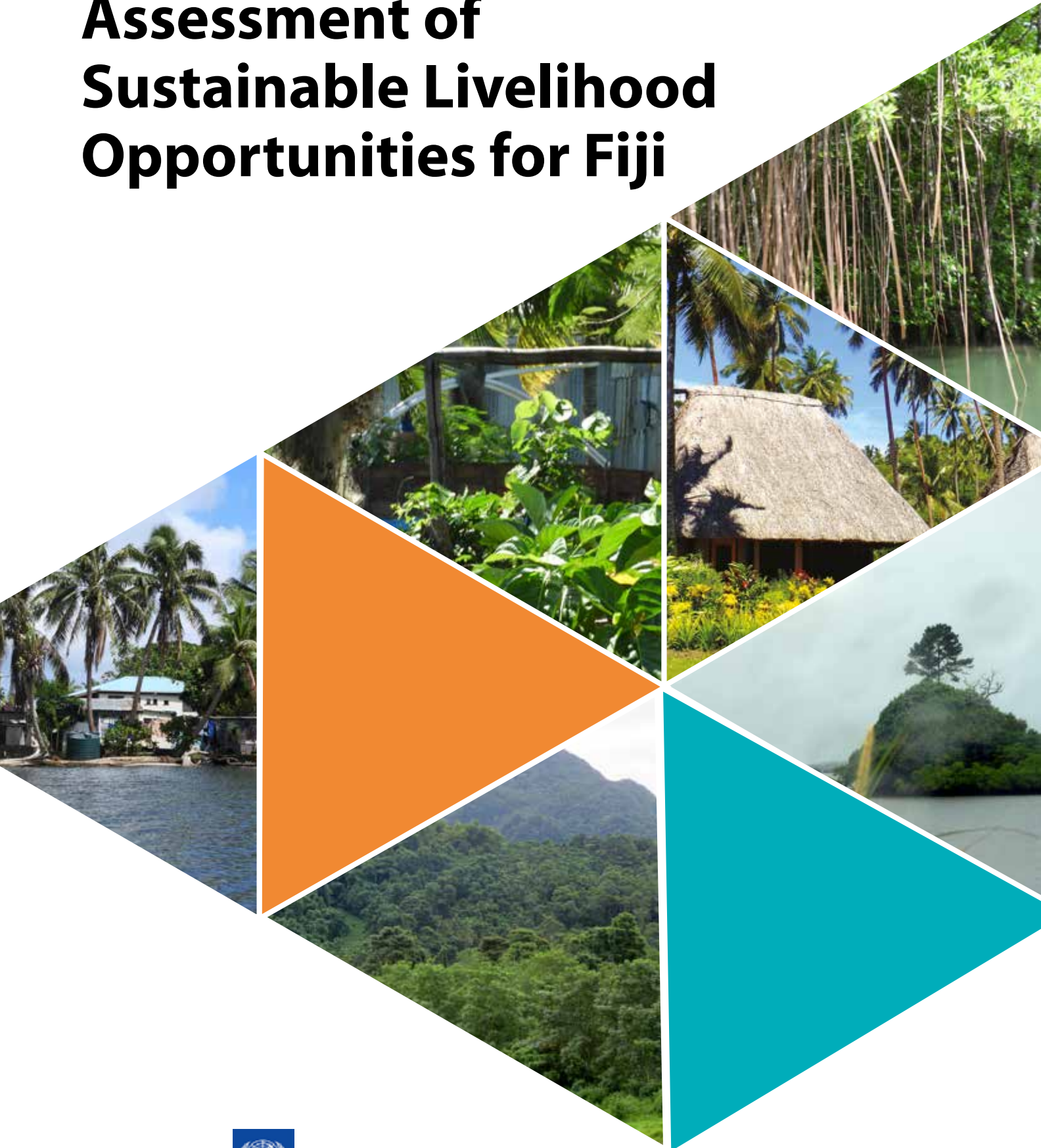


Assessment of Sustainable Livelihood Opportunities for Fiji



Team Members

Ganesh Gorti, Research Associate, Earth Science and Climate Change Division, TERI

Tamiksha Singh, Associate Fellow, Earth Science and Climate Change Division

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For more information

Karan Mangotra

Fellow and Associate Director, Earth Science and Climate Change Division,

TERI

Darbari Seth Block

IHC Complex, Lodhi Road

New Delhi – 110 003

India

Tel. 2468 2100 or 2468 2111

E-mail pmc@teri.res.in

Fax 2468 2144 or 2468 2145

Web www.teriin.org

India +91 • Delhi (0)11



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EXECUTIVE SUMMARY

Communities in Fiji face multiple threats: environmental degradation, climatic changes, and the persisting developmental challenges. In this light, it is important that sustainable livelihoods be actively promoted by the national government, which would result in poverty alleviation, nature conservation, and more importantly in sustainable development. Livelihoods in Fiji are intrinsically tied to the natural capital – fishing and agro-forestry based livelihoods are one of the most important livelihood forms. It is in this context this research is situated within – to understand the current livelihood challenges and identify potential sustainable livelihood interventions for Fiji.

Through our research it has been identified that natural capital is the most affected livelihood asset. Natural resources both on land in water are under duress due to unsustainable livelihood practices: the use of chemical fertilisers and pesticides (along with other farm inputs) is known to have created a negative feedback loop on soil and water quality. Moreover, rudimentary agricultural practices have been leading to soil degradation. It was also identified that a lack of training in best practices is a crucial bottleneck towards enabling sustainable resource use.

In this light, this research identifies a few crucial livelihood interventions that include both on-farm and off-farm strategies. First, the research highlights the importance of promoting organic agriculture across Fiji, organic

agriculture strategies that involve using biofertilisers and pesticides amongst other on-farm inputs, could considerably reduce the impact on soil and water quality. However, while promoting such strategies, it must also be ensured that supply chains for the organic produce are created thereby ensuring sustenance of the intervention. In addition to promoting organic agriculture, crop diversification could lead to ecological resilience as well. Community seed-banks could also be promoted to ensure a wide genetic pool, and conserve resilient traditional crops. These on-farm practices augmented with off-farm livelihood strategies like ecotourism, bioprospecting and rainwater harvesting could be lead to sustainable development.

It is however important that these strategies be backed by macro policy framework that would lead to effective upscaling and sustenance of the interventions. Moreover, it is also suggested that a stakeholder mapping prior to the implementation of the strategy be carried out. Promoting sustainable livelihoods also co-benefits for other sustainable development goals like SDG 1 (Zero Poverty), SDG 13 (Climate Action), amongst others. Understanding these co-benefits could help mobilise suitable domestic and international funding necessary for implementation.



SUSTAINABLE DEVELOPMENT AND SUSTAINABLE LIVELIHOODS

Human aspirations drive change. This has been prominent in the development paradigms that countries have been undergoing for the past many decades. Social, economic and political transformation have all enabled rapid development, resulting in urbanisation, generating new jobs and bolstering economies, with an aim to improve human development standards, thereby furthering the aspirations for change. Nevertheless, far little evidence on what constitutes equitable and just change was explored during the period of rapid industrialisation in the early 20th century. While capitalist economies were burgeoning, larger questions on whether this growth pattern was sustainable and equitable remained unanswered. We have an answer to this now – unsustainable growth patterns have proven to be detrimental, resulting in habitat and biodiversity loss, rising global temperatures and increased instances of extreme weather events to name a few. The concept of sustainable livelihoods is embedded within this narrative.

The discourse on sustainable livelihoods which focusses on livelihood avenues which are resilient and do not negatively influence the natural resources saw light in 1972, during the United Nations Conference on Human Environment (UNCHE). The Conference culminated with a declaration, more commonly known as the Stockholm Declaration, that set the agenda for inclusive development taking into consideration the environmental and social aspects that could lead to marginalisation and deprivation (United Nations, 1972). The Declaration also set a broad narrative for environmentally responsible development that would take into account the needs of developing countries. This was further catalysed during the Earth Summit in Rio de Janeiro which furthered the cause of sustainable development, where the Climate Change Convention under the UN was formulated and the

Convention for Biological Diversity was tabled amongst party members.

These series of efforts translated into the Global Goals – through 2000 to 2015 United Nations party members had set out on an ambitious plan to reduce poverty and improve basic developmental indices based on mutually agreeable goals and targets. These came to be known as the Millennium Development Goals (MDGs) and were touted as the greatest push towards poverty reduction and eradication (UNDP & World Bank Group, 2016). Fifteen years after these goals were first implemented; countries have transitioned to even more ambitious goals – The Sustainable Development Goals (SDGs). These comprehensive goals seek to ensure that environmental, economic, as well as social development targets are met translating into sustainable development for all.

Environmentally conscious development along with biodiversity conservation have been the cornerstones of the sustainable development goals and indicate a marked shift in how these global goals have been formulated since the MDGs. The SDGs, as the name suggests, emphasise on the maintaining the floral and faunal diversity while also ensuring a clean environment. To this effect, SDG6 on Clean Water and Sanitation, SDG8 on Decent Work and Economic Growth, SDG10 on Reduced Inequalities on SDG11 on Sustainable cities and Communities, SDG13 on Climate Action and SDG14 and 15 which talk about life below water and above land respectively extensively dwell on maintaining biodiversity and a clean environment, while promoting sustainable livelihoods that would aide in income generation. More specifically, SDG14 extensively deals with maintaining marine biodiversity and regulate and curb overfishing and exploitation of marine resources, while SD15 specifically deals with combatting desertification, reversing habitat

loss and land degradation, and maintaining and preserving various biodiversity zones including the fragile mountain ecosystems. SDG11 and 13, through sustainable habitat and climate specific action, indirectly delve on biodiversity issues while directly addressing the push towards clean environment.

