

Hi Walt,

We are impressed with your experience in building your business and the success with the coral and tropical fish. You are in the process of creating your nonprofit. So, the actual creation of the nonprofit is a prerequisite for any involvement. **We are interested in coral farming only if it is in areas that are designated as "No Catch" zones and the Coral Ark project**, and have the following questions (listed in bold).

Dear (Name withheld).....

To comment on your statement above (in red) we must have a clear and uniform comprehension of what an MPA (Marine Protected Area) or "No Catch Zone" is and how it serves our agenda.

The universally accepted definition of an MPA is as follows:

an MPA is generally considered temporally and are geographically defined areas that afford natural resources greater protection than is afforded in the rest of an area as defined in relation to fisheries management (e.g. the fishery, ecosystem or zone constituting the management unit), i.e. a no-take area to protect spawning of a certain fish species targeted by a fishery or an area with specific gear prohibitions.

Although "no catch zones" are generally a good idea (that I support) it does have some limitations that could limit the project. Those limitations could be:

- A selected area might not have an established (or published) MPA in place but the area is identified as a good candidate for a reef rehabilitation effort.
- In some cases the MPA might not be in any immediate need of a reef restoration program whereas nearby or adjacent areas would be a more suitable candidate.
- In Fiji MPA areas can move or rotate as often as every two years in order to allow diversity to establish over a wider zone within the Qoliqoli. A Qoliqoli is the exclusive designated fishing rights of a coastal village.
- Corals are not a target item to harvest by local villagers either for subsistence fishing or for any commercial purposes. This fact automatically renders them items of no interest to local fisherman.
- The village council can easily be convinced to monitor any newly planted area to establish a "Tabu area" without the need to register an MPA with Fisheries. Qoliqoli's are self-monitored by the village chiefs and are rarely (if ever) infringed upon between villages.

Therefore it would be our protocol that if we engaged any village to plant coral for the ADE project that a contractual agreement would be signed between the directors of ADE and the village committee that would state the following:

"It is agreed that during the time of this contract (three years) that the area designated as the coral farm be declared a Tabu Area and that no fishing activity of any nature, both from within the village or outside interest, would be allowed."

This, of course, would mean that no fishing or harvesting of any kind would take place as long as the contract is valid. The justification to the village to keep their

own people away from that immediate area is the money earned from the coral farming activities.

1. The budget of the Coral Propagation and Coral Ark projects is still not fully formed. It requires 3 boats. It would be interesting to see what could be achieved with 1 boat:

- Fiji has over 18,376 square kilometers of land spread over 337 islands of which about 129 are inhabited.
- The total coastline of Fiji consists of over 5,000 linear kilometers.
- The total economic fishing zone of Fiji (water area) is 1,200,000 square kilometers.
- The total mass of Fiji's coral reefs is roughly 10,000 square kilometers and it is estimated that approx. 68% of those reefs are currently at risk.
- There are four geographical areas in Fiji where a study such as this could be considered scientifically and environmentally beneficial. These areas are eastern Viti Levu, Western Viti Levu, Northern division both east and west in Vanua Levu and the Lau Group in the far eastern division.

I would strongly recommend that three boats service the first three areas mentioned above and leave the Lau Group for future expansion based on the success of the project in both Viti Levu and Vanua Levu.

One boat would be inefficient and measurable results would be limited to one small geographical area. Time simply does not allow for a coordinated effort if only one boat was available for the entire project. In addition to this, if only one boat was used it would become necessary to utilize a much larger vessel to reach these areas with higher operating cost than three regionally positioned boats working daily in one geographical area.

- Fiji has over 467 species of mollusk, 298 species of hard coral and about 2,000 species of reef fish with new species being discovered constantly.
- It is estimated that Fiji could hold as many as 600 species of hard coral but comprehensive surveys have never been possible due to limited funding.
- There has been one comprehensive survey completed on the Great Sea Reef in 2004 sponsored in part by the WWF (World Wildlife Foundation) but it was mostly to identify the fish and fauna populations with brief mention of coral covers. However the survey was completed in 12 days and our proposal would provide an extensive opportunity spanning three years.
- Two members of this team would be available for our study. One of them (Ed Lovell) has already agreed to sit on our Board of Directors. The other member (Helen Sykes) is familiar with our goals and has often offered her support when needed. Both scientist were key organizers of the WWF team and are available to assist ADE when we are ready.

