

**MINE REHABILITATION PRACTICES
OF RIO TUBA NICKEL MINING
CORPORATION**

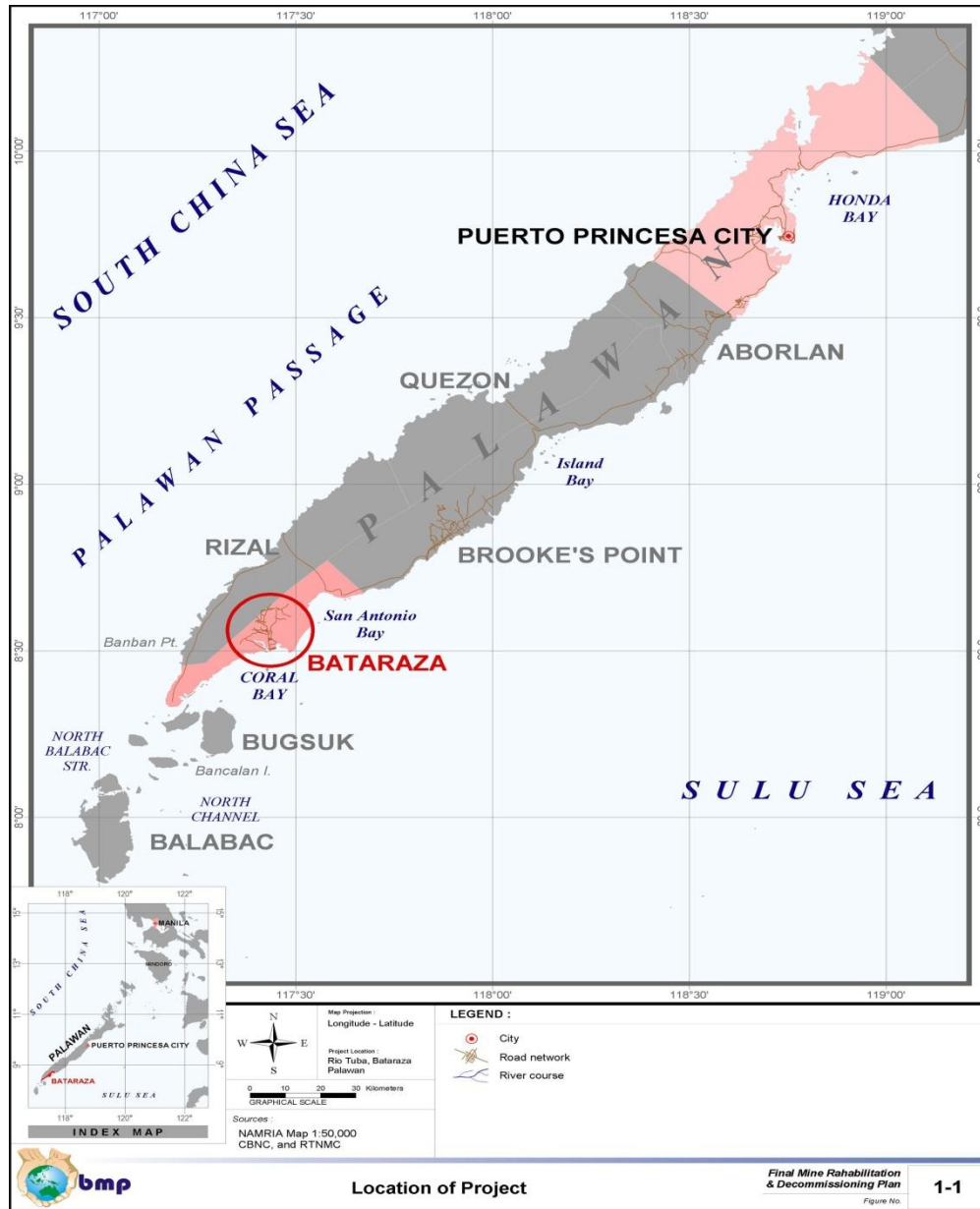


RIO TUBA NICKEL MINING CORPORATION

Rio Tuba, Bataraza, Palawan



Location and Accessibility



Manila - Rio Tuba
1 hr & 30 min. by
Company Plane

850 km (aerial dist)

Puerto Princesa City to
Rio Tuba

5-6 hrs. by land or
45 min. by Single
Engine Plane

252 km (road dist)

WHY RTNMC CONDUCTS MINING REHABILITATION?