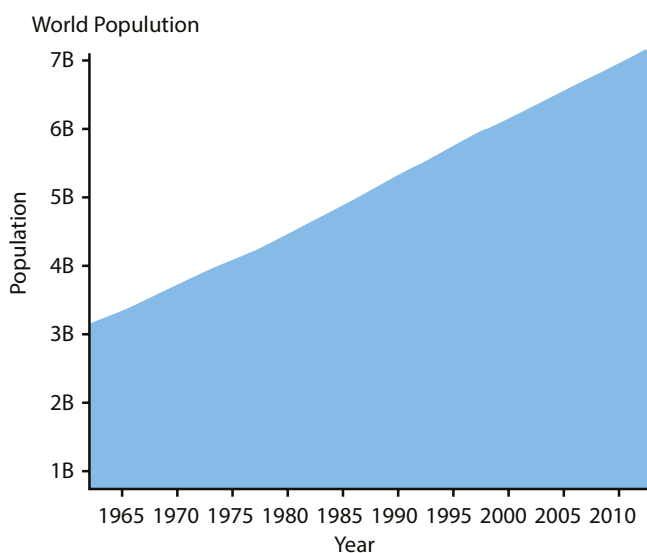


Figure 1: World population growth - 1960 - 2017

Source: World Bank Data

The trajectory of global change, which can be visualised through the above image exemplifies the need for and the challenge in maintaining a positive human-environment interaction. Rapid population growth increases demand for resources and negatively impacts the nature. It is hence important that sustainable livelihoods that promote equality on hand, and conserves nature on the other. It is within this larger discourse of Sustainable Development Goals, equitable growth and poverty eradication that the current research on sustainable livelihoods situates itself. The research focusses on Fiji, a project country for the UNDP-GEF Ridge-to-Reef programme being implemented in partnership with the Government of Fiji. Fiji has a relatively higher per capita income as opposed to other developing countries. It however has a high poverty percentage with roughly 34% of the population below the national poverty line according to the 2013-14 statistics (World Bank Group, 2018). This percentage is further higher in rural areas as opposed to urban areas. This thus raises crucial questions on the practices that

could reduce poverty while not adversely impacting the environment, keeping in mind the fragile ecosystems Fiji supports. It is in this context that the current research tries to explore sustainable livelihood options for Fiji through a grounded understanding of the current risks. It has also been noted that sustainable livelihood practices could positively influence adaptive capacity thereby resulting in co-benefits. This research is being carried out under the larger the Ridge-to-reef programme which seeks to preserve biodiversity, ecosystem services, sequester carbon, improve climate resilience and sustain livelihoods through a ridge to reef management of priority water catchments. We thus identify potential livelihood strategies that could have a direct positive conservational and environmental benefit or an indirect benefit, through livelihood diversification and reduced stress on natural resources.

The report is structured as follows: the second section explains the methodology that the study has adopted. The third and fourth sections focus on the current livelihood and the challenges they face, and subsequently identify alternate sustainable livelihoods that have a potential to be implemented in the specific context. This is followed by a concluding section.

Methodology

This research uses both primary data from case study sites within Fiji and secondary data pertaining to the case study sites and the Fiji's larger context to build a narrative around sustainable livelihoods. The ensuing subsections highlight the conceptual framework on which the study builds, the case study areas and the data collection tools employed.

Conceptual framework

Livelihoods are what people do in their daily lives to meet their livelihood goals (Schafer, 2002). This could include the income generation activities they are involved in, which could be agriculture, pastoralism, amongst others, the household chores one performs, and other sociocultural activities. However, these activities are influenced by a plethora of factors; for example, agriculture would be affected by the availability of natural

resources including water, and the soil quality which determines the growth of plants. Availability of farm labour is also critical for effective farm management, especially in regions where mechanisation of farm practices is not pervasive. In a way, these various needs could be characterised as assets that an entity possesses or has access to.

However with growing attention on sustainability and capability, (Chambers & Conway, 1991) equity, and sustainability, each of which is both end and means. In the 21st century livelihoods will be needed by perhaps two or three times the present human population. A livelihood comprises people, their capabilities and their means of living, including food, income and assets. Tangible assets are resources and stores, and intangible assets are claims and access. A livelihood is environmentally sustainable when it maintains or enhances the local and global assets on which livelihoods depend, and has net beneficial effects on other livelihoods. A livelihood is socially sustainable which can cope with and recover from stress and shocks, and provide for future generations. For policy and practice, new concepts and analysis are needed. Future generations will vastly outnumber us but are not represented in our decision-making. Current and conventional analysis both undervalues future livelihoods and is pessimistic. Ways can be sought to multiply livelihoods by increasing resource-use intensity and the diversity and complexity of small-farming livelihood systems, and by small-scale economic synergy. Net sustainable livelihood effects and intensity are concepts which deserve to be tested. They entail weighing factors which include environmental and social sustainability, and net effects through competition and externalities. The objective of sustainable livelihoods for all provides a focus for anticipating the 21st century, and points to priorities for policy and research. For policy, implications include personal environmental balance sheets for the better off, and for the poorer, policies and actions to enhance capabilities, improve equity, and increase social sustainability. For research, key questions are better understanding of (a) introduce the concept of sustainable livelihoods, wherein the idea of equity, sustainability and capabilities was put forth. Such an approach is especially relevant when the livelihood demands would see an increase with rising population, and would be a serious challenge for sustainable development. It is on this

understanding that the sustainable livelihoods framework developed by the UK Department for International Development (DfID) builds upon. The sustainable livelihoods framework or SLF as it is popularly known, utilizes the five capitals to understand how livelihoods outcomes are shaped (DFID, 1999) particularly the livelihoods of the poor. It was developed over a period of several months by the Sustainable Rural Livelihoods Advisory Committee, building on earlier work by the Institute of Development Studies (amongst others). The framework additionally identifies other processes such as policies, regulations, governmental hierarchy and the existing vulnerability context determined through the shocks and stressors which eventually shape the access and control over the capitals (Social, Financial, Natural, Human and Physical) thereby determining the livelihood outcomes (DFID, 1999) particularly the livelihoods of the poor. It was developed over a period of several months by the Sustainable Rural Livelihoods Advisory Committee, building on earlier work by the Institute of Development Studies (amongst others).

Existing research has effectively utilised this framework to assess the current livelihoods, identify the threats they are facing and propose corrective measures. For example, (Becker, 2017) as are the remotest rural communities. Modernity is spreading across the world under the guise of development and it is transforming disaster risk. This raises issues concerning how disaster risk is changing in such milieus. Using a sustainable livelihood approach, this article investigates access to different types of capital that central to the vulnerability of two coastal communities in Fiji that are affected by modernity to different extents. This comparative case study is based on semi-structured interviews, focus groups and observation. The results indicate that modernity transforms access to and use of key capitals (natural, physical, financial, human, and social capital) use the SLF to understand the differences in access to the five capitals amongst two coastal communities in Fiji, and develop a vulnerability context for them. Similarly, (Khandekar, Gorti, Bhadwal, & Rhijwani, 2019) use the SLF to understand gender differentiated access to assets within the mountain communities in India. Elsewhere, SLF was used to provide inputs to project managers to help understand the links between livelihoods, vulnerability and adaptive capacity (Klein et al., 2007). In this research, we use SLF as the guiding framework to aide in both

data collection and analysis. We utilise the five capitals/assets to understand the current livelihood practices that the communities in Fiji are engaged in, and to analyse information on challenges that these livelihoods currently face or might face in the future. We use this to further propose alternate sustainable livelihoods that have the potential of being operationalized in Fiji.

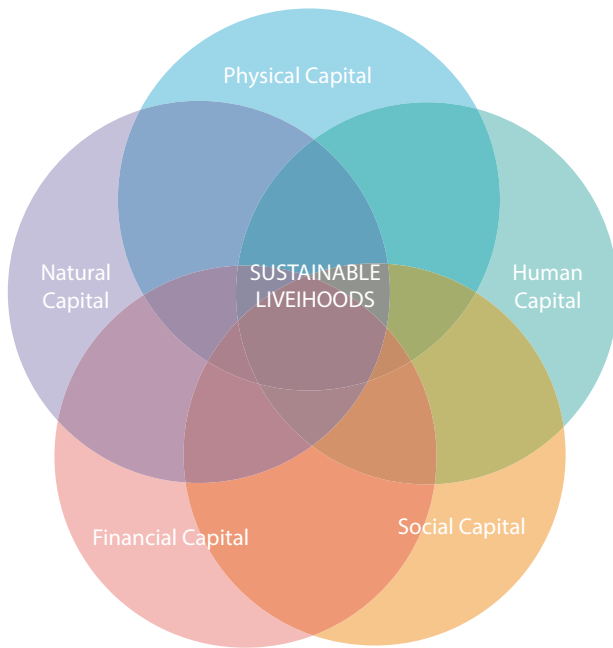


Figure 2: The five capitals under the Sustainable Livelihood Framework

Data collection and analysis

In this research we have employed a range of primary and secondary data collection methods to build a narrative around sustainable livelihoods for Fiji. These include systematic literature review as a secondary data collection method, semi structured interviews, and focus group discussions as a primary data collection method. The former was used to establish an understanding of the field site, and persisting issues, while the latter built on the literature review to develop a thorough understanding on the challenges currently plaguing the communities. The field interactions were also used as a means to understand the complexity of governance in Fiji, and identify the importance of stakeholders in enabling effective action. While the data was being collected, the five capitals of the SLF were kept in mind. SLF was also useful in analysing the data collected regarding the current livelihoods and

the challenges that they are facing. The research built on this framework to arrive at a qualitative narrative on current status, risks and opportunities for sustainable and alternate livelihoods. Below we discuss the key issues covered by the primary data collection techniques:

Semi structured interviews: To understand the current livelihood patterns and the crucial policy challenges plaguing sustainable development semi structured interviews were carried out in the case study regions (detailed in the ensuing sections). Respondents were asked to remark on two crucial parameters, one on the changes in climatic parameters and other on environmental parameters (non-timber forest products, water availability, forest cover, soil quality). Interlinked to this, the interviewees were also asked to identify livelihood practices that are having detrimental/negative impact on the above parameters. Building on this, respondents were then asked to identify the crucial barriers that they see in promoting sustainable livelihoods in the region. These semi structured interviews were conducted with government and non-governmental stakeholders to develop a holistic understanding of the various issues.