2. How many villages (15?) and what is the square miles or KM of area that would be protected? Would villages agree to make these areas 'No catch' zones?

By engaging a total of 45 villages I would estimate that about one half square kilometer would be planted in each location. Corals can reproduce asexually and sexually. In asexual reproduction, new clonal polyps bud off from parent polyps to expand or begin new colonies. In this case the natural settlement would be localized to the immediate surrounding area of the mother colony.

However, about three-quarters of all stony corals produce male and/or female gametes. Most of these species utilize broadcast spawning methods, releasing massive numbers of eggs and sperm into the water to distribute their offspring over a broad geographic area making settlement widespread and benefiting larger zones of the environment with increased habitat. This increase in surrounding habit can be traced (theoretically) by utilizing “specie specific” colonies in each planting area.

In the short term the new spawns could conceivably cover approx. 1.5% of Fiji’s total reef system but in the long term it must be recognized that as these corals continue to reproduce habitat would increase exponentially. For this reason limiting the project to No Take Zones is impractical although most (if not all) new projects could originate in the designated Tabu area that the village has designated in coordination with the project. It is also important to note that these MPA zones move or rotate from time to time in order to have a control for scientific comparison as diversity changes while other open areas have been exposed to overfishing pressure due to the closure of one area.

The other fact to remember is that although MPA’s do have an effect on fish populations when it comes to territorial reef fish that only migrate one or two kilometers up and down the reef they really have little to do with protecting coral cover. Fiji islanders have little use for live or dead coral and are not interested in harvesting it. There is no curio trade in Fiji and they do not mine coral for cement production in these villages. There is a small trade (miniscule) in large pieces of massive (boulder type) corals for limestone to use in septic tanks but that has just been outlawed in Fiji. MPA areas can be the first priority but it will largely depend on what areas need the restoration efforts the most.

3. If you broke down the costs per square mile or kilometer, for protection, what would these be?

This is a difficult question to answer at this point of project development. Especially if you consider the fact that we are still discussing the overall size of the project and level of philanthropic involvement.

There are two areas of investment to consider (1) initial investment in infrastructure, mainly boat or boats (2) ongoing annual expenses such as purchases of support items, salaries, stakeholder involvement, village support etc.

One of the major expenses in this project is the boats and motors. However, once the boats have been purchased they will only appear on the initial costing

spreadsheet in the first year and other expenses will be a constant, although graduating, as the project expands over a four year period.

4. What methods would you use to verify and monitor protection? **In addition to routine monitoring, I'd like to see some scientific verification uploaded to a website so that I, as a coral reef investor, could actually see the progress on the area being protected.** My preference is to see expansion of reef adjacent or in the Great Sea Reef, with No Catch of any wildlife zoned.

Our plan is to have continuous monitoring and data recording. Three members of our team (designated, not appointed yet) are highly experienced in these types of studies and recording the number of species planted and the growth rates of both the individual species as well as the overall reef by use of transects and video will be part of the ongoing project. A portion of this work can be carried out by graduate students of the University of the South Pacific. The USP has approached me on many occasions to help them provide viable projects that the students can participate in to further their studies and develop thesis for their graduate work. This project will have a perfect fit.

We are already experienced in keeping accurate records of our present coral farming efforts and the same type of data will be collected and recorded (on a higher scientific level) in this project.

It is our goal to make this data available to science in a useful way to advance our understanding of coral resilience, growth rates, natural settlement, coral reef recovery rates and evolution in order to help (if possible) mitigate the effects of global warming and acidification.

This will be the largest coral reef restoration project of its kind in the world and the knowledge we hope to gain through our study of the results (in many areas of environmental science) will give us a measurable and meaningful platform in which to base many theoretical hypotheses that raise questions today.

