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REMITTANCES REVIEW

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Development Impacts of Remittances in Agricultural Households in Fiji

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Abstract

This paper provides the contribution of remittance income for agriculture and rural development in Fiji at the micro-level analysis using the most recent household survey data available. On the contrary to general belief that remittances are mostly used for food consumption amongst households in the Pacific islands, the empirical results show that remittances have alternative uses by the households in Fiji. In particular, it sheds light on remittances as a driver for pro-poor agricultural production and diversification.

Keywords: Agricultural households; Remittances; Empirical modelling; Fiji.

JEL Classification: F22, F24

Introduction

Millions of people have migrated to other countries and it is estimated that the number of people living outside their country of birth is over 215.8 million or 3.2 percent of the world's population in 2010 (World Bank, 2011, p.18). Migration generates significant economic benefits for migrants, their families back home, and their adopted countries. For example, remittance (i.e., the portion of a migrant worker's earnings sent back from the destination of employment to the origin of the migrant) flows to developing countries amounted to $406 billion in 2012, more than three times that of official development assistance (ODA) (World Bank, 2012b).

Remittance flows to rural areas have been an important financial resource necessary for rural development and family support, providing a safety net during periods of stress and are utilised for productive and social purposes (Lucas & Stark, 1985; Rosenzweig,

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1988; Lucas, 1987, 2006; Stark, 1984; World Bank, 2006c, 2012b). Remittances also contribute to the development of local agricultural economies and improvement in the welfare and livelihood of the receiving households, by providing basicg necessities such as food, clothing, better health, and education thereby building human and social capital and to a smaller extent contributing towards savings or business investments (Adams, 1996; Mitra & Gupta, 2002; Rogaly & Coppard, 2003; Mendola, 2005).

Understanding how remittances affect the monetary resources allocated to certain expenditure categories, especially those measuring physical and human capital investments is thus important in explaining the levels of welfare achieved by the migrant households. This is particularly seen in the case in Fiji where the episodic events of the military coups have led to a significant outflow of a large proportion of skilled professionals. The United Nations Department of Economic and Social Affairs (UNDESA) (2005, p.1) reports that 60 percent of Fiji's skilled workers have either emigrated and/or gone abroad as guest workers, and this loss of skilled workers has been the world's fourth highest, behind Guyana, Jamaica, Haiti, and Trinidad and Tobago. The Fiji Island Bureau of Statistics (FIBOS) (2012) estimates that 84,711 residents left Fiji between the period 1995 and 2010, of which over 80 percent are skilled professionals (i.e., civil servants, doctors, lawyers, accountants, teachers, business people, entrepreneurs, engineers, and skilled people in trades of all kinds). Referred to as the "brain drain", this reduction in knowledge and abilities undermines Fiji's potential to achieve success in sustainable economic growth and development. In the case of the health sector, for instance, a total of 190 or 41 percent of physicians trained in Fiji have immigrated to other countries (World Bank, 2011, p.116).

Migrants' remittance flows are seen in both urban and rural households in Fiji. In the case of Latin American countries, as noted in various studies, these households utilise remittances for food, durable and nondurable goods, housing, health, education, purchase of land, and improving farming performance and output (Acosta, Fajnzylber, & Lopez, 2008). For example, Pakistani rural farm households use remittances to facilitate the accumulation of land and agricultural capitals, while migration and remittances partially compensate for lost labour, contributing directly to the household income and indirectly to crop production and diversification (Adams, 1996; de Brauw, Taylor, & Rozelle, 2001).

To study the effects of remittance income on household welfare, this paper examines various hypotheses based on the welfare impact of remittance flows that remittances improve the economic and social

wellbeing of the receiving household in Fiji using the most recent household survey available. In particular, it analyses the potential contribution of remittances as a driver for agricultural and rural development. The rest of the paper is set out as follows: section two provides a brief literature review on the linkages between remittances, household consumption, and agricultural crop diversification. The model specifications of the remittances-consumption and remittances-agriculture relationships and the methodologies are discussed in the third section. The empirical results are presented in the fourth section with conclusions noted in the final section.

Literature Review of Remittances-Welfare Impact Nexus

Remittances-Household Consumption Nexus

In the literature examining the remittances-household consumption nexus, several studies have rejected the assumption that a dollar increase in remittance income has the same effect as a dollar increase of wage or farm income (de Brauw, Taylor, & Rozelle, 2001; Duflo & Udry, 2004). Instead, the studies have shown that households can distinguish the nature of different income sources attributing them to different uses. For example, Taylor (1992) finds that in the case of rural Mexico, the remittance-receiving households tend to invest more in farm assets. Similarly, for Guatemala, the households devote remittances more on durable goods, housing, education and health, and less on food and other nondurable goods (Adams, 2005). Durand and Massey (1992) point out that under the right circumstances, a significant percentage of remittances and savings can be devoted to productive enterprises. Their study in the case of Mexico shows that households residing in urban or rural communities with access to urban markets tend to use remittances for setting up small or medium size businesses. They also find that remittance recipient households in rural communities with favourable agricultural conditions tend to spend more on agricultural inputs.

Studies have noted that remittances obtain all the attributes to become a positive force for human capital development. In the case of education, the study by Acosta et al., (2008) examines the impact of remittances on the share of household expenditures allocated to education. They find that remittances not only have a positive impact on educational expenditures among the middle- and upper-class households but also play a positive role on the educational spending on children in the households with low parental schooling. Similar results found by Yang and Martinez (2006) confirms that remittances are positively correlated with school attendance. Cox-Edwards and Ureta (2003) find that remittances have a significantly positive impact

on school attendance, especially compared with other sources of income in El Salvador. The overall results from these studies support the view that remittances can help relax credit constraints in low-income households and raise children's educational attainment.

In the case of health outcomes, Acosta et al., (2008) examine the impact of remittances on child health using detailed household-level data from Nicaragua and Guatemala. They find that remittance recipient households in Guatemala tend to have better health outcomes (child's weight for age and height for age) and inputs (child delivery by a doctor and vaccinations) than non-recipient households. The estimated coefficients of health effects are positive but only the doctor-assisted delivery input is found to be significant in Nicaragua.