- **Because it is mandatory under the 1995 Philippine Mining Law**
- **Because doing so is a moral commitment of the company**

*** USING THE TOOLS OF RESEARCH
IN OPERATIONALIZING MINING
REHAB...**

***AFTER ALL, MINING REHABILITATION
IS A VERY NEW SCIENCE IN THE
PHILIPPINES...**

***NO STANDARDS TO BASE UPON, NO
TEMPLATES TO COPY AND PASTE!!!**

**THE MULTI-OBJECTIVE APPROACH
TO MINE REHABILITATION IN
RTNMC**

IDENTIFICATION OF OBJECTIVES

Principal Objective

- Fast revegetation of mined –out areas

Secondary Objectives

- Conserve local biodiversity (Wildlife Conservation Act)
- Make mined-out areas produce food (Govt priority)
- Economic welfare and preservation of the cultural heritage of the Indigenous People (IPRA Law)
- Improvement of the role of women (Gender and Devt. Act)

IDENTIFICATION OF CONSTRAINTS

Very poor soil condition

- Very low Nitrogen and Phosphorus contents
- Extreme water availability
- Prone to erosion
- Tendency towards lower pH
- Very low MPN (Most Probable Number) microorganism count

Others

- Non-availability of planting materials of native species
- Dust
- Labor Illiteracy
- High labor turnover

CONTOUR MINING – the method used by RTNMC to extract nickel ore



Original
Vegetative
Cover

Top soil

Nickel ore
extraction
zone, between
5 to 20
meters
from top

Bedrock

IN RIO TUBA NICKEL MINING CORPORATION AND ALL COMPANIES UNDER THE UMBRELLA MANAGEMENT OF NICKEL ASIA CORPORATION, IT IS COMPANY POLICY TO FAST TRACK MINING REHABILITATION.

RESEARCH PRIORITIES

RESEARCH GAP

JUSTIFICATION/ RATIONALE

SPECIFIC FIELDS OF STUDY

Soil Amelioration

To improve soil condition and fertility

***Organic fertilizer screening
*Collection and screening for possible production of rhizobium, VAM mycorrhiza and other microbial inoculants**

Biodiversity Conservation

To enhance post-mining ecosystems restoration

***Floral and faunal assessment
*Taxonomic assessment
*Phenological study of endemic tree species**

Silviculture, Agro-Forestry/Aquaculture Combination Trials

To optimize land use and enhance food productivity of mined-out areas

***Mensurational and tree biomass yield studies
*Cropping trials**

Socio-cultural Attributes of IPs

To enhance the capacitation of the IPs in preserving their cultural heritage

***Socio-economic surveys
*Others**

Gender and Development

To identify and elevate the role of women in mining rehabilitation

***Demographic and perceptual surveys
*Training needs assessment
*Others**

ON-GOING RTNMC R & D PROJECTS

TITLE	YEAR STARTED	COOPERATING AGENCIES	HIGHLIGHTS
Recolonization of native floral and faunal species	2008	CBNC, DENR PCSDS	Data collection is continuing
Growth development of introduced reforestation species	2008	DENR PCSDS	Data collection is continuing
Initial cropping trials	2009	MAO, OPA, FIDA R9 Philrice, IRRI	Rice, corn, soybeans, bananas, kenaf, assorted vegetables
Inland tilapia culture trial	2010	BFAR HARIBON Palawan	Data collection is continuing
Agro-forestry trials	2011	DENR	Narra, Mahogany mixed w Pararubber and Pineapple
Macrosomatic clonal propagation trials	2009	CBNC, ERDB, ERDS	Data collection is continuing
Growth performance study of Jatropha	2011	KIBITECH	Data collection is continuing

RTNMC's CURRENT INTEGRATED APPROACH TO HASTEN VEGETATIVE COVER DEVELOPMENT AND ADDRESS OTHER VARIOUS CONCERNS IN OPERATIONALIZING MINING REHABILITATION