Our website for “Aquaculture Development for the Environment” will carry the information about our project as well as monthly uploads of the progress we are making and report on any new findings based on previous theory.

5. How is the Coral Farming project related to the Coral Ark project - where would you collect and house the specimens to be kept for posterity? My partner thought the specimens would be stored in the ocean, and I thought they would be stored on land. If on land, what is the facility cost for keeping these specimens alive?

Since we last met this question has been heavily on my mind and within the thought process of how to economically (and realistically) come up with a plan that we could put into place with little or no investment to immediately activate the “Coral Ark” part of this project. I will explain

I realized that through my many years of exposure to most of the public aquariums in the world I have developed a network of “friends” in this industry. In fact, two of the most influential people in this industry will be asked to participate on the Board of Directors (either as advisory members or directors) and their network is highly respected.

Through this network we will be approaching several Public Aquariums (to start) that would agree to support and house these corals in a special exhibit set aside as “The Coral Ark of Fiji Waters” (or something like that) that would amount to a universal effort to protect and grow these species for posterity.

The coral reefs of Fiji make up just over 9% of the total coral reef coverage in the South Pacific and 3.5% of the world’s coral reef. For the last two decades, Indo-Pacific reefs have shrunk by 1 percent each year—a loss equivalent to nearly 600 square miles (1,553 square kilometers). That makes the rate of reef loss about twice the rate of tropical rain forest loss.

One of the significant things to remember about this loss is the fact that, as in the rainforest, medical science is constantly finding new properties derived from the coral reef ecosystem.

In a report from NOAA it pointed out that recently science has discovered new compounds derived from a sea sponge and corals. One compound eats away at the shield bacteria use to protect themselves from antibiotics. The second discovery was compounds that fight some of the worst infectious bacterial strains.

Besides being the source of potentially useful chemical compounds, the porous limestone skeleton of corals has been tested as bone grafts in humans. Pieces of coral set into a fracture act as a scaffold around which the healing can take place. The implant eventually disappears, absorbed by the new growth of bone. Rates of rejection are much lower than with artificial grafting materials.

It should be noted that, aside from the compounds mentioned here, there are likely many other compounds under development which have not yet been disclosed to the wider public. It is safe to say that the published research is only the tip of the iceberg when it comes to the pharmaceutical possibilities presented by compounds derived from creatures found in coral ecosystems, including the corals themselves. Thus, it is nearly impossible to predict what the future economic benefits of bio prospecting will be, as more potentially valuable medical compounds are isolated from organisms found in coral ecosystems. This aspect of reef value was not incorporated into the estimated \$5.5 billion total global value of coral reef biodiversity, but is certainly both a consideration for the economic value of coral reefs and the costs to society if reefs are lost.

In our Coral Ark portion of this project it is reasonable to assume that, through our unique association and working relationships, almost all of the world’s public aquariums would be eager to participate. Their controlled environments would be

the perfect place to store all the species of Fiji and make them available to all science. If we were to select certain species for each participating aquarium they could easily reproduce the perfect parameters to ensure the long term survival of the species in their care.

In one of your earlier questions to me about the ROI of this project I now have a more realistic approach that the “Coral Ark” could be sponsored by the many participating Aquariums and/or their sponsoring organizations. Once the corals have been farmed, identified and isolated on the farm sites we could then approach the Public Aquarium community with wide range appeal to education, awareness, conservation, ecology and scientific research with a very unique display for the future of humanity.

In conclusion I would like to add that this project has the potential to:

- Develop local economic incentives that support conservation.
- Strengthen capacity within provinces to manage natural resources.
- Promote community-driven conservation planning and management.
- Assess and mitigate environmental impacts on coral reefs and coral.
- Promote community-driven conservation planning and management through environmental awareness workshops at village level.
- Mitigate poverty in outlying villages where little or no economic opportunities exist.
- Establish long-term monitoring for reef health and diversity.
- Assemble the largest coral reef data base on a multitude of baselines for scientific research and a better understanding of our coral reef ecosystems.

I hope this information is helpful in assessing our goals as a team and we appreciate your interest in our project so far.

My Kindest regards,
Walt Smith