Remittances-Agricultural Production Nexus

Given the significant flows of remittances to developing countries, various studies have examined the impact of remittances on agricultural households since the 1980s. Although the analysis of remittance flows shows various socioeconomic ramifications, how the remittance income affects the rural communities has been intensely debated for over the last three decades. Bohning (1975, p. 125) notes that, "doubts have been raised with regard not only to the relief of unemployment but also to the purely beneficial nature of remittances, and some observers have considered emigration detrimental to the development of these countries". Contrary to this argument Griffin (1976, p. 359) notes

> *Internal migration is likely to improve the distribution of income in rural areas and accelerate capital formation and technical change on small peasant farms. Migration, in effect, enables the peasantry to overcome the imperfections of the rural credit market by creating opportunities to amass finance capital in the cities for subsequent investment in agriculture.*

Stark (1984) notes that migration creates favourable conditions for rural development. However, the findings in the case of Kenya show that, "there is little evidence that urban-rural remittances have been a significant means to rural economic development" (Rempel & Lobdell, 1978, p. 324). They indicate that despite massive remittances, agricultural development is inconsequential. Wood and McCoy (1985) and Griffith (1985) concur that remittances have contributed little to local agricultural development. In their studies on the Caribbean cane cutters in Florida, the larger part of remittances is spent on housing maintenance, and consumption on durable goods such as household appliances, while only very little is invested.

Acosta, Fajnzylber, and Lopez (2008) point out that there are at least three channels through which migration and remittances can affect the household welfare by providing mechanisms to smooth consumption in the context of negative external shocks. The first assumption is that, in the absence of an efficient credit and insurance mechanisms, migration and remittances can play an important role by allowing households to diversify their income sources which then serve as a risk-coping mechanism. Second, in the presence of negative shocks, the households may ask for additional monetary assistance during hard times. The third channel that remittances assist the households smooth out the effects of negative shocks and increase their welfare is through increased savings and accumulation of assets.

Other studies have also clarified the role of remittances in household economics and the conditions for agricultural investment. For many rural households, migrants or workers' remittances form a major portion of household monetary income (Deere & de Janvry, 1979). However, it can also be a small percentage of total monetary income from the remittances (Oberai & Singh, 1980). How a rural household prioritises remittances suggests that consumption values of remittances substitute investment possibilities and factor endowments (e.g., access to productive resources such as land acquisition, farm inputs, capital and labours, etc.) influence the utilisation of remittances (Arizpe, 1981; Wiest, 1979; Reichert, 1981). In the analysis of 12 selected labour-exporting countries for the period 1974 to 1977,[1] Russell (1986) demonstrates that the remittance income used for consumption clearly favour the households in all these countries. He has estimated that, on average, over 50 percent of remittances are spent on house countries and improvements, and only 9 percent is invested in land acquisition.

Remittances are also found to be correlated with the households' production possibilities. Households with a lower initial consumption level would spend remittance income on daily food needs and consumer goods (Stuart & Kearney, 1981). Better-off households with a higher initial consumption level, would spend remittances on housing or land purchases but not necessarily for increasing agricultural production (Rhoades, 1978). Acosta et al., (2008) find that by increasing the income of the recipient households, remittances

[1] The selected labour-exporting countries are Algeria, Bangladesh, Egypt, India, Jordan, Morocco, Pakistan, Syrian Arab Republic, Tunisia, Turkey, Yemen Arab Republic and Yemen PDR (Russell, 1986).

lead to the changes in expenditure patterns in the case of Mexico, El Salvador, Guatemala, Peru, Nicaragua, and Dominican Republic. They note that remittances may allow previously poor families to meet their basic food needs and subsequently increase their expenditures on housing, education, or health.

Several studies note five factors that explain the deviations in the remittance and agricultural investment nexus. It is suggested that investment in land or modern technology varies with a household's resource endowment, the amount and frequency of remittances, the regional market structure, the availability of additional productive resources, and the managerial experience of the farmer (Arizpe, 1981; Rempel & Lobdell, 1981; Gladwin, 1979; Saint & Goldsmith, 1980).

Adequate capital and management skills are crucial for agricultural development. Certain technologies require large investments, however, the ecological factors can affect the productive capacity and discourage investment in the agricultural activities (for e.g., in semiarid environments with erratic rainfall and prolonged droughts). Market access, market distortion (controlled by few producers/importers), infrastructure imperfections (due to transport, communication problems) may retard regional agricultural development regardless of the productive potential as well as lack of land availability that depends on regional demography and local and tenure system (Upton, 1973; Arizpe, 1981). In addition, cash crops can be risky which require the farmer to absorb losses in some years. If remittances are small and infrequent, a farmer may not want to risk his limited capital on an uncertain venture.[2] Farmers with prior commercial experience will more likely invest remittances as they already have confidence as well as the necessary productive resources (Saint & Goldsmith, 1980; Gladwin, 1979; Arizpe, 1981; Rempel & Lobdell, 1981). A decision to convert monetary capital into productive capital to expand a farmer's production possibilities represents the valuing of investment over savings or consumption (Upton, 1973).

The motivation to remit has been subjected to a combination of economic and social motivations, such as self-interest, altruism, investment, loan repayment, and bequest motives, which determine the transfer of resources between the migrants and the household members at home (Stark, 1984; Lucas & Stark, 1985; Stark & Lucas, 1987; Rosenzweig, 1988). These transfers can provide different purposes in the households such as meeting the basic needs of the

[2] To decrease this uncertainty a farmer must know the regional market conditions, the production risk involved, and also have the necessary management skills.

family; serving as payments for services rendered to migrants; payoffs of an insurance scheme that protects recipients from income shocks; returns on the investments made by the household in the migrant's human capital; and migrant's investment in inheritable assets; or various other combinations thereof (Stark, 1984; Lucas & Stark, 1985).

Various country studies, in general, have confirmed the hypothesis that international migration and remittances have a beneficial impact on rural well-being and agricultural production in many developing countries. For instance, Lucas and Stark (1985) find that remittances sent to Botswana allowed rural poor households to survive hardships imposed by the severe droughts, while remittances helped rural poor households in Ghana mitigate the effects of high inflation periods (Lucas, 2006). In the case of rural farm households in Pakistan, Adams (1996) finds that external remittances have a significant effect on the accumulation of land, while internal remittances have a positive and significant effect on the accumulation of agricultural capital.

In Botswana, Lesotho, Malawi and Mozambique, labour migration to South African mines reduced crop production in the subsistence sector in the short-run, but over time, remittances have enhanced both crop productivity and cattle accumulation in these countries, except in Lesotho (Lucas, 1987). In Bangladesh, Mendola (2005) notes that while international migration allows the home-country households' migrants to increase production and income, internal migration does not have significant beneficial effects on rural well-being. In rural China, remittances partially compensate for lost labour, contributing directly to the household income and indirectly to crop production (de Brauw, Taylor, & Rozelle, 2001).

It is also observed that the ways in which migration and remittances affect agricultural production and income go beyond their direct impact on farm activities (Reardon, Taylor, Stamoulis, Lanjouw, & Balisacan, 2001). In South and Southeast Asia, each migrant created an average of three jobs though remittances (Stahl & Habib, 1991). In the case of Mexico, remittances created "second-round" income effects that favour poor people, both inside and outside the rural economy (Taylor & Lopez-Feldman, 2010). This study concludes that both remittance recipient households and non-recipient households benefit from remittance transfers, although it takes several years for the positive effects of migration to take place.