- * Soil amelioration to improve fertility**
- * Use of Large Planting Materials (LPMs)**
- * Use of native species as planting materials – (20 -25 species)**
- * Implementation of Agro-Aqua-Forestry farming systems**
- * Economic empowerment of the IPs thru employment opportunities**
- * Deployment of women in the manpower pool.**

STRATEGIES TO ENHANCE SOIL AMELIORATION

1. Surface matting with the original topsoil – at least 30 cm thickness

As sources of buried seed populations of original species and microbial organisms

2. Massive application of organic materials mainly chicken dung -

At the rate of 5-8 tons of chicken dung per hectare

3. Application of microbial inoculants

Still at trial stages: Rhizobium for leguminous species; mycorrhiza; and, Azospirillum for grasses including Vetiver and Bamboos

SITE PREPARATION

RE- CONTOURING/ GROUND LEVELLING



MATTING WITH TOP SOIL



Staking



Hole Digging



Use of digging bar in rocky areas

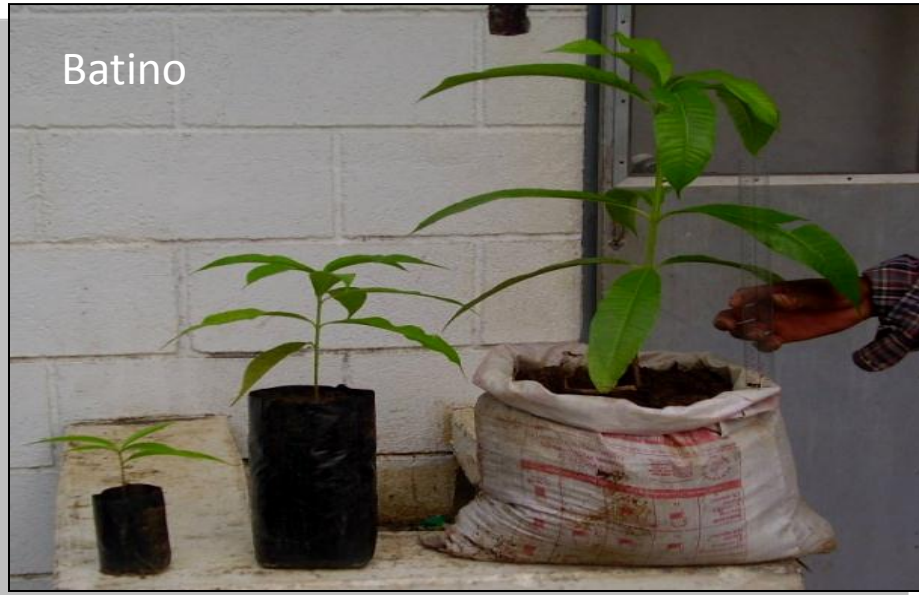
Hauling of Seedlings/Outplanting



Use of backhoe (for Very Large Planting Materials only)

USE OF VERY LARGE PLANTING MATERIALS (VLPM)

Batino



USE OF ENDEMIC PLANT SPECIES



Calumpang



Wild Mangosteen



Palawan Apitong



Eugenia sp.?



Tongkat Ali



?

ESTABLISHMENT OF MINING REHABILITATION RESEARCH CENTER AT GP4



Installation of rain gauge and thermometers for basic meteorological data collection.



RTNMC MINING REHABILITATION RESEARCH CENTER

Implemented by: RTNMC - CBNC

MGB Region IV-B MIMAROPA

ERDS Region IV-B MIMAROPA / ERDB

PENRO Palawan / CENRO Brooke's Point

PGS



The 25-hectare pilot area at GP-4 is packaged into Post Mining Ecosystems Restoration Laboratory



“Study on recolonization of floral species”. Showing 1m x 1m quadrat, with zero native plant population, just 1 day after plantation establishment in June 2008