Focus group discussions: In addition to the semi structured interviews, focus group discussions with the communities were also conducted. These were used as a means to obtain on-field narratives of change and challenges vis-à-vis livelihoods and thereby help augment the data gathered through the semi structured interviews. The groups were asked targeted questions pertaining to current livelihoods initially and there after the conversations were used as a cue to post further questions on on-ground challenges and institutional limitations that have been impeding livelihood promotion.

Study area

For the primary data collection, we had used data from three case study villages that are emblematic of the larger livelihood challenges facing the communities in Fiji. These villages were chosen in consultation with the Department of Environment, and were spread across two different administrative regions in Fiji, namely Nadroga—Navosa and the Ba provinces. Issues pertaining to both

coastal (marine) and in-land livelihoods were discussed with various stakeholders. These on-field stakeholder interactions took place in Moto sector and Nabala village of Ba province and Sigatoka in Nadroga-Navasa province.

Data gaps and research ethics

As mentioned earlier, this study uses multiple datapoints, including primary and secondary sources. However, due to the lack of availability and access to datasets including information from the Bureau of Statistics and the Ministry for iTaukei Affairs, certain considerations could not be drawn. For example, the village level socio-economic surveys conducted by the iTaukei Affairs Ministry could have been used to understand the current natural resource dependence amongst communities living in the forest's fringes. While the primary interviews were used to build a narrative around current issues and needs, the quantitative data from the surveys could have supplemented it, thereby aiding in a more targeted analysis that is more region specific. Future research could try to fill-in this gap and could augment the perception-based issues highlighted in this report with geospatial datasets on natural resources to identify hotspots where sustainable livelihood pilots are a pressing need.

While collecting primary information for this research it was ensured that the responses were anonymised, and the interviewees were made aware of the scope of the project and what this component (on sustainable livelihoods) envisages to do. Participant's request to not document certain statements were also honoured.

Current livelihood practices and challenges

Understanding the current threats to livelihoods is crucial in framing future livelihood interventions. It is hence important to situate research within the current threats to livelihoods and biodiversity, thereby intervention can reduce vulnerabilities while capitalising on the opportunities that might arise. In this context, as discussed in the above section, this study makes use of the data from on-field interactions and secondary data publically available to build a narrative around the current livelihood challenges that communities are facing in Fiji. As an analytical framework we use the Sustainable

Livelihoods Framework (SLF) to compartmentalise the data into five capitals (referred to as resources here) that have been identified as crucial components of the SLF. It is also important to understand that there are complementarities and interdependences between these five capitals, wherein, issues pertaining to one capital can result in positive or negative impacts on the other. For example, a lack of human capital, manifesting itself as lack of awareness on biodiversity issues can negatively influence natural capital.

Natural capital

Fiji is endowed with natural resources – the tropical rainforests that sustain numerous floral and faunal species, the corals that support numerous aquatic species, and the highlands which now support the grasslands. With close to 58% of Fiji being forested (Department of Forests, n.d.). Livelihoods in Fiji are intrinsically tied to natural resources – from the forests that provide non-wood forest products, to the marine and fresh waters which help sustain fishing based livelihoods, the communities derive a lot of benefits from these fragile ecosystems. It was also understood that certain livelihood practices have a negative feedback loop on the local biodiversity and is already affecting the local populace. This had highlighted the systemic impacts some perturbations might have. Our interactions with the local communities and key stakeholders made evident that there has been a continuous stress on natural resources, both on land and in water. Though it has been noted that Fiji had a net gain in forest cover between 1990 and 2005 (Department of Forests, n.d.), literature has also pointed to a reduction in closed forests and increase in open forests (FAO, 2015), which is a potentially worrying trend. Closed forests have a greater crown cover as opposed to open forests, and provide more ecosystem services. Our interactions have also identified this reduction in the quality of the forest cover as an issue. It was also understood that in certain instances, a few invasive floral species, including the African tulip, have been gradually increasing in their territorial spread. Invasive floral species can lead to reduced genetic diversity, often capturing and destroying the natural habitat of certain native species. Though it was opined that invasive floral species is not an immediate threat, it potentially could be in the near future. We have also understood from our interactions that communities do not have access to as many fruit

trees as they used to in the past. This is especially in the context of communities living close the forests, and who are predominantly iTaukei. However, such a reduction could merely signal lifestyle changes and not necessarily a loss of habitation for the breadfruit tree.

Through our interactions, it became evident that the reliance on fertilisers on the field is rampant, while it more often than not does not lead to increased production as expected. As mentioned earlier, systemic impacts were pointed out due to this rampant application of fertilisers in the fields. It was opined that the chemicals from the field enter water resources, resulting in damage to the aquatic life including the corals. This in-turn affects the livelihood of the fishing community. The interactions also highlighted the high dependence on rain water for irrigation purposes, despite there being a few boreholes that were dug exclusively for irrigation purposes. Our on-field interactions had pointed to the reduction in available water in a few adjacent streams close the farmlands, though it must be noted that this might not be an issues across various geographies within Fiji. River bank erosion has been identified as a crucial challenge, wherein certain tracts of land have been affected resulting in damages to communities. It is in this context that the government had started piloting a new programme with vetiver to check riverbank erosion.

Earlier I used to use 20 bags of fertiliser for the same area. Now I use 40. The produce that I get remains the same. Soil is no longer as good as it used to be. It's difficult to be a farmer now.

-A farmer from Ba

Our interactions had also identified that certain rudimentary agricultural practices are being practiced in certain areas. Shifting cultivation for example is practiced in certain locations, which at times leads to the destruction of local forests resulting in loss of native forests. Aggravating this issue is the fact that certain native plant species that could be potentially used as a source of firewood are not being promoted actively, it was noted.

Financial capital

A subsidy to farmers in procuring fertilisers has been identified as a crucial financial benefit that is keeping the farmers afloat. However, rudimentary agricultural practices, increased reliance on fertilisers and reduced water availability have all been affecting livelihoods. In addition to this, a lack of access to markets has been identified as a crucial bottleneck for the farming sector. On one hand, while the periodicity and frequency of supply of produce from the farmers when value chains between them and retailers/hoteliers have been established has been identified as an issue, it was also noted that access to markets is a challenge. Our interactions with farmer groups had pointed to distance being a crucial bottleneck in finding new markets and establishing value chains.

When I cannot sell my produce in my local market I take it to the closest city, which is two hours away, so I loose money there and have hardly anything left.

- A farmer from Ba

Issues such as these need to be addressed in potential livelihood options to ensure its effectiveness, and highlights the need to understand the challenges facing current livelihoods which could potentially be addressed in proposed interventions. It was also pointed out in the discussions that only a few of the Women's groups at the village act as financial intermediaries which act as micro-credit lending facilities for its members. These groups, through such lending, promote livelihood enhancement. The effectiveness of such groups could thereby determine the success of potential livelihood options.

Social capital

Social capital is defined as the social resources one utilizes to carry-out certain livelihood activities (DFID, 1999) particularly the livelihoods of the poor. It was developed over a period of several months by the Sustainable Rural Livelihoods Advisory Committee, building on earlier work by the Institute of Development Studies (amongst others). Communities in Fiji exhibit strong social cohesion and are dependent on them for a plethora of social activities that



Figure 3: Community interaction in Sigatoka

constitute one's daily activities. The locals also form a lot of community groups through which decisions are made at the local level. These groups or committees include Decisions at the resource management committee, the women's group, amongst others. It is not uncommon to see numerous committee that are responsible for various tasks within the village (Becker, 2017) as are the remotest rural communities. Modernity is spreading across the world under the guise of development and it is transforming disaster risk. This raises issues concerning how disaster risk is changing in such milieus. Using a sustainable livelihood approach, this article investigates access to different types of capital that central to the vulnerability of two coastal communities in Fiji that are affected by modernity to different extents. This comparative case study is based on semi-structured interviews, focus groups and observation. The results indicate that modernity transforms access to and use of key capitals (natural, physical, financial, human, and social capital. In certain instances, even farming is done in a collective way, where a group of farmers come together and work on one single farm and then move onto the other (Becker, 2017) as are the remotest rural communities. Modernity is spreading across the world under the guise of development and it is transforming disaster risk. This raises issues concerning how disaster risk is changing in such milieus. Using a sustainable livelihood approach, this article investigates access to different types of capital that central to the vulnerability of two coastal communities in Fiji that are affected by modernity to different extents. This comparative case study is based on semi-structured interviews, focus groups and observation. The results

indicate that modernity transforms access to and use of key capitals (natural, physical, financial, human, and social capital. However, a few interactions have pointed to a decreasing social cohesion which might have an impact on certain livelihood activities in the future. However, it was also noted that for any new activities that might be implemented in the villages, including livelihood pilots, these community groups along with the village heads, would play a crucial role, thereby highlighting the importance of tapping into this social capital. In the ensuing sections we highlight this – the importance of inclusive planning enabled through participatory resource management programmes that puts the community at the centre of resource management.



