in Samoa defines men's and women's access to and control over resources, including land and labour	Rural Samoa (Lotofaga and Falevao/Lalomauga) Participants: men and women	- Desk review of literature - Focus group discussions - Stocktake of Ministry of Agriculture and Fisheries, Ministry of Women, Community and Social Development - Consultations with two communities	- Gendered division of labour in agricultural activities. - Men roles are considered labour-intensive (planting taro and clearing land). - Women spend most of their time doing subsistence farming to feed their families. - Women have a significant role but are not recognised as farmers instead as helpers. - Traditional Samoan crops that were grown and eaten are no longer farmed such as swamped taro due to changing nature of soil. - Higher consumption of imported food at each meal.
3	FAO & SPC (2019) [33] 'Country gender assessment of agriculture and the rural sector in Solomon Islands'	- Analyse the agriculture and rural sector at the policy, institutional, community and household levels from a gender perspective	Rural Solomon Island (Guadalcanal and Malaita) Participants: government officials	- Desk review of literature - In-depth interviews - Consultations with civil society organisations - Site visits to communities	- Nearly equal number of women and men actively working in subsistence farming. - Gendered division of tasks, responsibilities and knowledge. - Men roles include clearing gardens, heavy planting and harvesting tasks. - Women do ongoing and labour-intensive tasks involving maintenance. - Strong emphasis on traditional food gardens. - Men and women have complementary knowledge sets on how to adapt to change and sustainably grow crops.
4	FAO & SPC (2019) [34] 'Country gender assessment of agriculture and the rural sector in Tonga'	- To improve awareness and understanding of gender perspectives in rural livelihoods in order to develop effective strategies to support food security, nutrition and resilience	Rural Tonga (Tongatapu) Participants: government officials	- Desk review of literature - In-depth interviews - Consultations with civil society organisations, private sector representatives and development partners - Field visits to communities in Tongatapu	- Men are considered to be the main breadwinners and decisionmakers, while the role of women is to take care of the household. - Division of farm labour is slowly but steadily becoming more fluid with majority of agriculture tasks completed by women and men (clearing land, ploughing, planting and harvesting materials). - Women have additional roles including weeding and maintenance of subsistence gardens. - Women are considered to be drivers of change, they forward think about the future. - For climate resilience, women and men planted crops that would mature the quickest (3 months).
5	Kenny & Tapu-Qiliho (2022) [17] 'Exploring the access to, and experiences of people of diverse sexual orientation and/or gender identity engaged in fisheries: a scoping review'	- Map participation and perceptions of people and communities of diverse SOGIE engaged in fisheries - Understand the economic and social contribution, experiences and treatment of SOGIE individuals in fisheries - Identity barriers to full participation of such individuals -Develop place-based research	Samoa (Savai'i, Upolu, Apia)	- Talanoa and storytelling - Formal and informal discussions and interviews - Participant observation	- Fa'fafine are taught by grandmothers and mothers the traditional way of doing agricultural activities. - Fa'fafine are often confined to subsistence farming rather than being able to access the full range of agricultural activities. - Fa'afatama do not have access to men's activities and have limited access to women's activities. - More research is needed on Fa'fafine and Fa'afatama roles in agriculture.

Table 2. *Cont.*

Grey literature					
No.	**Author/year/title**	**Objective**	**Population or region**	**Methodology**	**Key findings**
6	Loganimoce & Meo (2023) [37] 'The significance of traditional practices in the Lau Islands, Fiji, and their importance to women for sustainable protection and production'	- Reports on the outputs and outcomes of the Gender Inclusion Consultation with women	Fiji (Lau Province)	- Face-to-face interviews through targeted focus group discussions - Semi-formal discussions	- Agricultural roles are generalised and is influenced by factors of age, geography, culture, ethnicity and whether an individual is residing in one's original village or spouse's village. - Differences in roles result in knowledge and skillsets that are assigned to women or men. - Activities women perform are not considered real work rather considered a household responsibility. - Men roles include clearing gardens, maintaining large root crops and planting and tending to cash crops. - Women roles include weeding and maintenance of subsistence gardens, processing and cash crops. - Strong importance of traditionally practicing their roles and responsibilities in reviving culture and traditional practices.
7	Percy et al. (2022) [39] 'Gender, agrifood value chains and climate-resilient agriculture in small island developing states'	- Explores the interconnections between gender equality, climate resilience and agrifood value chains in small island developing states, from a food systems perspective	Samoa and Tonga	- Desk review of secondary data and literature - Interviews with FAO staff and relevant regional and subregional offices	- Gendered social norms. - Samoan and Tongan women are less active in production, instead have a greater role in food preparation, storage and value addition. - Men roles include clearing land, planting taro. - Community level, due to traditional stereotypes and cultural attitudes, women lack confidence and self-esteem to assume decision-making responsibilities. - Mostly the older generation remembers and practices traditional farming practices due to cash-oriented production system.
8	UN Women (2022) [43] 'Gender and Environment survey 2022 report, Kingdom of Tonga'	- Provide nationally representative and sex-disaggregated statistics across several thematic areas	Tonga (Nuku'alofa, Tongatapu rural, Vava'u, Ha'apai, 'Eua, Niuas) Participants: 2136 women and 2014 men	- Household survey	- Fallowing is most likely to be practices by men at 62% compared to women at 33%. - Men work on large agricultural land, using different techniques (crop spacing, mixed cropping and intercropping). - Women mainly perform agriculture activities in home gardens. - Men and women will notice different conditions occurring depending on their assigned activity, e.g. men in Tonga will likely notice soil degradation on farming land.