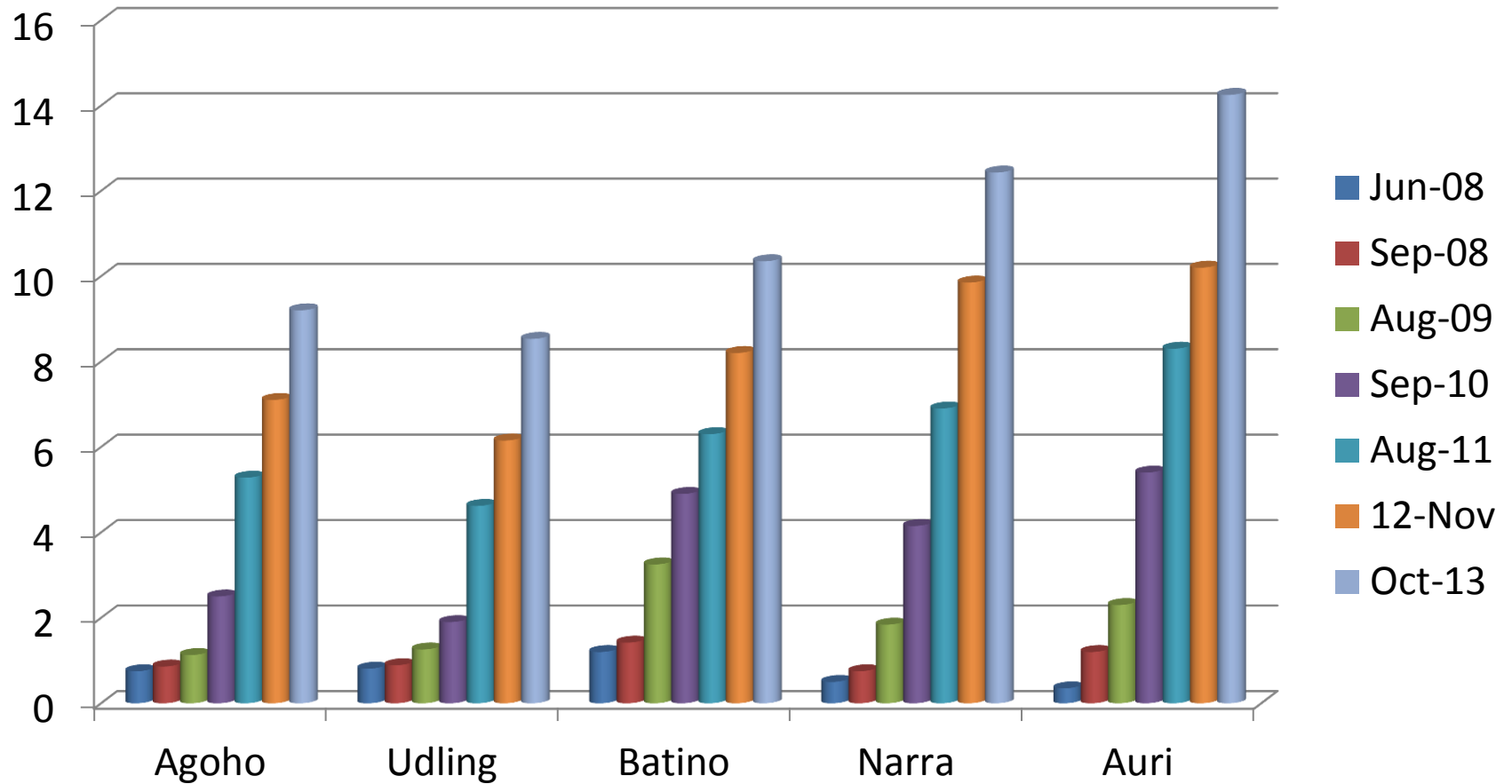


After 1 month, eight (8) colonizing native species were observed

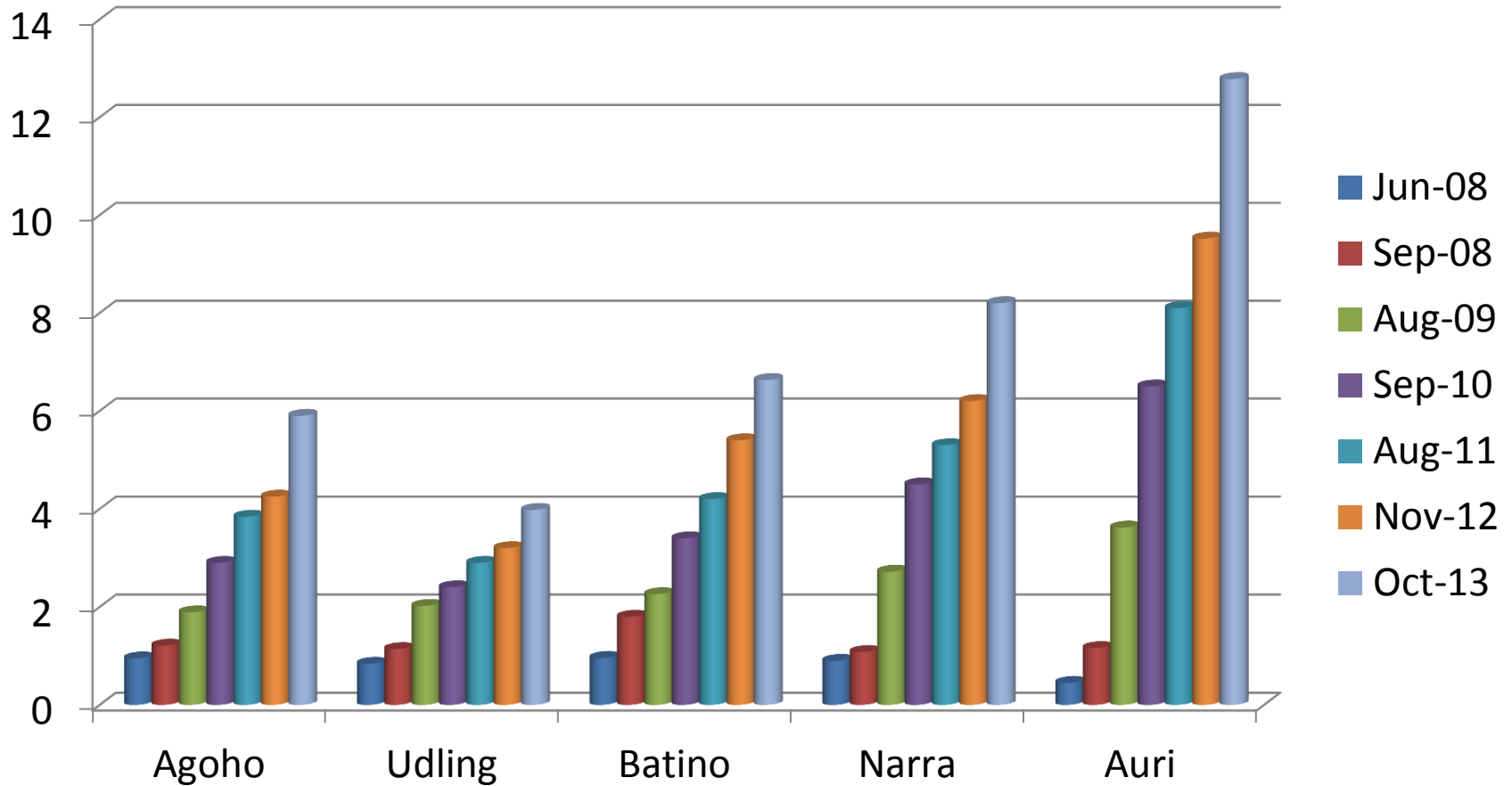


After 6 months, forty six (46) colonizing native species were observed

Diameter measurements of introduced reforestation species at GP-4 (in cm DAB or Diameter at Base)



Height measurements of introduced reforestation species at GP-4 (in meters)