Figure 4: Interactions with the Indo-Fijian community in Ba

Human capital

Human capital in the Sustainable Livelihoods Framework represents a range of indicators that are representative of the knowledge and skills that they poses and are influential in shaping their livelihoods (DFID, 1999) particularly the livelihoods of the poor. It was developed over a period of several months by the Sustainable Rural Livelihoods Advisory Committee, building on earlier work by the Institute of Development Studies (amongst others. Human capital in isolation cannot lead to improved livelihoods, but is necessary to make use of the other four capitals. It is hence important that this capital be strengthened to ensure potential livelihood activities' effectiveness. Through our interactions, it was observed that human capital needs to be promoted before new programmes are implemented. Interlinked

to the discussion in the natural capital subsection, it was opined that lack of training in agricultural practices is a major issues. Practices that are otherwise not beneficial to the environment are still practised because of a lack of awareness of the negative implications arising from it. It was also understood that a number of best practices are not employed all due to lack of awareness. For example, mixed cropping is beneficial in retaining soil productivity and could positively influence soil health, however due to lack of awareness farmers do not practise this cropping technique. Moreover, in certain instances where large areas of forests are cleared for agricultural purposes, the long-term effects of such biodiversity loss are not very well understood. This reiterates the importance of community sensitization and awareness in promoting sustainable livelihoods.



Figure 5: Interactions with the iTaukei community in Ba

Physical capital

Physical capital relates to the physical infrastructure that is needed for livelihoods (DFID, 1999) particularly the livelihoods of the poor. It was developed over a period of several months by the Sustainable Rural Livelihoods Advisory Committee, building on earlier work by the Institute of Development Studies (amongst others. These could include basic services like adequate water supply and sanitation needs, good transportation, clean and reliable electricity, amongst others. These services would directly influence the livelihood outcome, for example adequate water supply along with reliable electricity is essential for optimum productivity in a farmland. However, any inadequacies in these could impact

livelihoods. During our interactions, especially amongst the sugarcane farmers, a lack of adequate water especially in the lean months was identified as an issue. Moreover, continuous supply of electricity was also identified as an issue which affects water pumping. Additionally, in some regions where flooding, inundation of farmlands and homes was considered to be an issue. However, communities in many regions have found an effective solution to mitigate the risk from flooding by raising the plinth of the house by a few meters, thereby reducing the risk of inundation. It was also understood that access to sanitation, in certain villages, is an issues especially during periods of heavy rainfall.

Sustainable Livelihoods

As detailed above, sustainable livelihoods are a means to reduce poverty through alternate livelihoods which simultaneously account for sustainability thereby maintaining ecological balance. However, since livelihood interventions change the way a community lives, it is important that such interventions be driven through a hybrid bottom-up understanding and top-down priority setting for its effective implementation. A bottom-up approach would entail a comprehensive understanding of the risks that the communities are currently facing/ might face in the near future. While the context within which these interventions are introduced is important, the institutional dynamics also play a crucial role in determining its success. It also entails that these interventions take into account the local dynamics of power and authority while involving a targeted socio-economic group. For example, in many of the developing countries, especially across the Hindu Kush Himalayan region, women are the torchbearers of agriculture, and any intervention related to farming in this region has to target this gender group and push the women self-help groups¹ to actively participate in the intervention's uptake for its successful implementation.

On the top-down priority setting, it is crucial that these livelihood options be backed by long-term developmental objectives of the administrative unit, whether it is a village, a district, a province or the country

¹ Self-help groups or SHGs are financial intermediary institutions that exist at the village level in India and some parts of South Asia, which actively engage in livelihood

in itself. Moreover, these interventions need to be situated within existing or prospective policy decisions so that necessary institutional and financial support is allocated for its implementation. It is also essential that all livelihood practices exhibit the potential to be upscaled. It is often observed that sustainable livelihood projects which perform well as pilots do not reach the expected outcomes when upscaled due to a plethora of issues including contextual mismatch, lack of community acceptance, lack of policy support amongst others. It is thus important to adopt a learning-by-doing approach, where an iterative learning loop is established with the various stakeholders involved. Such an approach would help in course correction through the implementation period, and help resolve issues pertaining to community acceptance and contextual mismatch. It has also been noted that such participatory resource and environmental governance programmes have a potential to shape future paths around a sustainable system (Marschke & Sinclair, 2009).

With this background, the ensuing subsections build on the identified challenges and propose alternate sustainable livelihoods that could be promoted in Fiji which would reduce the pressure on natural resources through livelihood diversification and by promoting sustainable utilisation of resources. These livelihood strategies have been disaggregated into on-farm and off-farm practices and are discussed below.

Improving Farm Practices

Organic Agriculture

Ever since the modernisation and mechanisation of farm activities, farm production has seen a phenomenal increase, however, this increase has not necessarily translated to greater profits on one hand, and on the other has also led to degradation of soil and contamination of surface and ground water resources, leading to ecological damage and considerable human health challenges in a few regions of the world. In response to this, there has been a growing interest in organic agriculture, where the use of agricultural chemical inputs (including chemical fertilisers, pesticides, insecticides, and weedicides amongst others) are limited and use of natural manure, pesticides and insecticides is encouraged. In Australia, for

example, the agricultural sector has been blamed for an increase in water scarcity and pollution, soil degradation and growing emissions from the agricultural sector (Wheeler, 2011). Such changes have an adverse impact on the biota, adversely affecting the wildlife and human population equally.

Thus organic agriculture, since late 1990's has seen a pentafold increase, from about 11 million hectares in 1999 to about 58million hectares in 2016. The number of organic producers across the world has also seen an increase from just about 200,000 to about 3 million producers (Willer & Lernoud, 2018). This growth in cultivated land on one hand highlights the growing transition from chemical-intensive farming to more sustainable means of farming, and on the other also highlights the growing markets for organic produce, with the biggest being the US being the single largest market with about \$43 billion in 2016, accounting for almost half of the total market share, and closely followed by Germany and France (Willer & Lernoud, 2018).

Below, we build on a couple of examples across the world where a transition to sustainable agriculture, with a focus on organic farm inputs have been promoted or implemented. Using these cases, and building on what is already being implemented in Fiji, we arrive at a trajectory for action which could enable the growth of the organic agriculture sector in Fiji and would help reduce ecological damage on one hand, and build livelihoods, adaptive capacities on the other.

Organic agriculture around the world

Countries, organisations, and individuals have actively been engaging in organic agriculture keeping in mind sustainable development of the agricultural sector, and as a result of a growing market demand for such produce. A majority of the demand for such produce is however concentrated in the developed countries, and the United States, Germany and France together account for a considerable portion of the organic agriculture market, while Sweden, Denmark and Switzerland are amongst the highest per-capita consumers of such produce (Willer & Lernoud, 2018). On the other hand, quarter of the world's organic agricultural land (14.3 million hectares) and more than 87 percent (2.4 million) of the producers were in developing countries and emerging markets in 2016,

providing itself as a humongous market opportunity for the developing countries' producers.

Denmark has, for example, through concerted efforts built on the existing common agricultural policy set by the European Union and has also introduced an organic action plan to promote organic produce across Denmark and improve its exports of organic produce (Ministry for Food Agriculture and Fisheries, n.d.). The Danish government, has, through a range of policy measures, ensured that the demands for organic produce within their domestic markets are sustained. This included promoting organic food amongst public kitchens by allocating specific funding for greater promotion of organics, setting targets for the local governments for the purchase of organic produce, amongst others (Ministry for Food Agriculture and Fisheries, n.d.). This is set in the context of a strong partnership forged amongst stakeholders (the Government, the Farmers, and the retailers) to actively promote organic farming and produce (FAO, n.d.). Denmark had also used a range of supply side and demand side policy instruments to lower prices on one hand and increase demand on the other (as discussed above through the Organic Action Plan). It had also used subsidies for farmers converting to organic were provided, which promoted more farmers to convert (Daugbjerg, 2010). This was also augmented by a policy decision to lower the price of organic products in the retail markets, to increase demand. These range of interlinked policy decisions has brought Denmark close to ten percent domestic organic produce market share (Willer & Lernoud, 2018).

A similar narrative emerges from India, where a regional government had proactively formulated a policy that would promote organic agriculture across the mountain state, nestled in the Himalayas. Sikkim had, in 2003, through strong political commitment signalled its intention to transform the agricultural practices in the state. By 2010, this had translated into the Sikkim Organic Mission which had set ambitious targets to enable this transformation. The State had promised to make available exclusive retail outlets through which organic produce could be marketed, it had also made amendments to school curriculum to promote the benefits the organic agriculture (Government of Sikkim, n.d.). To enable the transition, the State followed an incremental approach

to reduce the dependence on chemical fertilisers and pesticides on one hand, and increase the demand for organic fertilisers on the other. The State had slowly reduced the subsidies it had in place for chemical fertilisers and pesticides, nudging farmers to go organic. It had, alternatively, made available organic certified organic manure to the farmers (Government of Sikkim, n.d.). Since organic manure is obtained from cow dung, the State had also targeted animal husbandry as a sector to reduce the amount of chemicals in the feed that is given cattle. This holistic approach had helped Sikkim transition into the only Organic State in the World by late 2015. Despite these strategies, research has found that non-availability of the required organic fertilisers is a major impediment in greater absorption of organic farming practices (Sharma, Pradhan, & Bhutia, 2017). It is also known that it takes about five years to reach pre-transition yields and hence subsidising the transition is essential for sustenance.