4. Discussion

The scoping review has synthesised the existing literature to understand the role of gender in the practice and sharing of Indigenous and traditional knowledge in agricultural production in Tonga, Samoa, Solomon Islands and Fiji.

4.1. Gendered Division of Labour and Culturally Defined Gender Roles

This review finds that agricultural production is gendered, culturally specific and contextual. Within diverse geographical and cultural contexts, men and women develop different knowledge sets, as they have different experiences and interactions within agricultural production. Men and women have different roles when engaging in the same agricultural production activity. It is, therefore, essential to provide opportunities that enable men and women to share their complementary perspectives and knowledge of agricultural production. For instance, Peralta (2022) highlights that men and women in Vanuatu are involved in similar agricultural activities, such as the production and postharvest of food and cash crops [21]. This collaboration provides an opportunity and an important platform for the sharing of traditional knowledge and ideas between genders, which can improve agricultural production. Contrary to previous literature, this new finding contributes positively to understanding the gendered transmission of knowledge.

Women are significantly knowledgeable about agriculture, particularly in managing home gardens and understanding which crops are best for each season. Ramirez-Santos et al. (2023) emphasise that women in Asia and Africa are crucial in maintaining home gardens and food preparation, which contributes significantly to food security [44]. However, this knowledge is often overlooked despite the importance of sustainable agricultural production, where women are undervalued, have little participation in discussions about agricultural production and are limited in decision making at a community level [34,35,39]. Women's diminished decision-making can, in part, be attributed to the impacts of Western colonisation, initially through Christian missionaries and religion, which enforced binary practices that disrupted the Pacific Islands' traditional gender roles and how people are seen, heard, included and involved in decision making [16,19,45,46]. For example, historically, men and women were equally important in decision making and their contribution to the household and community. However, colonisation resulted in men being viewed as the providers of the family, while women were considered physically inferior and limited to maternal duties [7,16,21]. In agricultural decision making, the erosion of platforms for women to share their knowledge and perspectives on agriculture is concurrent with the breakdown of traditional leadership structures and the adoption of Western social structures that emphasise the power of village leaders and chiefs (who are typically male) [5,7]. McLeod et al. (2018) [7] advocate for enhancing and strengthening the roles of women in agriculture through their culture and traditions. They contend that by valuing pre-colonial traditional forms of leadership and greater recognition of the diversity of ways women participate in decision making within Pacific societies, women will gain greater influence in decision making [7].

Singh et al. (2021) [5] highlight the importance of integrating gender perspectives into community discussions and programs. This enables all community members to have equal access to resources [5] and ensures they are provided with the opportunity to contribute equally and actively in decision-making processes. The significance of a gendered perspective is demonstrated in a Samoan village, where a female high chief was appointed. Her knowledge of the environment enabled improved planning and management of agriculture in the village [42].

There are similar examples seen across the world. In a project in Uttar Pradesh in India, women are involved as equal partners in decision making on agricultural and post-production services [47]. This work showcases that women were able to talk freely and discuss issues relating to sustainable agriculture; this involvement increased overall productivity and income [47]. In rural communities of Burundi, Central African Republic, Democratic of Congo, Mali, Niger, Ghana and Senegal, there are 'Dimitra' Clubs[1], which strengthen the participation and leadership of men, women and youth in community self-organisation. Women account for two-thirds of member attendance in Dimitra Clubs. All members are able to contribute and inform decision-making on a community level regarding varying issues, including agriculture and sustainable development [47]. The integration of gendered knowledge into discussions and decision-making allows for unique insights and provides an opportunity to use traditional knowledge in agriculture and adaptation to climate change. A gendered perspective is required when analysing any agricultural system. However, although non-binary people have an extensive history in Pacific cultures, in particular in Polynesia and Micronesia, in academic work, at least, there has been little attention devoted to understanding how non-binary genders contribute to and support agricultural food production [18]. For instance, an ethnographic study of four farms in Switzerland explored queer farming practices and how they navigate gender normativity. These individuals are discouraged from farming as a livelihood on the basis of their sex, gender or sexuality, while they de- and re-construct gender and farming identities. [48] Raj, G. (2024), further discusses insights into the complexities, contradictions and limitations of empowerment experienced by queer farmers within community supported agriculture. [49] On the other hand, there is increased recognition of the growing role of non-binary people in organic farms on Long Island and across the United States [50]. This literature review highlights an important gap in scholarly approaches to research on gender and agricultural production in the PICTs, one which not only perpetuates binary conceptions of gender but also renders invisible parts of Pacific populations.