The empirical studies have highlighted the economic impact of remittances on rural well-being and agricultural production. For instance, Lucas and Stark (1985) find that remittances sent to

Botswana allowed rural poor households to survive hardships imposed by the severe droughts, while remittances helped rural poor households in Ghana mitigate the effects of high inflation periods (Lucas, 2006). In the case of rural farm households in Pakistan, Adams (1996) finds that external remittances have a significant effect on the accumulation of land, while internal remittances have a positive and significant effect on the accumulation of agricultural capital. It has been found that in Botswana, Lesotho, Malawi, and Mozambique, labour migration to South African mines reduced crop production in the subsistence sectors in the short-run, but over time remittances enhanced both crop productivity and cattle accumulation in these countries, except in Lesotho (Lucas, 1987).

In the case of Bangladesh, while international migration allows the home-country households of migrants to increase production and income, internal migration does not have significant beneficial effects on rural well-being (Mendola, 2005). In rural China, remittances partially compensate for lost labour, contributing directly to household incomes and indirectly to crop production (de Brauw, Taylor, & Rozelle, 2001).

In Ghana, migration from rural areas has negative effects on household farm income initially, although over time, remittances tend to fully compensate for lost labour, and contribute to household incomes (Tsegai, 2004). Miluka, Carletto, Davis and Zezza (2010) find that in Albania, rural remittance recipient households are more likely to shift their on-farm investment from crop to livestock production, and work significantly fewer hours in agricultural production. Despite the reductions in labour force, agricultural income does not seem to decline as a result of migration and that total income rises partially due to higher investments in livestock production. They also note that migration has no impact on farms' technical efficiency, and the recipient households invest less in productivity-enhancing and time saving farm technologies for crop production.

In western Mali, while migration has fostered the adoption of improved technology, migrant households do not show better agricultural performance than the non-migrant households due to the fact that a reduction in the labour effort tends to offset any investments and improved technologies from remittance receipts (Azam & Gubert, 2006). Jokisc (2002) finds that remittances have not been dedicated to agricultural improvements, instead it have been used for housing in the case of Ecuador. The labour shortage and natural and economic factors related to migration have a negative impact on agriculture. It has been observed that in a context of high migration, lack of innovative production techniques, reduction of

plant and animal biodiversity, and a decrease or abandonment of farming activities tend to experience a rising trend in Mexico's rural farming sector (Nave-Tablada & da Cloria Marroni, 2003).

The ways in which migration and remittances affect agricultural production and income go beyond their direct impact on farm activities (Taylor & Stamoulis, 2001). Stahl and Habib (1991) note that in the South and South-East Asia, each migrant created an average of three jobs through remittances. In a study of Mexico, Taylor and Lopez-Feldman (2007) find that remittances create "second-round" income effects that favour poor people, both inside and outside the rural economy. The study concludes that both remittance recipient households and non-recipient households benefit from remittance transfers, although it takes several years to experience the positive effects of migration.

In terms of pro-poor inclusive factor impact, there are growing evidences that remittances reduce poverty among the recipient households. For instance, international remittances significantly reduce poverty in a sample of 74 developing countries (Adams & Page, 2005). Their study suggests that on average, and after controlling for the possible endogeneity of international remittances, a 10 percent increase in per capita remittances lead to a 3.5 percent decrease in the incidence of poverty. In Guatemala, Adams (2004) finds that remittances reduce the level, depth, and severity of poverty among receiving households. Similar results have also been found by Brown and Jimenez (2008) that the impact of migration and remittances on poverty reduction are statistically significant in both Fiji and Tonga, although it has a much stronger effect in Tonga than in Fiji.

The literature examined above, implies that there is a significant link between remittances and improvement in the welfare and livelihood of the receiving households in developing countries. However, the impact of remittances on agriculture is rather mixed and highly contextual. In some cases, migration and remittances foster household farm investment and agricultural production, while in others, the opposite occurs. Analysis of such impact is vital in small island economies where the employment options are limited, and economic migrations are high. Based on the findings of various studies for the positive impact of remittances in the agriculture sector this study examines if remittances alter the expenditure patterns of the receiving households. The further evaluation includes the analysis of the decision-making process of crop choice and diversification between the remittance recipient and non-recipient households. The methodological approach, assumptions, and the associated

econometric issues are discussed next followed by the empirical evaluation in the penultimate section.

Model Specifications, Data and Methodology

This section presents the models to explore the linkages between remittances and household consumption patterns, followed by the role of remittances in the agricultural production in Fiji. The model specifications and methodologies of remittances-household consumption and remittances-agriculture nexus highlight the key variables and their likely impact for improving wellbeing.

Remittances-Household Consumption Nexus: Models and Methodology

To examine the contribution of remittances on welfare, the household consumption expenditures on food, housing, education, health, and consumer goods are used as a proxy for welfare indicators. The underlying household consumption model used in the present study is associated with the Working-Leser specification of household utility-maximisation (Working, 1943; Leser, 1963). This Working-Leser framework relates to the household budget shares linearity to the logarithm of total household expenditure, and takes the following form:

$$w_{ij} = \alpha_j + \beta_j \ln(E_i) + \varepsilon_{ij} \quad (1)$$

where w_{ij} is the ratio of expenditure on good *j* to total household expenditure in household *i*, $\ln(E_i)$ is the logarithm of total household expenditure and ε_{ij} is an error term. In line with Deaton (1997), equation (1) has been extended to include other variables assumed to affect the budget shares allocated to different types of goods. The underlying remittances-household consumption model is expressed as follows:

$$w_{ij} = \alpha_j + \beta_{1j} \ln(E_i) + \beta_{2j} X_i + \beta_{3j} Z_i + \beta_{4j} R_i + u_{ij} \quad (2)$$

where X_i is a vector of the characteristics of the head of household *i*, Z_i is a vector of the characteristics of the household *i*, R_i represents the remittance receiving households, μ is a random error term that captures unobserved characteristics, and *i* is 1,…N, households. In the case of education and health expenditure categories, the zero-consumption problem is particularly high, i.e., a large number of zeroes are observed in the 2008-09 HIES dataset. This could be the case as education and health services are provided by the government in the rural and urban areas whereby expenditures for these public goods may be very low. Also, many households in the sample for both rural and urban areas do not send their children to private schools. It is known that estimates of coefficients are

inconsistent when only the observed positive purchase data are used (or censored by an observable latent variable) to estimate consumption behaviour using the Ordinary Lest Squares (OLS) regression. In such circumstances, it could be argued that the standard Tobit model is a suitable model to estimate the impact of remittances on household expenditure patterns (Tobin, 1958). However, it has been argued by Heien and Wessells (1990), Shonkwiler and Yen (1999), Perali and Chavas (2000), Lazaridis (2003), Jabarin (2005) that in a system approach, censored regressions have correlated error terms and estimation must be done jointly. Consequently, applying the Tobit technique to estimate the equation (2) separately would lead to inefficient estimators since it fails to take into account the interrelations across the remittances-household consumption equations.