Promoting organic farming in Fiji

Fiji is endowed with biological diversity that sustains both life on land as well as under water. That the exquisite marine life that the Island nation is home to, supporting hundreds of tropical marine species, the corals, and the thick tropical rainforests that portion of its land is home to, needs to be protected is an immediate necessity. However, large-scale intensive agriculture though has solved the food production issues, the long-term impacts from such intensive practices, which rely on heavy use of fertilisers, could potentially be devastating. As witnessed in many instances across the world, commercial farming that promotes the use of chemical fertilisers is detrimental to the soil quality and water quality (Foley et al., 2005). Examples across the world suggest that though the "green revolution" has benefitted in improving the food stocks, it has led to, in many instances, increased salinity of the soil, decreased water availability and issues with its quality, and soil quality vis-à-vis soil organic matter (Foley et al., 2005) (R. B. Singh, 2000), indicating the large trade-offs such practices might have. Through the interactions the project team had, the communities themselves had opined that the use of fertilisers has been affecting soil quality.

It has also been shown that an increased use of fertilisers might affect the nitrogen run-off and eventually impact

the health of the corals (Angelo & Wiedenmann, 2014). For instance, in Maryland, USA, it has been estimated that 36% of the nitrogen found in the Chesapeake Bay is from agricultural (Kobell, Horton, Simpson, & Summers, 2015). This has also been identified as a crucial issue through the numerous stakeholder interactions. Though this percentage may vary based on multiple factors, it puts in perspective the impact of large-scale use of fertilisers on nitrogen run-off and subsequently the water quality and its impacts on corals. Corals in Fiji act as a natural barrier, sustaining numerous life forms and protecting the lands from dangerous storm surges. They also sustain numerous communities that are dependent on fishing for their livelihoods, as witnessed in the Locally Managed Marine Areas (LMMA) popularised through the Fiji Locally Managed Marine Areas Network (FLMMA). Any changes to the corals will be potentially harmful to these coastal communities. Hence, on one hand while the use of chemical fertilisers will impact inland communities by affecting soil quality in the long-term, it will also affect the coastal communities, by potentially impacting the reefs, and the marine life. Hence, it is even more critical that sustainable farming practices be promoted.

While organic agriculture is practised in Fiji, it is neither at the scale it could be at, nor is it being tapped into as an alternate sustainable livelihood means to conservation and biological security. Fiji, in 2016, had around 13,000 hectares of land under organic cultivation, which puts the total agricultural land under organic farming at just around 3.1% (Willer & Lernoud, 2018). In contrast, Fiji's South Pacific neighbour, French Polynesia, has around 31% of its total agricultural land under organic farming (Willer & Lernoud, 2018). This presents Fiji with an opportunity to promote organic farming through changes in both policy and agricultural practices. As evidenced through the success of organic farming across the World, it is imperative that a strong political push towards the organic transition combined with holistic policy formulation is needed to enable this transition.

Crop and plantation diversification

Fiji's major crops include sugarcane, coconut, taro, papaya amongst others. While sugarcane is predominantly grown by the Indo-Fijian population, other traditional crops like taro and cassava are grown by the iTaukei community

The way forward:

To increase adoption of organic farming amongst farmers, a multistakeholder, multistep process could be formulated. This could entail the following components/steps:

In the near-term (0-2 years):

1. Impart necessary training on organic farming to farmers
2. Promote on-farm production of inputs
3. Enable domestic demand for produce through establishing supply chains with local hotels and resorts to promote organic food through their menus

In the medium-term (2-6 years):

4. Develop a comprehensive Organic Farming Roadmap/Action Plan
5. Reduce investments (subsidies) for chemical fertilisers gradually while at the same time bolstering farmers' income through the transition phase when yields are expected to be low
6. Establish organic certification

In the long-term (beyond 6 years):

7. Explore potential export markets. The United States, New Zealand and Australia are already amongst the top five export destinations for vegetable produce originating from Fiji (World Integrated Trade Solution, 2017) and could be explored as future destinations for organic produce originating from Fiji.

a. Establish/Utilise existing processing units for exports – Fiji as Oceania hub for organic exports
Potential environmental benefits: Increased water and soil quality; reduced phosphate and nitrogen run off – improved coral health

predominantly. Statistics also point to how close to 80% of the population practice subsistence farming, with it contributing around 30 to 40% to the agricultural GDP of Fiji (FAO, n.d.). Casava, Dalo, Assorted vegetables, Coconuts and Pineapple were amongst the top five agricultural

products, along with Sugarcane, in 2015 (Department of Agriculture, 2015). While, a considerable portion of the produce is consumed in the domestic market, a portion of it, mainly, sugar, is exported to various countries. The table below highlights the major agricultural commodity exports across three years:

Table 1: Agricultural exports, Fiji

	2014	2015	2016	2017 (Estimated)
Total Exports (\$Millions)				
Sugar	FJD \$201.4 (USD \$95.4)	FJD \$129.4 (USD \$61.3)	FJD \$103.1 (USD \$48.8)	FJD \$194.9 (USD \$92.3)
Fruit & Vegetables	FJD \$39.1 (USD \$18.5)	FJD \$36.4 (USD \$17.2)	F\$36.5 (USD \$17.3)	F\$45.6 (USD \$21.6)
Kava/Yaqona	FJD \$7.5 (USD \$3.6)	FJD\$8.8 (USD \$4.2)	FJD \$14.2 (USD \$6.7)	FJD \$19.6 (USD \$9.3)
Exchange Rates	USD 1 = FJD 2.11199			

Source: (US Department of Commerce, n.d.)

Fiji's forest resources could be clubbed into two distinct parts, one which has native forests, and the other which constitute of plantations (Leslie & Tuinivanua, 2010). Pine constitutes the majority of plantations, while teak and mahogany constitute a minor portion. While a majority of land is still under native forests, the pine plantations are far from sustainable, and need better management. It was also opined that native species could be used instead of pine as a source of firewood.

Scope for crop diversification

Literature has identified that mixed-cropping or crop diversification increases the resilience of farmers, and is one of the major factors that help reduce vulnerability of smallholder farmers (McCord, Cox, Schmitt-Harsh, & Evans, 2015). It has also been argued in literature that mixed crop-livestock farming has interlinkages with sustainable farming than mono cropping (Rudel et al., 2016). Thus, it has been argued that such cropping practices be promoted by agricultural policies to aide in sustainable management of resources. It also widely accepted that traditional systems has promoted such mixed-cropping, however, the intensive farming practices that were subsequently introduced had ignored the importance of such traditional systems. In Fiji and most of the South

Pacific, it was opined that such traditional knowledge systems had historically promoted mixed cropping (Shah, Moroca, & Bhat, 2018). Examples across the world have pointed to how mono cropping could reduce the resilience of communities and often affect food security.

Examples from Malawi have pointed to the potentially harmful maize lock-in the farmers are into, irrespective of its soil and climate (in)suitability (Mango, Makate, Mapemba, & Sopo, 2018). In this light, it is important to consider diversifying from mono cropping, and engage in mixed cropping, which is not only economically resilient but is also ecologically resilient.

Fiji has a huge potential to enable a sustainable farming transition by promoting crop diversification and mixed cropping in conjuncture with organic farming techniques. Such practices will not only help conserve soil productivity and reduce the ecological footprint that agriculture is currently having in Fiji. Moreover, certain high value cash and horticultural crops, including spices like cardamom (FAO, 2017), could be explored to raise incomes from farming. As mentioned in the above sections, from the interactions the project team had, it was understood that a lot of agricultural practices are detrimental to long-term sustainability, such as excessive use of fertilisers, mono-cropping, shifting cultivation in certain locations, and sub-optimal utilisation of cash and horticultural crops. In this light, a comprehensive integrated farming technique could be implemented that would promote a range of crops, and train farmers in sustainable agricultural techniques.

In the case of hardwood and softwood plantations, which were planted with the intention of reintroducing trees in degraded grasslands, our discussions pointed to (see section 4) certain instances of exacerbated impact from flooding in region where pine-plantations exist. This is backed by literature which identifies reduced water yields after pine plantations had been established (M. J. Waterloo, Schellekens, Bruijnzeel, & Rawaqa, 2007). It has also been established that post mechanised extraction of the pine plantations, the sedimentation flow rate had increased, influencing the storm water flow (M. J. Waterloo et al., 2007). It has also been established that afforestation programmes will result in a reduced water yield and unless soil in areas where afforestation has occurred is deep, it would result in soil erosion as well (Maarten J Waterloo, 2002). In this light, native plant species as sources of fuelwood could be promoted in Fiji, instead of the pine plantations which are being used for manufacturing woodchips. Such diversification of plantations would help protect the genetic diversity in plan species, which is often threatened by invasive species, while keeping in mind the livelihood needs of the local communities.

The case of Vetiver grass (Chrysopogon zizanioides)

During the consultations in Fiji, it was understood that vetiver grass (*Chrysopogon zizanioides*), a tropical grass species which is known for its penetrating roots that keep a check on soil erosion is now being used to check riverbank erosion in Fiji. Certain experimental plots have been set-up in villages where the grass is being planted with the help of local communities to help protect the villages inland from flooding and landloss. It is here that the cultivation of vetiver presents itself as a huge opportunity to the local communities. The roots of vetiver are used in production of essential oil, a prime commodity, which could result in considerably income generation for the local communities and have co-benefits for disaster risk reduction and climate change adaptation. Such plantations of vetiver have been successfully piloted elsewhere in the world, like in the case of Morocco, where vetiver is being employed to check erosion, as well as sustain local livelihoods (UNDP-GEF, 2011). Literature has also identified that vetiver has a huge potential in carbon

sequestration and has both adaptation and mitigation co-benefits (M. Singh et al., 2011). It is opined that the use of vetiver as an inter-crop in agro-forestry systems can help boost rural incomes while not having any adverse impacts on the ecosystem (M. Singh et al., 2011). These benefits from vetiver could be tapped into to help mitigation and adaptation efforts in Fiji. However, it is to be kept in mind that commercialisation of the crop could lead to exploitation and be detrimental to the desired outcome of preventing river-bank erosion. However, with awareness programmes and regulations, commercialisation of the grass cultivated in areas along the river banks to check erosion could be regulated, while at the same time cultivation in other areas could be promoted.

