



PHOTO

ALBUM

COASTAL COMMUNITY RESOURCE CENTER
TIWOHO VILLAGE O NORTH SULAWESI O INDONESIA

Facilitated by:

*Community of Tiwoho
Mangrove Action Project
Yayasan Akar Rumput Laut
Yayasan KELOLA*

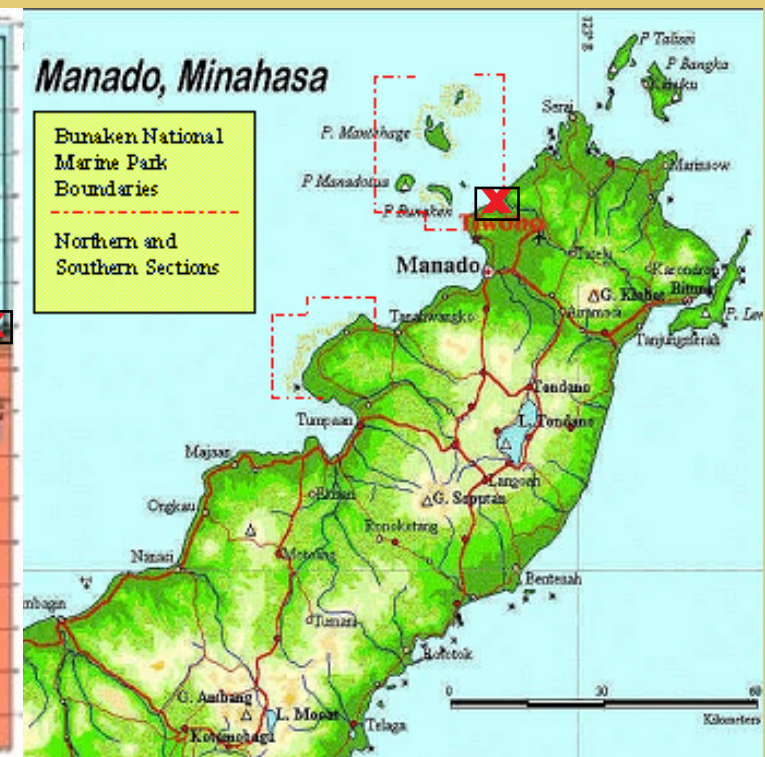
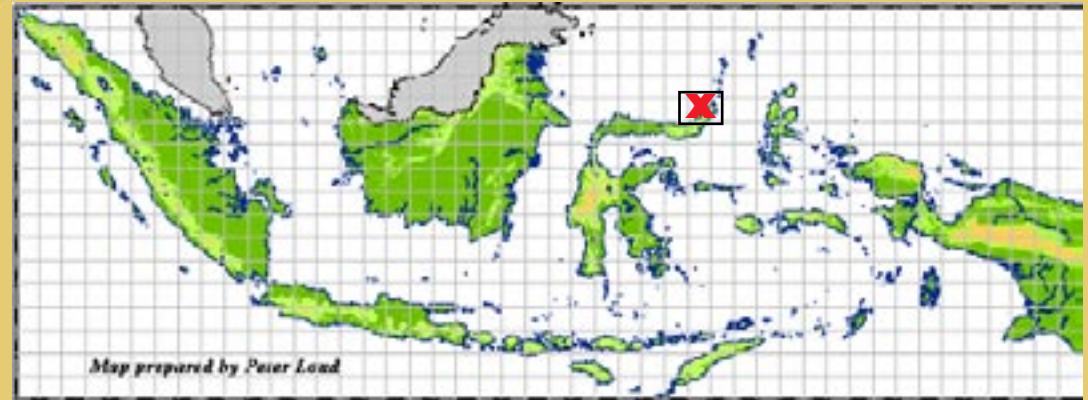
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LOCATION: TIWOHO VILLAGE BUNAKEN NATIONAL PARK