In the current study, Lee's (1978) generalisation of Amemiya's (1974) two-step procedures are adopted to cope with the problem of large number of zero observations seen in the health and education expenditure categories. As a first step, the Probit models are used to calculate a set of Inverse-Mills ratios for each of the expenditure category in which the censorship is likely to be a problem (i.e., health and education). In the second step, the Inverse-Mills ratios of health and education expenditure categories are included in equation (2) for correcting the censorship, as expressed in the following form:

$$w_{ij} = \alpha_j + \beta_{1j} \ln(E_i) + \beta_{2j} X_i + \beta_{3j} Z_i + \beta_{4j} R_i + \beta_{5i} IMR_j + u_{ij}^{'} \quad (3)$$

Where $IMR_j = -\frac{\overbrace{\phi(K_j)}^{Normal\ Density\ Function}}{\underbrace{\Phi(K_j)}_{Normal\ Distribution\ Function}}$; and K_j is a vector containing E_i, X_i, Z_i and Ri.

The specification of equation (3) is further classified indicating the household head and household characteristics into the following form that estimates the effects of remittances on the household consumption patterns:

$$w_{ij} = \alpha_j + \beta_{1j} \ln(Exp_i) + \beta_{2j} Top3_i + \beta_{3j} \ln Hhsize_i + \beta_{4j} Age_i + \beta_{5j} Female_i + \beta_{6j} Hheduc_i + \beta_{7j} Child_i + \beta_{8j} Youth_i + \beta_{9j} Elderly_i + \beta_{10j} \mathrm{Re}m_i + \beta_{11j} Rural_i + \beta_{12j} IMR_j + u_{ij}^{'} \quad (4)$$

where *w* represents the budget share of good that is taken as food, housing, durable and non-durable goods, education and health;

lnExp is the logarithm of total household expenditure;

Top3 is the dummy variable for household in the top 3 income deciles;
lnHhsize is the logarithm of household size;
Age is the household head's age;
Female is the dummy variable that represents the female household head;
Hheduc is the average education of the adults (aged 18 and above) in the household;
Child is the proportion of children below the age of 5 in the household;
Youth is the proportion of children between the age of 6 and 17 in the household;
Elderly is the proportion of the adults aged 65 and above in the household;
Rem is the dummy variable for the remittance receiving households;
Rural is the dummy variable for the households that live in rural areas;
IMR is the Inverse-Mills ratios of healthcare and educational expenditures;
u_{ij} is the random error term that captures the unknown variation in the *j*th budget share for the *i*th household and for which standard econometric assumptions are made;
and *i* is 1,…N, households.

To test the impact of remittances on each category of the household expenditure pattern, equation (4) is estimated using the seemingly unrelated regression (SUR) technique. This methodology of SUR technique is used for analysing the model with multiple equations and correlated error terms. As the model includes multiple equations which are independent of each other on the surface, however, the equations are estimated using the same data and therefore the error terms may be correlated between the two equations (Zellner, 1962).

The SUR technique is an extension of the linear regression model that allows for the exploitation of information in the correlated errors in order to achieve greater efficiency in the estimates, which in return yields unbiased and consistent estimates for each separate equation (Greene, 1998). In addition, Lazaridis (2003) notes that the econometric restrictions under the SUR are easily imposed so that it conforms to adding-up the homogeneity and symmetry properties derived from the standard demand theory.

Remittances-Agricultural Production Nexus: Model Specifications

The logistic regression technique is used to examine the probability of an agricultural household's crop selection, while the Poisson regression techniques is utilised to assess the crop diversification. The normal logistic equation can be expressed as follows:

$$Prob(y^*<1 \mid x) \implies y^* = 1 \text{ if } y/z < 1 \text{ or } 0 \text{ otherwise} \quad (5)$$

where y is the observed dependent variable, z is the threshold level and x is the matrix of various household level characteristics. The following equation (6) estimates the probability of each crop selection with a set of demographic and socio-economic variables:

$$Y_i = f(X_{1i}, X_{2i}, ...X_{ki}) \quad (6)$$

where Y_i is the dependent variable that represents the different choices of agricultural crops (i.e., root crops, fruits, vegetables, etc.) and take the value of 0 or 1. The X_s are the socioeconomic and demographic indicators that determine the decision-making process of choosing one particular crop. Suppose that y^* in equation (5) captures a true status of an agricultural household either choosing one type of crop or another, then the estimation can be undertaken by using the following specification:

$$y^* = \alpha + \sum_{j=0}^{k} \beta_j X_{ij} + u_i \quad (7)$$

where y^* is (cannot be observed and is a latent variable) variable *y* that can be observed as a dummy variable that takes the value 1 if $y^* > 0$ and takes the value of 0 if otherwise. The β is the vector of parameters and α is a scalar. The error terms are denoted with μ.

In equation (8) below, P_i represents the probability of the *i*th household choosing one type of agricultural crop over the other based on the vector of predictors X. Moreover, the study assumes that P_i is a Bernoulli variable, so that:

$$P_i(X) = \frac{e^{\alpha+\beta X}}{1+e^{\alpha+\beta X}} \quad (8)$$

Since the β is a row vector of parameters and α is a scalar, then the logistic model to be estimated takes the form as follows:

$$Logit(P_i) = \ln\left(\frac{P_i}{1-P_i}\right) = \alpha + \sum_{j=0}^{k} \beta_j X_{ij} + u_i \quad (9)$$

Where P_i is the probability of a household choosing one particular crop and $(1-P_i)$ is the probability of choosing the other type of crops.

The ratio $P_i/(1-P_i)$ is known as the odds ratio, which simply represents the odds in favour of the household growing one type of agricultural products. The natural log of this odds ratio is called the Logit, and therefore equation (9) is called the Logit equation (Gujarati, 1999).

The explanatory variable X_{ij} is a set of characteristics of the household head's and the households. This includes the household head's age, age squared (proxy for experiences in farming and trading), gender; the household characteristics such as household composition, household income from nonfarm activities, average adult education in the household, and social network (i.e. access to internet, a phone or mobile phone, or receive remittances from the abroad and within the country). The β_j represents the logistic regression estimates of the explanatory variables, while μ_i represents error terms.