The way forward:

To help diversify crops and encourage mixed cropping amongst the subsistence and commercial farmers, the following steps could be followed:

In the near-term (0-2 years):

1. Identify and pilot suitable crops for growth in the region (Spices like cardamom and vegetable production could be encouraged)
2. Promote mixed cropping in conjuncture with organic farming
3. Identify and promote existing horticultural crops that can achieve scales of economies

In the medium-term (2-6 years):

4. Integrate crop diversification and mixed cropping in Organic Farming Roadmap/Action Plan
5. Promote cash crops like vetiver contingent to strong regulations
6. Identify alternate native trees to replace exotic tree species currently being used for plantations and in wood chips manufacturing
7. Explore potential export markets – links with organic produce processing units

Potential environmental benefits: improved soil quality; greater genetic pool resources through promotion of native species

Promoting community seed banks

A high dependence on monoculture and amplified impacts from habitat loss and climate change impacts have resulted in food security issues in Fiji (Shah et al., 2018). Increasingly, the idea of growing local and consuming local has been gaining traction as a means to reduce environmental foot print and promote native species. This approach could have potentially positive benefits for the environment and in improving food security of the communities. Community seedbanks are thus characterised as “locally governed and managed” institutions which are predominantly informal that seek to save local varieties of seeds for local use (Vernooy, Shrestha, & Sthapit, 2015). However, in order to promote native species, saplings/seeds are essential. In a world with increasingly dwindling genetic pool, to which Fiji is no exception, conserving genetic diversity through crop diversification and by promoting local cultivars is important. Local cultivars are said to be more resistant to the prevailing environmental conditions, even if they are not high yielding. However, one crucial challenge is in maintaining this diversity – it has been observed across regions in the world that the local communities who are the repositories of knowledge on indigenous plant varieties could play a crucial role in this. Community seed banks could be promoted across Fiji to promote genetic biodiversity on one hand and, seed and food sovereignty on the other (Vernooy, Sthapit, Galluzzi, & Shrestha, 2014), thereby reducing the need to procure seeds. Community seed-banks that promote local varieties of crop coupled with multi-cropping, moving away from mono-cropping can significantly improve soil quality. Local communities could thus be encouraged to inventorise local plant species and store their seeds at village level seed-banks. Such techniques could hence check invasive species and reduce the agroforestry degradation.

While most seedbanks world-over have been implemented thanks to the support from local non-governmental organisations, examples of such seedbanks being promoted by national governments also exist (Vernooy et al., 2015). For example, in Brazil, where there policies that promote traditional agriculture are still in its early stages, community seed banks are promoted in the national plans on agro-ecology and organic agriculture

(Vernooy et al., 2015). Such on-farm conservation-based livelihoods can significantly improve the local agrobiodiversity. Hence it is imperative that community seedbanks backed through national policy frameworks be promoted extensively, benefitting both the conservation efforts underway and livelihoods programmes. Subnational, national level seedbank networks could also be formulated for effective dissemination of the learnings from the grassroot level.

Off-farm livelihoods

While the above section dwelt with on-farm practices that might have environmental benefits for the both the terrestrial and marine ecosystems, in this section, potential off-farm livelihood practices that might have environmental and economical benefits are discussed. These build on the issues identified in section 3, and when implemented in conjuncture with on-farm livelihood options discussed above, incremental environmental benefits could potentially be observed.

Ecotourism

Sustainable tourism practices could potentially act as a bridge between the dichotomy that exists between sustainable development and conservation efforts. Ecotourism is considered a form of sustainable tourism that promotes small scale tourism as opposed to mass tourism (Jairus N. Koki, 2017), and includes visits to natural ecosystems in order to learn, study or conduct other environmentally friendly activities (Kiper, 2013). Ecotourism is also promoted as a livelihoods strategy that could result in community’s economic development (Jairus N. Koki, 2017). Fiji has a huge potential to promote such sustainable livelihood practices since tourism is the primary contributor to the island nation’s economy, with close to a million tourists visiting Fiji in 2018 alone (Fiji Bureau of Statistics, 2018). Example from many parts of the world have shown both positive and negative benefits of ecotourism. For example, through pilots in Kenya it was understood that ecotourism had helped in building both human and physical capital, while aiding in environmental conservation alongside (Jairus N. Koki, 2017). However, studies elsewhere have also highlighted



the negative implications of ecotourism for conservation efforts, a times resulting in a greater influx of tourists than the carrying capacity of the ecosystem. It has also been highlighted that such programmes could lead to social inequalities in remote communities (Bahadur & Klaus, 2011) supported by structured questionnaires, were conducted to determine 1. It has also been argued that ecotourism could play a significant role in promoting conservation efforts by establishing an iterative learning process for sustainable development (Mondino & Beery, 2019) © 2018 The Author(s). For largescale proliferation of ecotourism activities that involve environmentally friendly and regulated tourism activities that would benefit local communities as well, policy support is essential. It is also necessary for the revenue generated from ecotourism be used for activities that would not degrade the ecosystem. For example, increasing farmland or livestock from the revenue generated from ecotourism could have potentially debilitating impacts on the ecosystem. Hence, appropriate training must be imparted to enable appropriate usage of the revenue generated (Bahadur & Klaus, 2011) supported by structured questionnaires, were conducted to determine 1. In Fiji, certain examples of ecotourism do exist, however with a stronger policy and regulatory decisions, such activities could be further promoted.

Bioprospecting and value addition

On farm-produce can be sold in markets as is or through some value addition that might increase the price of the commodity. This value addition can take numerous forms; fruits can be made into juices, while vegetables could be processed for utilisation in the food industry. A similar narrative also emerges from non-timber forests products that could be explored to help augment incomes. It is through this value addition, which is more commonly known as bioprospecting – assessing the economic potential of plant species (Negi, Maikhuri, & Rawat, 2011), that alternate, sustainable livelihoods could be provided to communities that would help reduce environmental degradation. Elsewhere in the world, non-timber forests products have extensively been used, either through domestication of the plant species or by obtaining the necessary plant material from forests occasionally, to generate income through sustainable practices. For example, in the Himalayan region in India, wild fruits

and plants form a crucial part of the diet, and these are used as dietary supplements or when there is a shortfall of staple food (Negi, Maikhuri, Rawat, & Chandra, 2013). *Rhododendron arboreum* is one such species which is used extensively by the local communities. The flower is used to produce a unique drink that also has numerous health benefits. Communities in this region have slowly begun to prepare juices and concentrates that are marketed in local markets. Such examples are also witnessed in the Sahel where domestication of certain indigenous fruit trees was promoted to bolster rural livelihoods (Kalinganire, Weber, Uwamariya, & Kone, 2009). Through concerted efforts and by imparting required training, certain fruits like the breadfruit, rose apple and mango could also be promoted further in Fiji. The Fiji Agricultural Vision 2020 document also seeks to promote other tropical fruits such as durian, rambutan amongst others. While this relates to the point on crop diversification mentioned above, the required training could also be imparted to the local communities so that they could further process these fruits to make fruit juices and concentrates. By aggregating the produce/ processed product, transaction costs associated with selling the product could be considerably reduced as well. Such community marketing schemes through farmer producer companies have shown beneficial results in rural India, where a group of farmers growing horticultural crops had come together to form a farmer producer company which handles processing, value addition and marketing of the horticultural produce. Potential markets include the hospitality sector, with its numerous hotels and resorts.

The way forward:

In the near-term (0-2 years):

1. Identify and pilot suitable plant species for growth in the region – carry out detailed cost-benefit analysis for commercialising prospective plant species
2. Impart necessary training for processing and marketing the produce
3. Establish markets – explore links with hotels and resorts along with the organic produce

In the medium-term (2-6 years):

4. Promote the creation of Farmer Produce Company for sustenance of the programme

Rainwater harvesting

Our community interactions had pointed to a lack of availability of water for irrigation in a few locations, as well as for domestic purposes in the highlands. Time that is otherwise spent on collecting water which constitutes one's productive time, could be used for conservation oriented livelihoods if issues around water availability are addressed. It is here that rainwater harvesting could play a crucial role. Fiji's monthly rainfall ranges from about 300-400mm during the wetter parts of the year and around 80-150mm during the drier period (World Bank Group, 2019), taking the annual average rainfall to close to 3000mm in the lowlands and considerably higher in the highlands. Moreover, El Nino periods are known to induce droughts across Fiji. Hence, promoting community led rainwater harvesting could have huge benefits to the local populace. Examples from across the world have shown the positive benefit from such interventions (Mutekwa & Kusangaya, 2006). Across the world, practices of rainwater harvesting have shown positive benefit to the environment and has aided in building sustainable livelihoods. Such rainwater harvesting techniques have shown resulted in improving agricultural production on one hand, and have helped in poverty alleviation (Dile, Karlberg, Temesgen, & Rockström, 2013). Such techniques have also helped in building resilience and adaptive capacities to climate change. Studies in the sub-Saharan tropics have shown promise for agricultural intensification especially in drier and water scarce regions (Dile et al., 2013). Lessons from a few other sub-Saharan countries have identified the importance of participatory technology development and an integration of biophysical and socioeconomic factors helping in the design and implementation of such strategies (Songok et al., 2018). Moreover, studies have also shown that rainwater harvesting techniques could have beneficial impact on small farm holders (Pachpute, Tumbo, Sally, & Mul, 2009) and thereby could address the issue of relatively higher rural poverty indices. Thus, community led and community owned rainwater harvesting ponds could be promoted, where costs of construction and maintenance of such ponds could be subsidized by the government. Such activities could also generate employment of local populace -- through the construction of and maintenance of ponds

-- who are considered to be least opportune thereby addressing multiple issues and echoes the principles of participatory management which often regarded as the best way to manage natural resources. In the long-run, however, mainstreaming such strategies through policy support will be essential for effective up-scaling. Hence, a comprehensive natural resource management policy could embed a component on rainwater harvesting to ensure effective management. This is especially necessary since upstream rainwater harvesting techniques could have downstream impacts, and as witnessed in India, this has resulted in the destruction of existing upstream water harvesting techniques (Ngigi, 2003). Hence, a comprehensive understanding of both biophysical and socioeconomic implications, as stated above, is necessary.