*The village of Tiwoho is located in the Northern section of Bunaken National Marine Park, in the regency of Wori, province of North Sulawesi, Indonesia. Tiwoho is a twenty-minute boat ride from Bunaken Island and a 45-minute drive from Manado, the capital of North Sulawesi. Bunaken National Park has gained a worldwide reputation for its coastal ecosystems, especially its coral reefs due to their amazing richness and diversity. In the mangrove forest we find 37 species of true mangroves including old growth *Sonneratia alba*, at 40 meters plus one of the world's tallest mangrove trees. The mangrove forest is also inhabited by rare mammals such as the cus-cus and tarsier.*



TIWOHO VILLAGE

The villagers of Tiwoho are an even mixture of fisherfolk and farmers, Muslims and Christians, the people are hard-working, eager to learn, fun-loving, and the most gracious of hosts. Their village boasts every type of tropical environment imaginable, mangrove forests, coral reefs, seagrass beds, mountains, tropical rainforest, farmland, & waterfalls. An ideal setting for an education center.



Clockwise from top left: 1) traditional "cakalele" dance, 2) sky blue water and reef walls teeming with fish are a trademark of Bunaken National Park, 3) traditional kite fishing using a spiders web for bait (no hook), 4) traditional boat called a londe, 5) The tarsier is an occasional resident of the area's mangroves 6) MAP staff Ben Brown teaching the use of a Thai mangrove crab trap to a women's group.



USING LOCAL MATERIALS

It was the intent of the project to utilize locally available, renewable building materials. We didn't always succeed, as local builders are overly reliant on steel reinforced cement, but we did use our fair share of local materials such as; coconut wood, bamboo, locally made pozzolanic brick, and roofing tiles from thatched Nypah and Sago palm leaves. By the end of the project, we did succeed in re-introducing the local community to the treatment and use of bamboo as a strong and sustainable natural resource.



Clockwise from bottom left: 1 & 2) leaves of the Nypah palm being collected and turned into thatch roofing tiles. 3) delivery of bamboo headed toward the treatment center, 4) the CORAL library is made of coconut posts, bamboo walls and bamboo roof lattice covered with nypah thatch roof.



INITIAL CONSTRUCTION



MAKING PROGRESS



FINISHINGS



Clockwise from top left:

1) front view showing library and plenary room on top floor, office, kitchen and lobby on lower floor. Foreground depicts the pottery shed for improved cookstove production. 2) View from the ocean showing auditorium and classrooms, 3) The Mangrove Auditorium has a capacity of 150 people and commands a view of the village, mangrove and ocean.



FINISHINGS

*Clockwise from top right:
1) Outer view of the CORAL Library,
donated by the Coral Reef Alliance,
2 & 3) Inside the library, comfortable bamboo seating
for reading, and a variety of materials relevant to
coastal resource management and the environment.
4) A view from the library's balcony of the CCRC grounds
and various appropriate technology demonstrations; (left)
Pottery shed for making improved cookstoves and clay
handicrafts, (front-right) Pottery Kiln, (back-right) the roof
of the bamboo treatment facility.*



BUILDING WITH BAMBOO



Clockwise from left:
1) Day 25 of the bamboo furniture building workshop, preparing for the exhibition, 2) building a gazebo on top of the septic tanks - 4 of these designs have sold so far to dive resorts, 3) the bamboo treatment center uses the vertical soak diffusion method (see www.bamboocentral.org), 4) punching the internodes of the bamboo before treatment, 5) half of the furniture produced during the workshop was sold at an exhibition. the other half remains at the CCRC which functions as a showroom.



IMPROVED COOKSTOVES

The Indonesian Cookstove Network (JKTI) along with MAP and Yayasan KELOLA co-hosted a week long workshop on the building, use and commercialization of fuel-efficient cookstoves as well as improved kitchen design. Resultantly two cookstove groups have been formed in Tiwoko, which produce two improved cookstoves for each member s household per week.