The equation (9) indicates that log of the odds ratio is a linear function of explanatory variables X_{ij} and the slope coefficients β_j provides the change in the log of odds ratio per unit change in the explanatory variables. In addition to that, the marginal effects or elasticities at the mean values of the explanatory variables are also computed to show the change in the probability when there is a unit change in the explanatory variables. The formula for computing the marginal effects, following Gujarati (1995) is as follows:

$$\frac{\partial \log[P_i/(1-P_i)]}{\partial X_j} = -\beta_j \qquad (10)$$

To model the number of crops a household adopts, the Poisson regression technique is used with the assumption that the conditional means and variances are equal (Wooldridge, 2009). In line with Hellerstein and Mendelsohn (1993), the underlying model can be utilised as follows:

$$P(y_i = h|x) = \frac{e^{-\lambda_i}\lambda^{hi}}{h!}(h = 0,1,2,...,m; i = 1,2,3,...n) \qquad (11)$$

where h indicates the number of crops adopted by the household *i*, λ_i is both the conditional mean and the variance of the Poisson distribution, and m is the maximum number of crops adopted. For λ_i is greater than zero, the mean and variance of Poisson distribution can be shown as:

$$E(y_i) = \text{var}(y) = \lambda_i = e^{\beta' X} \qquad (12)$$

where $E(y_i)$ is the expected value of the dependent variable for the *i*th agricultural household, β is a row vector of parameters, and X represents a vector of household's head and household characteristics for the *i*th household. Before estimating the effects of remittances on household consumption patterns and agriculture, the next section defines the data and variables used in this study.

Data and Variable Definitions

Based on the hypotheses tested here, various socioeconomic and demographic indicators are used to estimate the effects of remittances on household consumption patterns, crop production, and diversification. The household level data for the variables are from Fiji's HIES 2008/09 dataset which indicate the level of impact and its marginal effects for the remittances receiving household. Table 1 presents the variables and description of each variable used in equations 4, 9, 10 and 12.

A total of 3,573 households are included in the analysis of the remittances-household consumption nexus, of which 1,104 households receive remittances. The effects of remittances on the consumption pattern have been divided into five consumption categories: food, housing, durable and non-durable goods, health, and education. The health and education categories for the human capital are vital to measure these effects given the flow of remittances for long-term rural development.

To examine the remittances-agriculture nexus, 1,201 households are in the agriculture sector included, of which 348 households receive remittances. Most of the agricultural households sampled in the HIES 2008/09 are producing more than one agricultural product, and at least one member of the household engages in some form of paid employment. For example, a household producing sugarcane or 'dalo' on a commercial basis also grows vegetables and fruit for home consumption.

The dependent variables for remittances-agriculture nexus are divided into two groups. The first group of the dependent variables contains 20 agricultural products (i.e., a wide range of fruit, vegetables, root crops and livestock products) to model the production behaviour among the recipient and non-recipient households. The second group of the dependent variables are count variables for the Poisson regression model to measure the effect on crop diversification.

Table 1. Variable Description and Definitions

Variables	Definition
Dependent	
	Remittances-Household Consumption Nexus
Food	Share in total expenditures of expenses for food
Housing	Share in total expenditures of expenses for housing
DND	Share in total expenditures of expenses for durables and non-durables
Education	Share in total expenditures of expenses for education
Health	Share in total expenditures of health
	Remittances-Crop Production Nexus
Banana	Household grows bananas (Yes = 1, No = 0)
Beans	Household grows beans (Yes = 1, No = 0)
Cabbage	Household grows cabbage (Yes = 1, No = 0)
Cassava	Household grows cassava (Yes = 1, No = 0)
Copra	Household grows copra (Yes = 1, No = 0)
Cucumber	Household grows cucumber (Yes = 1, No = 0)
Dalo	Household grows dalo (Yes = 1, No = 0)
Eggplant	Household grows eggplant (Yes = 1, No = 0)
Pineapples	Household grows pineapple (Yes = 1, No = 0)
Pumpkin	Household grows pumpkin (Yes = 1, No = 0)
Rice	Household grows rice (Yes = 1, No = 0)
Sugarcane	Household grows sugarcane (Yes = 1, No = 0)
Tomato	Household grows tomato (Yes = 1, No = 0)
Watermelon	Household grows watermelons (Yes = 1, No = 0)
Yaqona	Household grows root yaqona (Yes = 1, No = 0)
Fish	Household involves in fish farming (Yes = 1, No = 0)
Cattle	Household involves in cattle farming (Yes = 1, No = 0)
Goat	Household involves in goat farming (Yes = 1, No = 0)
Pig	Household involves in pig farming (Yes = 1, No = 0)
Poultry	Household involves in poultry farming (Yes = 1, No = 0)
	Remittances-Crop Diversification Nexus
No_Rootcrops	Number of root crops the household adopted
No_Vegetables	Number of vegetables the household adopted
No_Fruits	Number of fruits the household adopted
No_Livestock	Number of livestock varieties the household adopted
Explanatory	
Top3	Household in the top 3 income deciles (Yes = 1, No = 0)
lnExp	Log of total household expenditure
lnHhsize	Log of household size
Age	Age of the head of the household
Age^2	Age squared
Female	Household head is female (Yes = 1, No = 0)
Hheduc	Average education of the adults (age 18 and above) in the household
Child	Proportion of children below the age of 5 in the household
Youth	Proportion of children between the age of 6 and 17 in the household
Elderly	Proportion of the adults aged 65 and above in the household
Rem	Household receives remittances (Yes = 1, No =0)
lnTREM	Log of total remittances received per annum
lnNFI	Log of total non-farm income per annum
Rural	Household in rural areas (Yes = 1, No = 0)
Network	Social network index =(phone + cellphone + internet)/3

Empirical Results

Results of the Remittances-Household Consumption Nexus

The empirical results for the OLS specification (equation 4), reported in Table 2, show the computed estimates for the five dependent variables for all remittance recipient households-consumption relationship. As expected, the explanatory variables that represent the household head's characteristics and household characteristics are found to be significant in several expenditure categories. The households in the top three income quintiles (Top3) are associated with higher levels of expenditure devoted to housing but less on food, education and health categories. A one percent increase in the total household expenditure (lnExp) increases the share spent on education, and durables and nondurables by 9.3 percent and 2.6 percent, respectively with a weak positive significance for health of all remittance receiving households. However, the expenditure shares for food and housing declines when expenditures increase in the other categories.