The way forward:

In the near-term (0-2 years):

1. Identify the most vulnerable and water scarce regions to promote community-led rainwater harvesting ponds
2. Identify the least opportune who could be employed to construct and maintain the ponds – partial employment guarantee for the poor
3. Ensure participatory management of community resources such as ponds
4. Continue to monitor the usage of the ponds, and the quality of water

In the medium-term (2-5 years)

5. Create a comprehensive policy to understand upstream-downstream linkages and promote upscaling

Conclusion

By analysing the current threats to livelihoods in Fiji, this report sets the context for exploring sustainable livelihoods in Fiji. It does this through a series of primary data collection methods that included interviews and community interactions, which was augmented with secondary literature. This exercise had thus helped identify the biodiversity threats that livelihoods currently pose, and understand what could potentially work for Fiji. These potential alternate livelihood options are discussed

in the above section, with an identified way forward that could be used for operationalizing the option.

The report further elaborates on the need for making livelihood planning multistakeholder, and driven through both, bottom-up and top-down processes. Through our interactions it was highlighted that sustainable livelihoods do not necessarily mean reinventing the wheel; it could very well mean “doing things better”. This research builds on this narrative to highlight the need to impart appropriate training to farmers so that the current farm-based livelihoods could be more sustainable. We highlight the importance of organic farming and mixed cropping in building a sustainable farming sector for Fiji. Building on the capitals mentioned in the sustainable livelihoods framework, we identify human capital, specifically knowledge and awareness, as crucial determinants of operationalizing effective sustainable livelihood options in Fiji.

It must also be ensured that a stakeholder mapping exercise is carried out prior to the implementation of the livelihood intervention, wherein all potential stakeholders are identified to enable an iterative learning process that take into account varied viewpoints. Such an exercise would also lead to a better understanding of the interconnectedness amongst communities and enable tapping into the appropriate social capital to further livelihood strategies. For example, if it is found that a women’s group in a particular village is very active, it would be useful to involve them from the beginning in any livelihood strategy that focusses on the women. The importance of such women’s groups, or Self Help Groups as they are known in South Asia, has been witnessed to be very high in promoting livelihood activities across South Asia, and especially India.

It is further important to understand the context within which actions are shaped. Our on-field interactions pointed to an interesting narrative on the success of the Fiji Locally Managed Marine Areas (FLMMA). It was often opined that the success of FLMMA could be attributed to the hybrid formal-informal partnership between governmental and non-governmental stakeholders which could drive action. It is important that such lessons from interventions that are already being implemented be absorbed into future planning around sustainable

livelihoods. This would thus help create an iterative learning loop and learn from a programme/action’s success or failure, and help design future action.

Apart from the on-farm sustainable livelihood options that were mentioned above, this research also identifies certain off-farm livelihoods that could be promoted that could help generate income and conserve biodiversity. However, it is essential that value chains be established for these livelihood options which would thereby address issues pertaining to the intervention’s sustenance. It is also to be noted that livelihood interventions involve considerable community engagement, and would require hand-holding over a period of time usually extending to a few years, when the communities are trained, and assisted through the transition. It is important to thereby understand the considerable resource investment (both human and financial) that is needed to enable such a transition.

Further, by operationalizing these livelihood options, certain targets under the Sustainable Development Goals (SDG) could also be achieved. For example, organic farming would not just meet the economic goals mentioned under the SDGs but also the environmental and social SDGs.

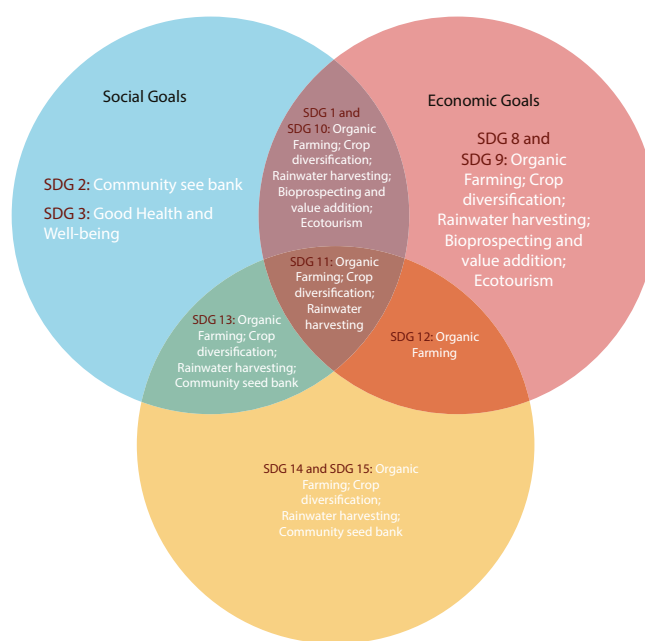


Figure 6: Sustainable livelihoods and SDGs - Interlinkages

The above figure highlights these interlinkages – between livelihood options and SDGs. Certain options/interventions could also have adaptation co-benefits; hence identifying such interventions which could have mutual co-benefits, for sustainable development and climate change adaptation, could lead to greater proliferation of action while meeting multiple developmental goals at the same time. Moreover, such interventions could potentially be funded through international climate funds such as the Global Environment Facility's funds or the Green Climate Fund. It is thus possible to promote sustainable livelihoods at scale if a thriving environment is provided that promotes the ideal conditions mentioned above.

Additionally, sustainable livelihoods could be further promoted through a policy mandate at the federal level. Having an overarching policy that explicitly identifies natural resource conservation and sustainable livelihoods as its goal can help provide specific institutional support for proposed interventions. However, since livelihoods options are themselves cross-cutting and have interlinkages with multiple sectors, sectoral ministries must be made key stakeholders in any such policy formulated.

Works cited

Angelo, C. D., & Wiedenmann, J. (2014). Impacts of nutrient enrichment on coral reefs: new perspectives and implications for coastal management and reef survival. *Current Opinion in Environmental Sustainability*, 7, 82–93.

Bahadur, G. D., & Klaus, S. (2011). Ecotourism benefits and livelihood improvement for sustainable development in the nature conservation areas of Bhutan. *Sustainable Development*, 19(5), 348–358. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=bth&AN=65926112&site=ehost-livefile:///Users/samantha_cheng/Documents/Mendeley Desktop/Gurung, Seeland - 2011 - Ecotourism benefits and livelihood improvement for sustainable development in the nature

Becker, P. (2017). Dark side of development: Modernity, disaster risk and sustainable livelihoods in two coastal communities in Fiji. *Sustainability*, 9(12).

Chambers, R., & Conway, G. (1991). Sustainable rural livelihoods: practical concepts for the 21st century. *IDS Discussion Paper 296*, 296(Brighton: Institute of Development Studies, University of Sussex), 29. Retrieved from <http://opendocs.ids.ac.uk/opendocs/handle/123456789/775>

Daugbjerg, C. (2010). Why Danish Organic Farming Policy has been successful, 3–4.

Department of Agriculture. (2015). Crop and Livestock Production Performance. Retrieved May 6, 2019, from <http://www.agriculture.gov.fj/images/Production Chart.png>

Department of Forests. (n.d.). The State of the World's Forest Genetic Resources: Country Report – Republic of Fiji. *FAO* (Vol. 19).

DFID. (1999). Sustainable Livelihoods Guidance Sheets Framework Introduction Vulnerability Transforming, 26. Retrieved from <http://www.eldis.org/vfile/upload/1/document/0901/section2.pdf%3E>

Dile, Y. T., Karlberg, L., Temesgen, M., & Rockström, J. (2013). The role of water harvesting to achieve sustainable agricultural intensification and resilience against water related shocks in sub-Saharan Africa. *Agriculture, Ecosystems and Environment*, 181(2013), 69–79. Elsevier B.V. Retrieved from <http://dx.doi.org/10.1016/j.agee.2013.09.014>

FAO. (2015). *Global Forest Resources Assessment 2015: Fiji*, 70. Retrieved from <http://www.fao.org/3/a-az212e.pdf>

FAO. (2017). Sustainable livelihood strategies for conservation of biodiversity in Fiji, including potential crops and value adding opportunities in three FPAM.