*Clockwise
from upper left: 1)
facilitation of the im-
proved cookstove workshop
took place in the main office of
the CCRC, 2) Ibu Yemi making a
one hole tasir stove which saves 33%
of the fuel used by traditional cook-
stoves in the village, 3) the group meets
once or twice a week to make improved
cookstoves for all of its members. Af-
ter several months 48 stoves have been
built in the village, each saving about
800 kg of charcoal per year, for
equivalent to 113 hectares of man-
groves 4) team building activity;
stamping on the clay and rice
husks to achieve the right
consistency.*



IMPROVED COOKSTOVES

Several of the villagers have gone on to form a small cooperative that produces pottery cookstoves on a commercial scale. These stoves will be sold in neighboring villages and in Manado, resulting in added income for Tiwoho villagers and more efficient fuel consumption (less use of biomass) by consumers. The CCRC also boasts an improved cookstove demonstration area, complete with a large stove for producing Nypah Palm sugar.



WASTEWATER GARDENS™

Clockwise from Top Left;

1) Emerald Starr of Planetary Coral Reef Foundation taking measurements with local construction team, 2) septic tank and two garden cells cemented and ready for the water seal test, 3) 30 species of mangroves trees and associates were hand raised in a nursery at the CCRC The Wastewater Gardens will act as a small arboretum of local mangrove biodiversity. 4) four local dive resorts installed WWG's after learning about the CCRC's system, pictured is Lumba Lumba resort 5) planted with mangroves and ready for treatment, WWG's remove 99% of fecal coliform bacteria, and 85% of PO₄ and 80% of NO₃, 6) Planting the WWG together with local villagers.

For more info on WWG's see: www.pcrf.org



NYPAH PALM DEMO

A group of school-aged children financially unable to attend school are studying about nypah palm as an educational activity and also to a source of sustainable income. The group leader, Ratna, is doing her undergraduate thesis on the collection and processing of nypah palm sap.



Clockwise from Top Left;

1) Examining sago palm, a terrestrial relative of the nypah palm, 2) In the class-room learning the steps of nypah sap extraction, 3) Heading to the nypah forest, 4) Products like nypah honey and vinegar are expected to have a high local demand, 5) Beating the inflouresence (fruit stalk) for 40 days to loosen the flow of nypah sap.

FISH SMOKEHOUSE

*Counter-clockwise from top right;
1) Traditional fish smoking methods in Tiwoho
burn fuel-wood inefficiently, and allow the
majority of smoke to escape (causing a health concern) before
effectively curing the fish. 2) Bamboo furniture maker (Pak
Kamal) donating time to construct a fish smokehouse, 3) A used
drum was cut open, cleaned and buried to serve as a firebox,
4) The complete smokehouse built with bamboo, nypah
thatch, and sheet metal will smoke fish more
efficiently and result in a higher quality
product with a longer shelf life.*



INNOVATIONS



*Clockwise from Top Left,
1) The bamboo furniture makers have built their own treatment facilities on a smaller scale and closer to home, 2) the bamboo group has also applied to the county government for funds to create small-scale mangrove crab fattening pens. The outcomes are uncertain, but the new spirit of trial and error amongst the villagers is a positive change in and of itself. 3) Another Edison? Pak Kadir's brand new bamboo lamp.*



INNOVATIONS



Clockwise from top Left: New fish smokehouse with clay firebox; new improved kiln for mass production of pottery cookstoves; spiced dried fish recipe learned during study tour to Kalimantan; new pottery cookstove design.

EDUCATION PROGRAMS



*Clockwise from
Top Left:
Virgin Coconut Oil
being made; presentation
to women's group about
virgin coconut oil production
and it's health benefits;
youth group makes and
markets banana chips to
add value to locally grown
bananas; various cakes
made from Avicennia
mangroves for local
consumption and
commerical production.*



EDUCATION PROGRAMS

July 23rd, 2004 marked "National Children's Day" in Indonesia. Yayasan KELOLA along with MAP hosted a mangrove planting event with 60 local elementary school children, teachers and several students from the University of Sam Ratulangi's Marine Science Department. A lesson took place in the Mangrove Auditorium (right) before the group headed down to a nearby abandoned shrimp pond. Four hundred seedlings prepared by the children several months before were planted. 400 mangrove seedlings were planted of four different species selected for their appropriateness at this specific planting site.