4.2. Decline in Intergenerational Traditional Knowledge Transmission

Previously, communities were self-sufficient in the production of traditional food crops; however, globalisation has led to a shift from traditional diets and practices to modern diets consisting of imported food that is readily available and cheaper in supermarkets [51]. In Fiji, most of the population is heavily dependent on cheap imported foods due to the belief that traditional practices are time-consuming and labour-intensive [35,51]. Similar examples are seen in other countries; in Papua New Guinea, traditional crops, such as yam, sweet potato and taro, have been replaced by imported rice, and traditional sources of fish and meat were substituted for imported tinned meat and fish [52]. In South Africa, traditional diets have been replaced by 'Western' diets that are centred around highly processed imported foods [53]. This has, therefore, led to a decline in local production and consumption of traditional staple crops, resulting in a decrease in traditional agricultural knowledge transfer.

This review finds that there is an intergenerational gap in traditional knowledge transfer. In the Pacific Islands, there is an overreliance on imported food, which has accompanied a decline in the practice and sharing of gendered traditional knowledge between older and younger generations. This finding implies that there is a communication barrier, as elders believe that young people do not want to learn about traditional agricultural practices, when young people are reportedly motivated and eager to learn how to farm. However, Ramirez-Santos et al. [44] and Thow et al. [54] highlight that new generations are less likely to conduct traditional agricultural practices (labour-intensive farming and

food preparation) due to their different diets when compared with their parents and grandparents. Further, the sharing and passing down of gendered traditional knowledge is affected by younger generations wanting to work on larger plantain farms or work outside the agriculture sector. This is explored by Borda et al., who identified that the lack of motivation to engage in subsistence farming contributes to a widening gap in agricultural knowledge transmission from one generation to another [55]. In support of this claim, Shah et al. [51] and Nunn et al. [8] demonstrate that women are unable to share Indigenous practices of maintaining home gardens or food shortage practices. For instance, in Fiji, practices such as sun drying food and shavings of root crops or storing yams in heaps covered in soil and banana leaves are now unable to be taught [51]; men are not engaging in subsistence farming as frequently; therefore, men are also unable to teach and share traditional knowledge with each other or to teach young boys [38,39].

There is a clear link between maintaining local food production and dietary patterns and the preservation of gendered traditional knowledge, which emphasises the importance of encouraging the continuous transmission of traditional knowledge both between genders and between older and younger generations. With the advent of online platforms that allow for a reimagining of gender roles in a digital economy, female entrepreneurship stemming from traditional knowledge may be passed on through rural e-commerce. In Fiji, one such organisation, Rise Beyond the Reef, has, from 2015, produced handmade artisanal products (e.g., baskets, fans, screen-printed items and tapa wall hangings) for direct sale to consumers [56].

4.3. Climate Adaptation and Traditional Knowledge

The review finds that integrating knowledge of men and women results in resilient farming in the face of climate change. Each gender understands the environment differently. However, both sets of knowledge together contribute to Indigenous and traditional practices that better enable adaptation to climate change. This finding is explored in Phiri et al., where gender integration incorporates the unique abilities, knowledge and skills that are needed to respond to climate change [57].

The review suggests that crop diversification is occurring and is important when responding to drought or pests. Phiri et al. state that diversifying crop production supports current cropping systems' resilience to adverse climate change impacts [57]. Bryan et al. further emphasise the importance of diversified crops by highlighting their benefits, which include reducing climate risks to production and livelihoods and providing better environmental sustainability [58].

Diverse and integrated traditional knowledge and understanding of crops, from men and women, can assist in providing food security. For example, in Bangladesh, women are moving away from rice production to other more nutritious and climate-resilient crops, such as pulses, maize and vegetables (pumpkins) [58,59], while in Fiji, women are growing root and tuber crops, such as yam and taro, as these crops mature quicker and are readily available [5]. Additionally, in Malawi (sub-Saharan Africa), men and women are using Indigenous knowledge for household and climate resilience by keeping and sharing seeds and maintaining home gardens [57].