FAO. (n.d.). FAO, Denmark. Retrieved May 4, 2019a, from <http://www.fao.org/3/y1669e/y1669e07.htm>

FAO. (n.d.). Fiji Agricultural Sector. Retrieved May 6, 2019b, from <http://www.fao.org/3/y4632e/y4632e0d.htm>

Fiji Bureau of Statistics. (2018). Visitor Arrivals Statistics. Retrieved June 7, 2019, from <https://www.statsfiji.gov.fj/statistics/tourism-and-migration-statistics/visitor-arrivals-statistics>

Foley, J. A., Ruth DeFries, Gregory P. Asner, Carol Barford, Gordon Bonan, Stephen R. Carpenter, F. Stuart Chapin, et al. (2005). Global consequences of land use. *Science*, 309(July), 570–574.

Government of Sikkim. (n.d.). State Policy on Organic Farming.

Jairus N. Koki. (2017). Contribution of Ecotourism Towards Sustainable Livelihood of the Communities Living on Wasini Island, Kwale County, Kenya. *J. of Tourism and Hospitality Management*, 5(3), 106–125.

Kalinganire, A., Weber, J. C., Uwamariya, A., & Kone, B. (2009). Improving rural livelihoods through domestication of indigenous fruit trees in the parklands of the Sahel. *Indigenous fruit trees in the tropics: domestication, utilization and commercialization* (pp. 186–203).

Khandekar, N., Gorti, G., Bhadwal, S., & Rihjwani, V. (2019). Perceptions of climate shocks and gender vulnerabilities in the Upper Ganga Basin. *Environmental Development*. Elsevier Ltd. Retrieved from <https://linkinghub.elsevier.com/retrieve/pii/S221146451830246X>

Kiper, T. (2013). Role of Ecotourism in Sustainable Development. *Advances in Landscape Architecture*. Retrieved from <http://www.intechopen.com/books/advances-in-landscape-architecture/role-of-ecotourism-in-sustainable-development>

- Klein, R. J. T., Eriksen, S. E. H., Nss, L. O., Hammill, A., Tanner, T. M., Robledo, C., & O'Brien, K. L. (2007). Portfolio screening to support the mainstreaming of adaptation to climate change into development assistance BT - Climate or Development. *Climatic Change*, 84(1), 23–44. Retrieved from <http://dx.doi.org/10.1007/s10584-007-9268-x>
- Kobell, R., Horton, T., Simpson, T., & Summers, R. M. (2015). The Chesapeake Bay and Agricultural Pollution.
- Leslie, A., & Tuinivanua, O. (2010). Fiji Forestry Outlook Study. *Forestry*, 1–24.
- Mango, N., Makate, C., Mapemba, L., & Sopo, M. (2018). The role of crop diversification in improving household food security in central Malawi. *Agriculture and Food Security*, 7(1), 1–10. *BioMed Central*. Retrieved from <https://doi.org/10.1186/s40066-018-0160-x>
- Marschke, M., & Sinclair, A. J. (2009). Learning for sustainability: Participatory resource management in Cambodian fishing villages. *Journal of Environmental Management*, 90(1), 206–216. Elsevier Ltd. Retrieved from <http://dx.doi.org/10.1016/j.jenvman.2007.08.012>
- McCord, P. F., Cox, M., Schmitt-Harsh, M., & Evans, T. (2015). Crop diversification as a smallholder livelihood strategy within semi-arid agricultural systems near Mount Kenya. *Land Use Policy*, 42(2015), 738–750. Elsevier Ltd. Retrieved from <http://dx.doi.org/10.1016/j.landusepol.2014.10.012>
- Ministry for Food Agriculture and Fisheries. (n.d.). Organic Action Plan for Denmark. Retrieved from [https://www.foedevarestyrelsen.dk/english/SiteCollectionDocuments/Kemi og foedevarekvalitet/Oekologiplan Danmark_English_Print.pdf](https://www.foedevarestyrelsen.dk/english/SiteCollectionDocuments/Kemi%20og%20foedevarekvalitet/Oekologiplan%20Danmark_English_Print.pdf)
- Mondino, E., & Beery, T. (2019). Ecotourism as a learning tool for sustainable development. The case of Monviso Transboundary Biosphere Reserve, Italy. *Journal of Ecotourism*, 18(2), 107–121. Taylor & Francis. Retrieved from <https://doi.org/10.1080/14724049.2018.1462371>
- Mutekwa, V., & Kusangaya, S. (2006). Contribution of rainwater harvesting technologies to rural livelihoods in Zimbabwe: The case of Ngundu ward in Chivi District. *Water SA*, 32(3), 437–444.
- Negi, V. S., Maikhuri, R. K., & Rawat, L. S. (2011). Non-timber forest products (NTFPs): A viable option for biodiversity conservation and livelihood enhancement in central Himalaya. *Biodiversity and Conservation*, 20(3), 545–559.
- Negi, V. S., Maikhuri, R. K., Rawat, L. S., & Chandra, A. (2013). Bioprospecting of *Rhododendron arboreum* for Livelihood Enhancement in Central Himalaya, India. *Environment & We An International Journal of Science & Technology*.
- Ngigi, S. N. (2003). What is the limit of up-scaling rainwater harvesting in a river basin? *Physics and Chemistry of the Earth*, 28(20–27), 943–956.
- Pachpute, J. S., Tumbo, S. D., Sally, H., & Mul, M. L. (2009). Sustainability of rainwater harvesting systems in rural catchment of Sub-Saharan Africa. *Water Resources Management*, 23(13), 2815–2839.
- Rudel, T. K., Kwon, O., Paul, B. K., Boval, M., Rao, I. M., Burbano, D., McGroddy, M., et al. (2016). Do Smallholder, Mixed Crop-Livestock Livelihoods Encourage Sustainable Agricultural Practices? A Meta-Analysis. *Land*.
- Schafer, J. (2002). Supporting Livelihoods in Situations of Chronic Conflict and Political Instability: Overview of Conceptual Issues. ODI Working Paper.
- Shah, S., Moroca, A., & Bhat, J. A. (2018). Neo-traditional approaches for ensuring food security in Fiji Islands. *Environmental Development*, 28(August 2017), 83–100. Elsevier Ltd. Retrieved from <https://doi.org/10.1016/j.envdev.2018.11.001>
- Sharma, L., Pradhan, B., & Bhutia, K. D. (2017). Farmer 's Perceived Problems and Constraints for Organic Vegetable Production in Sikkim. *Indian Res. J. Ext. Edu.*, 17(1).
- Singh, M., Guleria, N., Rao, E. V. S. P., & Goswami, P. (2011). A Strategy for Sustainable Carbon Sequestration using Vetiver (*Vetiveria zizanioides* (L.)): A Quantitative Assessment over India. Project Document CM PD-1101, CSIR Centre for Mathematical Modelling and Computer Simulation, India, (July).
- Singh, R. B. (2000). Environmental consequences of agricultural development: A case study from the green revolution state of Haryana, India. *Agriculture, Ecosystems and Environment*, 82(1–3), 97–103.
- Songok, C. K., Kimeu, P., Kamunge, J., Ngumbi, R., Chammah, L., Adiema, C., & Omondi, C. (2018). Lessons Learned in the Replication and Scaling-up of Rainwater Harvesting Technologies in Arid and Semi-arid Areas: A Case Study of Kilifi County, Kenya. *Rainwater-Smart Agriculture in Arid and Semi-Arid Areas* (pp. 379–392). Cham: Springer International Publishing. Retrieved June 5, 2019, from http://link.springer.com/10.1007/978-3-319-66239-8_20
- UNDP-GEF. (2011). Planting vetiver all together to adapt to climate change in Morocco! Retrieved from https://www.adaptation-undp.org/sites/default/files/downloads/article_cba_morocco_-_adeline_aubry_04_2011.pdf
- UNDP, & World Bank Group. (2016). Transitioning from the MDGs to the SDGs, 1–176. Retrieved from <http://www.undp.org/content/undp/en/home/librarypage/sustainable-development-goals/transitioning-from-the-mdgs-to-the-sdgs.html>
- United Nations. (1972). United Nations Conference on the Human Environment: Stockholm Declaration. Retrieved from http://www.un.org/ga/search/view_doc.asp?symbol=A/CONF.48/14/REV.1
- US Department of Commerce. (n.d.). Fiji - Agricultural Sector. Retrieved May 6, 2019, from <https://www.export.gov/article?id=Fiji-Agricultural-Sector>
- Waterloo, M. J., Schellekens, J., Bruijnzeel, L. A., & Rawaqa, T. (2007). Changes in catchment runoff after harvesting and

burning of a *Pinus caribaea* plantation in Viti Levu, Fiji. *Forest Ecology and Management*, 251(1–2), 31–44.

Waterloo, Maarten J. (2002). Water and Nutrient Dynamics of *Pinus caribaea* Plantation Forests on Former Grassland Soils in Southwest Viti Levu, Fiji.

Wheeler, S. (2011). Review of Organic Farming Policy in Australia: Time to Wipe the Slate Clean? *Journal of Sustainable Agriculture*, 35(8), 885–913.

Willer, H., & Lernoud, J. (Eds.). (2018). *The World of Organic Agriculture -- Statistics and Emerging Trends 2018*. Retrieved from <https://shop.fibl.org/CHde/mwdownloads/download/link/id/1093/?ref=1>

World Bank Group. (2018). *Poverty and Equity Brief: Fiji*.

World Bank Group. (2019). *World Bank Climate Change Knowledge Portal | for global climate data and information!* Retrieved from <https://climateknowledgeportal.worldbank.org/country/fiji/climate-data-historical>

World Integrated Trade Solution. (2017). *Fiji Export Data*. Retrieved April 22, 2019, from https://wits.worldbank.org/CountryProfile/en/Country/FJI/Year/2017/TradeFlow/Export/Partner/by-country/Product/06-15_Vegetable



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Tel: (+91 11) 2468 2100
Fax: (+91 11) 2468 2144, 2468 2145
Web: www.teriin.org