

Project Objective – Consultancy –Technical Specialist ABS (Fiji)

Outcome 1. Discovering active compounds for pharmaceutical and agrochemical uses from organisms within the ecosystems of Fiji.

1. Bioprospecting in Fiji will be strengthened under this Component. The transfer of state of the art technology and knowledge building will be based on demonstration and pilot sites and bioprospecting activities closely involving communities with oversight by the Ministry of I'Taukei to ensure cultural mapping and customary processes is not compromised. The practical work will focus on marine ecosystems and give support to describing, preserving, and exploring seaweeds and deep sea microbe biodiversity for potential active compounds for eventual pharmaceutical or agro-chemical use. There will be the screening of compounds that are active against dengue, cancer, TB, drug-resistant microbes, or that show promise in psychoactive screening from marine areas throughout Fiji.
2. Under the guidance of the Department of Environment and the Ministry of I'Taukei, the USP will lead the project activities under this Outcome. Initially it will assist with the set up the database with Department of Environment on all organisms tested to date by all stakeholders. They will organize collections and do extraction and initial screening of bioactivity for both marine invertebrates and bacteria and fungi. The on-the-ground activities will be based on trial ABS agreements containing mutually agreed terms, with application of those terms. Active extract results will be then discussed with Georgia Tech (for marine invertebrates) and Scripps (for microorganisms). Based on this, a decision will be made on which samples will be further studied by the partner institutions and which will be studied by USP or other partners such as the Fiji National University and Douglas Pharmaceuticals.
3. Under existing agreements with the USP, each of the three institutions performs isolation and identification of potential active compounds. Final arrangements with research and pharmaceutical companies for the project will be as agreed between the DOE, the USP and the Ministry of I'Taukei. At the USP research will be initially done by Liquid Chromatography/Mass Spectrometry which will indicate which compounds are already known. For potentially new compounds the structural information will be obtained from GIT or Scripps. GIT and Scripps also perform more advanced bioactivity tests and liaise with other project partners that may include Douglas Pharmaceuticals (Nadi, Fiji) or the University of California at Riverside for anti-malarial testing and anti-cancer testing (undertaken at BMS). The GEF project will add psychoactivity testing with University of North Carolina, based on mutually agreed terms. Once engaged research partners will analyse further anything that has an attractive cancer or disease screen profile. Biological samples showing other type of activity will be tested by partners that have the relevant expertise. The focus of the project will be to build on the baseline work being done by the present ICBG partnership but with focus on new collections and some additional bioactivity tests which are not currently covered under the ICBG agreement.
4. The primary focus of the project will remain on less explored seaweeds and deep-water marine microbes, and will use ecological and evolutionary insights to increase the production of bioactive metabolites that are missed by traditional approaches. These would include chemicals that are activated or induced as defensive metabolites when first challenged with damage, consumer attack, or microbial attack. The biological resources will be obtained from areas that communities have an interest in conserving; are currently subject to locally-managed marine areas (i.e. status as a Fiji Local Marine Managed Area - FLMMA) or where communities have expressed an interest in establishing a LMMA. Prospect sites include locations on Viti Levu, Taveuni, Kadavu, and the Mamanuca, Yasawa, and Lau Island groups.

The project will also support the establishment of a screening facility at the national level in Fiji under the project and enhance the efficiency of local based extraction and purification processes.

Output 1.1: Scientific surveys undertaken on bio-chemicals from the coastal environs of Fiji.

5. The practical work will focus on exploring marine ecosystems and in particular seaweeds and deep sea-microbes. It will involve working with communities to survey, collect samples, describe and preserve them, as well as record information that will assist with biodiscovery and longer term management of the outcomes of research. Capacity building initiatives and provision of user pay (or PES) benefits to the targeted communities will be as guided by the prototype or interim agreements generated under Output 1.1.

6. The microbial samples collected by the USP and ICBG partners with the involvement of local communities and representatives from the Government national agencies may include host plants, coral or marine invertebrates – where the microbes show signs of host reliance.

Output 1.2: Screening facility for selecting and storing active compounds is established at the national level.

7. The credibility of Fiji's ABS medicinal and agro-chemical bio-discovery project and the maximization of community and broader government awareness of the biodiversity conservation benefits is contingent on there being an ability to demonstrate national level capacity to identify, purify and characterize potential active compounds. A screening facility is needed at the national level and should have the capacity to also facilitate storage of active compounds and host materials being researched.

8. The project will aid the transfer of state of the art technology (hardware, software, and know how) for bioprospecting to Fiji with assistance of the private sector partners. Hardware, software and knowhow will be transferred to the national level with the screening facility housed within a national institute or the Fiji National University. Dependent on the level of investment garnished from the private sector during the project life, the USP may house the technology until suitable accommodation is found at the national level.

Output 1.3: Capacities for state of the art analytical chemical techniques, disease bioassays, data handling and collection, culture and long-term storage of samples installed in Fijian institutions

9. This output will capitalize on the technology transfer in Output 1.3, being the set-up of the screening facility in-country. USP will be contracted to assist staff from relevant national agencies, national research institutes like FNU and potential local partners such as Douglas Pharmaceuticals to use the facility and technologies to undertake analytical chemical analysis, assemble disease bioassays, organize and manage data, to develop cultures and to manage long-term storage of samples. Some initial technical training may use the USP Liquid Chromatography/Mass Spectrometry capabilities. For potentially new compounds the structural information provided by the ICBG partners will be used to guide more advanced bioactivity tests. The activities will assist with the set-up of a database within the Department of Environment.

10. Within the life of the project it is expected that staff within national institutions will have the ability to organize collections and do extraction and initial screening of bioactivity for both marine invertebrates and bacteria and fungi and eventually be able to perform isolation and identification of potential active compounds. Staff will also be involved in negotiations

with off-shore partners on technical matters, approaches and methods; how to perform more advanced bioactivity tests; how to manage research partner's analytic including understanding disease screening profiles. Biological samples showing other type of activity will be tested by partners that have the relevant expertise.

Output 1.4: In-country technology and competencies applied to identify 30 active compounds which are purified and their structure elucidated.

11. The competencies achieved through training (Output 1.4) will be applied with the Bio-discovery technology to identify 30 active compounds which will be purified and their structure elucidated. Once at least 30 highly active compounds are identified this will form the basis for the identification of at least one lead compound to be considered for the development process for agrochemical and pharmaceutical products for commercial purposes

12. The ICBG partners will assist USP with this work as microbes and host materials are cultured to provide sufficient mass to make extracts that can be tested in bioassays. Where significant activity is discovered, the samples will be re-cultured in larger quantities to allow bioassay-guided fractionation, purification and structure elucidation of the active compound. With the input from the various partners, using technology at the national level with competencies gained by local staff, it is expected that it will be possible to purify 30 active compounds. The evaluation of these will identify the best candidates for the next stages of research.

13. GEF resources will be used to evaluate bioassays for activity against bacterial infections, cancer as well as diseases such as dengue, malaria, leishmaniasis, tuberculosis, HIV-AIDS among others. Tests will also be performed to consider agriculture pests and diseases. GEF resources will be used to send samples to private sector partners to the project.

Output 1.5: At least one lead compound is identified for commercial purposes.

14. For the 30 active compounds elucidated, the ICBG partners will be involved in performing more advanced bioactivity tests. They may in turn liaise with potential future private partners for advanced testing – and this will in turn need to be accommodated by the package of interim agreements agreed in Output 1.1. Once engaged these private research partners will analyse further anything that has an attractive cancer or disease screen profile. The aim will be to identify at least one lead compound during the life of the project.