Table 2. Remittances and Household Expenditure Category Results

	Food	Housing	Durables & Nondurables	Education	Health
Top3	-0.017***	0.043***	-0.008	-0.026***	-0.037*
	(-2.88)	(5.26)	(-0.71)	(-3.93)	(-1.67)
lnExp	-0.035***	-0.065***	0.093***	0.021***	0.028
	(-7.37)	(-10.02)	(10.51)	(3.95)	(1.58)
lnHhsize	0.015**	0.015*	-0.047***	0.016**	0.052*
	(2.45)	(1.82)	(-4.2)	(2.34)	(1.66)
Age	-0.001**	0.001*	0.001	0.001***	0.001**
	(-2.15)	(1.88)	(0.01)	(2.74)	(1.99)
Female	-0.028***	-0.004	0.027**	0.011*	-0.0004
	(-4.29)	(-0.57)	(2.56)	(1.77)	(-0.37)
Hheduc	-0.002**	0.001	-0.005***	0.004***	-0.0001
	(-2.31)	(1.08)	(-2.58)	(3.93)	(-0.8)
Child	0.069***	-0.042	0.109***	-0.102***	-0.006**
	(3.36)	(-1.43)	(2.75)	(-4.34)	(-2.04)
Youth	0.014	-0.039**	-0.005	0.032**	-0.008***
	(1.02)	(-2.15)	(-0.18)	(1.21)	(-4.02)
Elderly	-0.015	0.035*	-0.028**	0.011	0.005**
	(-0.88)	(1.84)	(-1.1)	(0.76)	(1.97)
lnTREM	-0.001	0.005**	-0.014***	0.007***	0.001
	(-0.81)	(2.1)	(-3.99)	(3.59)	(0.28)
Rural	0.062***	-0.143**	0.076**	0.035***	-0.003**
	(12.63)	(-21.33)	(8.41)	(4.14)	(-1.98)
IMR				6.04***	1.38*
				(5.38)	(1.71)
Root MSE	0.132	0.099	0.134	0.079	0.022

Notes: ln is log form of the variable. Total of 3,573 households are recorded in the HIES 2008/09, of these, 1,401 households receive remittances. ***, **, and * are significant levels at 1, 5 and 10% significant levels, respectively. The t-ratios are in parentheses.

The estimated household size (lnHhsize) coefficients are positive and significant for the four categories of food, housing, education and health as the expenditure budget increases in these categories with larger household size for the recipient households. However, the durable and nondurable expenditure decreases significantly. Importance is given to improving their living standards through better food and housing consumption as well as enhancing the human capital through education and health of these remittance-recipient households. The age coefficient indicates that age of the household head matters for the remittance-recipient households on the decisions show their expenditure allocations increase in the housing, education, and health category expenditures while the food expenditure category decreases. The female household heads tend to allocate more expenditure shares toward durable and nondurable goods and children's education but less on food category.

Education level is another key variable showing positive impact on the household expenditure budget. A one-year increase in average schooling (Hheduc) of household members increases the share devoted to education by 0.4 percent. However, the total expenditure for food and durables and nondurables decrease in the budget share by 0.2 percent and 0.5 percent, respectively.

Table 3. Access to Remittances and Expenditure Shares, HIES 2008-09

	Food	Housing	Durables & Nondurables	Education	Health
Total Household	0.001	0.005**	-0.014***	0.007***	0.0002
	(0.28)	(2.10)	(-3.99)	(3.59)	(0.28)
Fijian	-0.003	0.009***	-0.01**	0.005**	-0.0004
	(-0.81)	(2.62)	(-2.33)	(1.98)	(-0.98)
Indo-Fijian	-0.004	0.009*	-0.019***	0.014***	0.001
	(-0.64)	(1.70)	(-3.29)	(4.06)	(0.08)
Total Urban	-0.06	0.009**	-0.012**	0.008***	-0.001
	(-1.27)	(2.35)	(-2.41)	(2.59)	(-0.12)
Fijian	-0.004	0.01*	-0.006	0.001	0.001
	(-0.69)	(1.89)	(-0.88)	(0.1)	(0.01)
Indo-Fijian	-0.015**	0.009	-0.013*	0.019***	-0.001
	(-2.03)	(1.49)	(-1.82)	(4.22)	(-0.04)
Total Rural	0.005	0.003	-0.013***	0.005**	0.001
	(1.07)	(0.91)	(-2.8)	(2.15)	(0.49)
Fijian	-0.001	0.002	-0.007	0.006**	-0.001**
	(-0.09)	(0.49)	(-1.19)	(2.21)	(-2.07)
Indo-Fijian	0.019*	-0.004	-0.026***	0.008*	0.002
	(1.85)	(-0.65)	(-2.71)	(1.69)	(0.79)

Note: *** Denotes significance at 1%, ** at 5% and * at 10%; Figures in parentheses are t-statistic.

The estimated coefficient for number of children below the age of 5 (Child) in the household increases expenditure shares spent on food

by 6.9 percent, and durable and nondurable goods by 10.9 percent. The household number of children between the age of 6 and 17 (Youth) are associated with a 3.2 percent increase in the educational expenditure. Also, the households with elderly people over 65 increases the share devoted to health by 0.5 percent, and housing by 3.5 percent. Remittance income is allocated to housing and education categories while the durable and nondurable category indicates a decline. The households residing in the rural areas have higher expenditure shares on food, durables and nondurables, and education but less on health compared to the households in urban areas.

In the next step, the important role of remittances by individual consumption category is estimated. The computed coefficients with respect to remittances for each consumption category are presented in Table 3. It indicates that the household expenditures on Housing and Education are positive and significant for the remittance recipient households. In other words, remittance income is more likely targeted at household expenditures on housing (i.e., home improvement and renovation), education (i.e. school fees and learning materials), food and health (positive but insignificant), but less on durable and nondurable goods.

The analysis by ethnicity shows that for both Fijian and Indo-Fijian recipient households, the estimated coefficient of remittance income is positive and significant for education expenditure and housing categories at the respective levels. The findings indicate that remittances are specially targeted towards education and housing expenditures by both these ethnic groups. This result is consistent with the study by Acosta et al. (2008), which shows that an important motivation for remittances is to cover education and home improvement expenditures in the case of Mexico, El Salvador, Guatemala, Peru, Jamaica and Dominican Republic. The other positive estimated coefficient of the Indo-Fijian remittance recipient households is the health category; however, it is not significant. The effect of remittances on food category indicates a negative impact for both ethnic groups; however, the estimated coefficients are not significant.

In the next step, the remittances-household consumption nexus is estimated by urban and rural regions. The total urban remittance recipient households tend to allocate their expenditure budget share more on housing. The estimated coefficient of remittances for the urban recipient households on housing expenditure category is positive and significant at the five percent significant level. However, the estimated housing category for the rural remittance recipient

households is positive but is insignificant. Also, the remittance income received by rural households is allocated to the education category which is positively significant, the urban households coefficients for food and health consumptions although are positive estimated are not statistically significant. The total urban household coefficients for food and health expenditures are negative and not significant.

Further disaggregating the urban households by ethnicity, the estimated coefficient for Indo-Fijian households by categories show a higher share of total remittance income allocated to education expenditure but less on food, durables and nondurables. Moreover, the estimated coefficients of household size (Table 2) and remittances (Table 3) for Indo-Fijian households in the urban areas, support the view of Engel's law that food expenditures are an increasing function of income and family size, but that food budget shares decrease with income (Leser, 1963).[3] Based on the estimated results (see Table 3), it can be said that remittances are specially targeted towards households' education expenditure in the Indo-Fijian households, while urban Fijian households allocate more of their budget share on housing.