Traditional agricultural knowledge is crucial for managing climatic stressors. McLeod et al. (2018) reiterate the importance of this amidst the rise in extreme weather events [7]. They found that in the PICTs, women are revitalising traditional practices, such as laying palm leaves over the soil to keep it cool, covering young taro plants, transferring young shoots to shady areas, and mulching around taro patches, to mitigate climate changes such as increased heat and soil infertility [7].

Therefore, capturing and integrating the knowledge of different genders into agricultural practices, policies and programs is vital for coping with climate change. This will produce resilient farming strategies that are sustainable and ensure food security.

4.4. Strengths and Limitations

A strength of this scoping review is its systematic and comprehensive approach to reviewing relevant literature, including peer-reviewed journal articles and grey literature on gender, Indigenous knowledge, and agriculture in Fiji, Samoa, Tonga and the Solomon Islands. This allowed for mapping and analysing studies from multiple sources.

The limitations of this scoping review include the following: the studies were restricted to journal articles in English, which could have excluded key studies in non-English languages; published studies covered only from 2015 to 2024; the review was limited to Fiji, Tonga, Samoa and the Solomon Islands. These states do, however, represent examples of the challenges that larger PICTs are facing, and the review captures the range of different Polynesian and Melanesian social, economic and ecological environments.

5. Conclusions and Implications

Pacific Island communities are heavily dependent on growing their food and engaging in family farming for subsistence and livelihoods. However, the Pacific region is currently experiencing the ongoing effects of climate change on agriculture. Understanding and adapting to climatic conditions is an emphasis, which will contribute positively to food security in the Pacific.

This scoping review aimed to elucidate how men, women and non-binary identities are recognised in the Pacific Island region and how they develop distinct yet complementary knowledge and skills in agriculture that are crucial for the sustainability of food systems. It expanded on the limited literature on gender dimensions of Pacific Islands agricultural food systems.

This literature has revealed there is little mention of non-binary people in scholarly literature concerning Tonga, Solomon Islands, Samoa and Fiji. In Samoa, the *Fa'afafine* and *Fa'afatama* have been researched in relation to their roles and activities in fisheries, but there are little data available on their role in agricultural production [17]. More research is required to understand the gendered experiences of access to resources, division of labour, decision making and knowledge in agricultural production in PICTs. With respect to the division of labour, to better understand the roles played by non-binary people and the gendered use of time in communities [32–35], future research could further examine the roles of non-binary people in agricultural production and how their traditional knowledge, unique experiences and skill sets can contribute to food sustainability.

While people of non-binary genders in PICTs tend to adopt domestic roles similar to women, there is a knowledge gap around their contribution to agricultural production, and much more research is needed. At a minimum, we need to know if the *fa'afāfine* (Samoa), *fakaleitī* (Tonga), *mahu* (Tahiti), *pinapinaaine* (Kiribati), *vakasālewalewa* (Fiji), and *'akava'ine* (Cook Islands) represent significant proportions of the agricultural labour force in individual PICTs, and, if so, whether there is specific gendered knowledge they hold that is different from that of women and men. If not, does the adoption of women's roles by non-binary groups release other female labour into the agricultural production cycle? Another important question is whether these genders experience challenges (cultural or otherwise) in gaining access to resources or knowledge needed to engage in the agricultural production landscape and to gain insight into how these challenges can be managed, for example, through land access and training). Future policies and programs should,

therefore, incorporate the perspectives and views of men, women and non-binary people on agricultural production.

The findings of this review add to the global knowledge of the relationship between gender and sustainable agricultural production, utilising Indigenous and traditional knowledge. The research will positively contribute to future policy and program development in the Pacific Islands, as it suggests that men, women and non-binary people should be equally involved in decision making and that gendered traditional knowledge should be integrated into agricultural production for increased effectiveness. This review generates evidence for the SDGs (Goals 2 and 5) to ensure sustainable food systems are achieved through the implementation of traditional agricultural practices.

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Abbreviations

The following abbreviations are used in this manuscript:

ACIAR	Australian Centre for International Agricultural Research
FAO	Food and Agriculture Organisation
IDRC	Canada's International Development Research Centre
PCC	Population or participants/Concept/Context
PICTs	Pacific Islands Countries and Territories
SDGs	Sustainable Development Goals
SPC	Secretariat of the Pacific Community

Note

[1] Dimitra Clubs are voluntary groups of people work work together to address community issues and bring about change. The Food and Agriculture Organization of the United Nations (FAO) states that "the goal of the clubs is to help rural communities become more organised and resilient, and to move away from being dependent on external aid" (FAO, 2017. FAO-Dimitra Clubs: Stepping stones for action in rural areas. [available at: https://www.fao.org/gender/resources/videos/videos-detail/FAO-Dimitra-Clubs-Stepping-stones-for-action-in-rural-areas/en] (accessed 7 November 2024)

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