In the rural areas, remittance income goes to education category of both Fijian and Indo-Fijian households. Although, the school fees are relatively low and primary education is free in Fiji, the school expenditures for books, uniforms, and the associated schooling expenditures for the rural households are relatively high compared to urban households. It can also be said that both ethnic groups allocate remittances for education, as it is a vital form of investment in human capital. The results also show that the rural Indo-Fijian remittance recipient household tend to allocate more of its expenditure share on food category, while the rural Fijian household receiving remittances tends to allocate less on health. This is consistent with the finding by Narsey (2008) that some 69 percent of the poor live in rural areas, of which Indo-Fijian households are in the poorest category.

As the results indicate a positive impact of remittances on rural food share, in the next section, the study further investigates whether remittances provide a degree of social insurance to the agricultural households that lack access to insurance and credit markets. The next stage involves the estimation of remittance impact by individual crop

[3] Proposed by Ernst Engel in 1857 where he investigated the relationship between consumption expenditure and income, he stated that the poorer a household is, the larger is its budget share dedicated to nourishment (cited in Leser, 1963). However, Leser (1963, p.694-96) notes that the proportion of income spent on food decrease as income increases, holding other factors constant.

category. This provides some understanding on whether the agricultural households are vulnerable to severe declines in income from adverse shocks such as natural disaster, crop failure, and health crisis. The estimated results of remittances on agricultural production nexus is discussed next.

Results of the Remittances-Agricultural Production Nexus

Table 4 presents the estimated results for the Logit specification (equation 9) for the remittance-crop production nexus. Controlling for other socioeconomic and demographic variables shown in equation (9) the household heads' characteristics (age and experiences), household characteristics (household size, nonfarm income, average years of schooling, household composition, social network index, and household income deciles), only the estimated remittance income coefficients are reported for the impact of remittances on specific crops in Table 4 with its marginal impact and the correctly predicted values.

In the fresh fruits and vegetable (FFV) category (Table 4), the estimated remittances coefficients (i.e., the log of total remittance income received during 2008-09) are positive and significant for banana and cabbage suggesting that remittance income received by the agricultural households are more likely targeted in planting these two types of crops. The results indicate that a one percent increase in remittance income would increase the probability of growing bananas and cabbages by 0.5 percent and 0.3 percent, respectively. The estimated coefficients for other FFV crops such as beans, copra, eggplant, tomato, and watermelon are also positive but not significant at the conventional level, while crops such as cucumber, pineapples, and pumpkin are negative and insignificant signs.

In the case of root crops production, Table 3 shows that the remittance recipient households seem to be less motivated in growing dalo and 'yaqona' than the non-remittance recipient households. The estimated coefficient for dalo production is negative and significant at the five percent level implying that the remittance recipient households engaging in dalo production declined and may tend to shift to cash crops production such as fresh fruits and vegetables. The marginal effect of remittances on dalo production indicates a decline in the likelihood of engaging in dalo production by 0.9 percent. It is important to note that this traditional root crop has been severely affected by the floods in 2008-09 (Ministry of Primary Industry, 2009). Hence, the agricultural households sampled in the HIES 2008-09 engaged in dalo farming would have been adversely affected by its substantial decline in the output.

Table 4 Logit Estimates for Remittances-Crop Choice Nexus

Selected Crops	Remittance Income	Marginal Effect	Correctly Predicted
Fresh Fruits & Vegetables (FFV)			
Banana	0.096**	0.005	93.51%
	(2.44)		
Pineapples	-0.218	-0.001	99.17%
	(-1.25)		
Watermelon	0.077	0.001	97.34%
	(1.29)		
Beans	0.012	0.0002	97.42%
	(0.2)		
Cabbage	0.078*	0.003	94.84%
	(1.82)		
Cucumber	-0.018	-0.0004	97.25%
	(-0.28)		
Eggplant	0.055	0.0014	96.75%
	(1.02)		
Pumpkin	-0.015	-0.0003	97.75%
	(-0.20)		
Tomato	0.056	0.0004	98.92%
	(0.64)		
Root Crops			
Cassava	0.008	0.001	84.93%
	(0.28)		
Dalo	-0.047**	-0.009	72.27%
	(-2.00)		
Yaqona	-0.033	-0.007	70.86%
	(-1.42)		
Other Agricultural Crops			
Rice	-0.036	-0.0004	98%
	(-0.45)		
Sugarcane	0.028	0.002	89.43%
	(0.88)		
Copra	0.035	0.004	86.51%
	(1.21)		
Livestock			
Fish	0.008	0.0014	77.85%
	(0.33)		
Cattle	0.125**	0.004	96.42%
	(2.61)		
Pig & Goat	0.065**	0.004	92.51%
	(1.86)		
Poultry	0.076	0.001	98.33%
	(1.04)		

Notes: From 1,201 agricultural households recorded in the HIES 2008/09, 348 households are identified as remittance recipient households. Critical values for the z-statistic significance levels at 1, 5 and 10% are as follows: 2.58, 1.96 and 1.65, respectively.

The effect of remittance income on sugarcane production is positive but not significant, while the impact of remittance income on rice farming is negative and insignificant. Both these productions have declined over time and also in the 2008-09 period due to the adverse climatic conditions. In the case of households engaging in fishing

business, there is a positive impact of remittance flows but the coefficient is not significant. The estimated coefficients are positive and significant for Cattle, and Pig & Goat at the five percent level, except for poultry farming (though it has a positive sign but is not significant at the conventional level). The marginal effect of remittances on cattle farming suggests that a one percent increase in total remittances received by household would increase the probability of cattle accumulation by 0.4 percent. Remittance income also contributes to pig and goat accumulation by 0.4 percent.

To examine the household's decision on crop diversification given the remittance income, Table 5 presents the estimated remittances coefficients based on Poisson model (equation 12) for its impacts on crop diversification. Various socioeconomic and demographic indicators are used for the modelling purposes, the results are reported only for the remittances and the incidence rate ratio in Table 5.

Table 5. Poisson Results for Remittances-Diversification Nexus

Dependent Variable: Numbers of Crop Production and Livestock				
	No. of Root Crops 1-5	No. of Fruits 1-3	No. of Vegetables 1-7	No. of Livestock 1-6
Remittances	-0.014	0.062**	0.033**	0.032*
z-statistic	(-1.32)	(2.06)	(1.88)	(1.91)
Incidence Rate Ratio	0.99	1.06	1.03	1.03
LR $\chi^2_{(12)}$	68.33***	36.15***	43.70***	23.03**

Note: Critical values for the z-statistic significance levels at 1, 5 and 10% are as follows: 2.58, 1.96 and 1.65. Number of root crops includes cassava, dalo, yams, kamala and yagona. Number of fruits includes banana, pineapples and watermelon. Number of vegetables includes beans, cabbage, cucumber eggplant, pumpkin, tomato and other vegetables. Number of livestock includes fish, cattle, pig & Goat, poultry, other meat and other dairy.

Overall, the results suggest that households' receiving remittances tend to be more diversified in their agricultural production than the non-remittances recipients. The estimated coefficients for remittances are positive and significant for the diversification of fruit and vegetable categories. The incidence rate ratio suggests that the recipient households adopt more than one type of fruits and vegetables which are 1.06 and 1.03 times higher than the non-recipient households, respectively. In terms of livestock farming, the estimated coefficient of remittances is positive and significant indicating that households receiving remittances are 1.03 times likely

to add different types of livestock to increase livestock production than the non-recipient households.

Although, the estimated remittances coefficient for number of root crops production is negative, it is not significant. The results somewhat show a declining trend in root crops production. This is consistent with the report that the output of dalo has declined from 74,009 tonnes in 2008 to 70,500 tonnes in 2009, and the yaqona production has decreased from 3,285 tonnes to 3,150 tonnes during the 2008-09 period (Ministry of Primary Industry, 2009, p. 31). This may due to the adverse weather conditions as noted earlier.

The overall results for the remittances-household consumption and remittances-agricultural nexuses support the view that the households with a higher initial consumption level would spend much of the remittances on housing and human capital, and partially for agricultural inputs (Rhoades, 1978; Russell, 1986; Acosta et al., 2008). This study also supports the view that remittances are partially used in the agricultural production and diversification (Upton, 1973; Gladwin, 1979; Saint & Goldsmith, 1980; Arizpe, 1981; Rempel & Lobdell, 1978). In particular, the empirical results for the remittances-agricultural nexus imply that agricultural households in Fiji use remittances to foster agricultural productions in fruits and vegetables (i.e., banana and cabbage), livestock (i.e., cattle, and pig & goat), as well as for the diversification of these commodities.

Discussion and Conclusion

This study examines the contribution of remittances towards rural development in Fiji by way of testing three hypotheses. First, the empirical examination tests the impact of remittances on household consumption patterns; second, it analyses the impact of remittances on crop production, and third, it evaluates the possible effect of remittance on crop diversification. The results shed light on the potential influential role of remittances in the household expenditure behaviour, and agricultural production and diversification. On the contrary to the general belief that remittances are mostly used for food consumption, the results for Fiji suggest that remittance income has alternative uses amongst recipient households.

The findings for the first hypothesis indicate that remittances are especially utilised for education expenditures and housing. The expenditure patterns differ between urban and rural areas and between Fijian and Indo-Fijian households. In the urban areas, Indo-Fijian households use remittance income substantially on education related expenditure while remittances received by Fijian households are used for housing. Similar consumption patterns are also found in

the rural areas supporting the view that Fijian and Indo-Fijian households use the remittance income mostly on education expenditure. Findings support the view that recipient households tend to allocate remittance income for the productive use, as well as the Engle's law that food expenditures are an increasing function of income and family size, but that food budget share decreases with household income increases in Fiji.

In the second hypothesis, the logistic regression results show that remittances have a positive and significant impact in promoting the production of banana, cabbage, cattle, pig and goat among recipient households implying that remittances nudge households to grow more cash crops (such as fresh fruits and vegetables) and fewer traditional root crops (such as dalo and yagona).

In the third hypothesis, the Poisson regression technique reflects the effects of remittances on crop diversification. The incidence rate ratio result supports the view that there is a relatively higher probability for the remittance-recipient households to grow more than one type of fruits and vegetables than the non-remittance recipient households. For livestock farming, the remittance-recipient households add different types of animals to the production than the non-recipient households.

The econometric models and techniques applied in this study provides a quantitative approach to examine the nexuses of remittances, household welfare and agricultural production in the case of Fiji. Thus, a participatory research method might be useful to capture the qualitative aspects of how remittance income helps the recipient household: 1) to improve standard of living; 2) to integrate in the global agribusiness and agri-food value chains; 3) to diversify agricultural production; and 4) to overcome limited access to agricultural land and credit constraints. Future research that integrates such aspects might produce intriguing new insights.

One important factor that the current study excludes, due to the data limitations, is the cost of remittances and the characteristics of financial services in Fiji. A qualitative approach using questionnaires as the tool of data collection and analysis should be considered for future research. In doing so, it enables government agencies to provide institutional support to financial services and institutions by delivering tailor-made schemes that encourage the use of cost efficient money transfer technologies, as well as linking the remittance recipient households to other financial products such as savings, credit (i.e., credit for productive investments and housing) and

insurance (i.e., agricultural production insurance) to improve economic and social development.

A second important factor that this study does not address explicitly is the agricultural productivity and innovation in Fiji. The conventional wisdom is that low productivity in agriculture is due to subsistence-oriented farming which involves the application of traditional methods for cultivation and the wide use of low-yield varieties of seeds. Agricultural productivity is also affected by limited expansion of arable land due to Fiji's land tenure system and its geographical, socioeconomic and environmental circumstances, as well as below par financial and insurance services in Fiji (Asafu-Adjaye, 2008; de Boer & Chandra, 1978; Haszler, Hone, Graham, & Doucouliagos, 2010; Ward, 1960, 1995). Adoption of innovative agricultural practices and newly-developed high yield seeds have seen little success and are difficult to implement, given that agriculture has been a risky business and the farmers encounter numerous risks and uncertainties. Uncertainty also stems from land tenure issues which cause racial tensions amongst the major ethnic groups (Ward, 1960, 1995). The Fijian society, based on an integrated clan relationship, is of communal nature, whereas the Indo-Fijian societies are more culturally diverse (Revuvu, 1983; Asian Development Bank, 2006). It has been noted that most aspects of Indo-Fijian lifestyle and culture have comfortably coexisted with the indigenous Fijian way of life for over a century. Occasionally, cultural differences between the two communities have proven rich fodder for political agitations, even though simmering racial tensions can also be attributed to other factors, including a racially based electoral system (Tavola, 1991; Ewins, 1992; Gounder, 1999; Firth, 2001). To overcome those challenges, the common and realistic practice adopted by the agriculture-dependent households is to engage in off-farm income-generating activities as a means of diversifying farm income and creating favourable conditions to minimise risks and uncertainties. As the current study suggests the theoretical possibility that non-farm income such as remittances have a significant role in enhancing agricultural production and encouraging cash crops diversification. Future research might benefit from considering to what extent remittance income would have a substantial impact on agricultural productivity and innovation adoption.

Despite the need for future research, the empirical findings presented here have important implications for the contribution of remittance income to household welfare, agricultural production and diversification in case of Fiji.

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