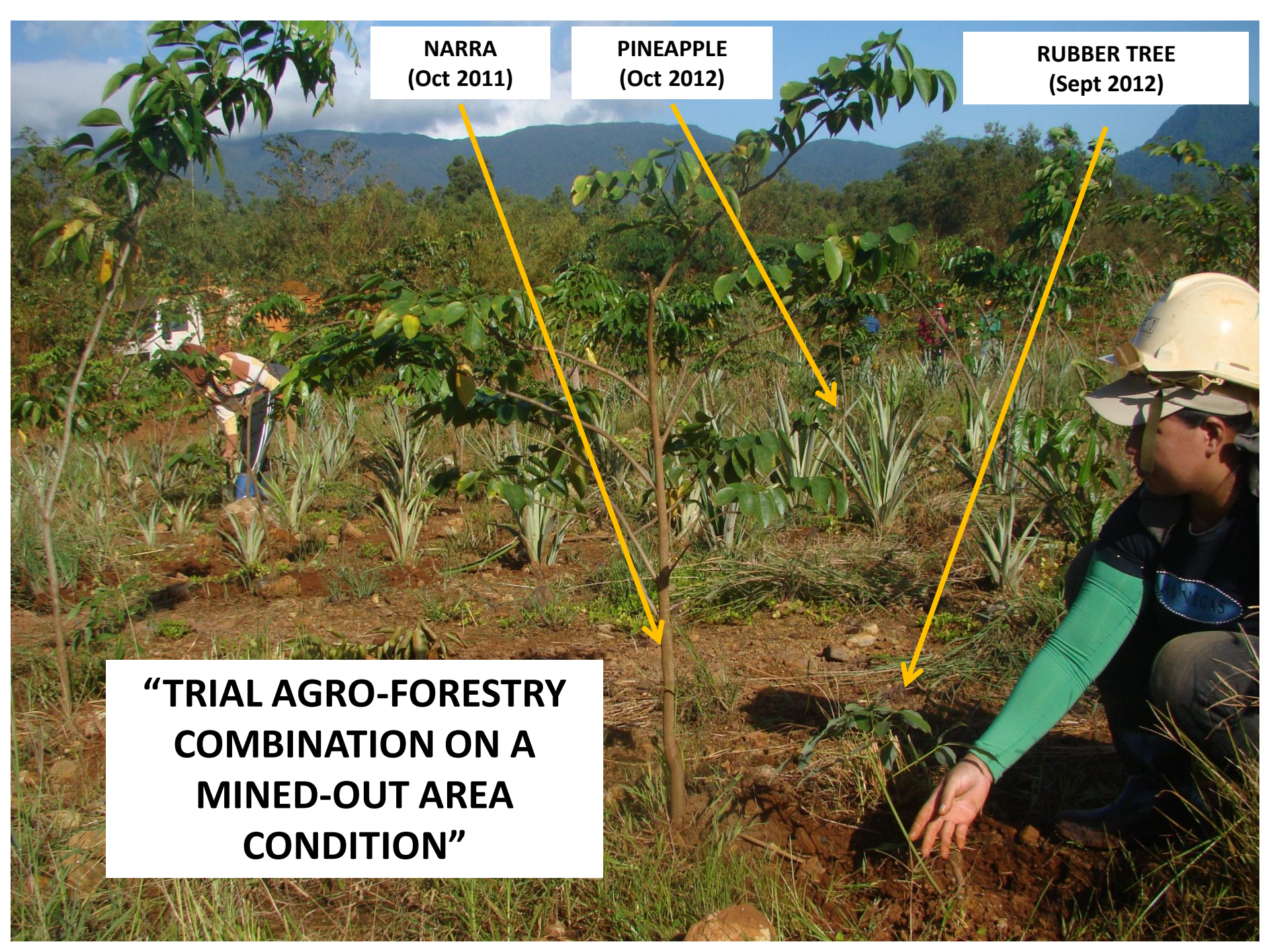


**NARRA
(Oct 2011)**

**PINEAPPLE
(Oct 2012)**

**RUBBER TREE
(Sept 2012)**

**“TRIAL AGRO-FORESTRY
COMBINATION ON A
MINED-OUT AREA
CONDITION”**



“TRIAL PLANTING OF JATROPHA UNDER MINED-OUT AREA CONDITION”



“Trial Planting of Indigenous Grass Species on Coconet Medium for Area Greening Purposes at Mt. Bulanjao”



WITHOUT COCONET



WITH COCONET



**“TRIAL PLANTING OF
VETIVER IN SUN DRYING
AREAS FOR SLOPE
STABILIZATION”**



Two years after planting



AFTER 5 YEARS

“Direct seeding of Pararubber (*Hevea brasiliensis*)”

Planted: August 2013





PALAYAN SA MINAHAN





MALUNGGAY

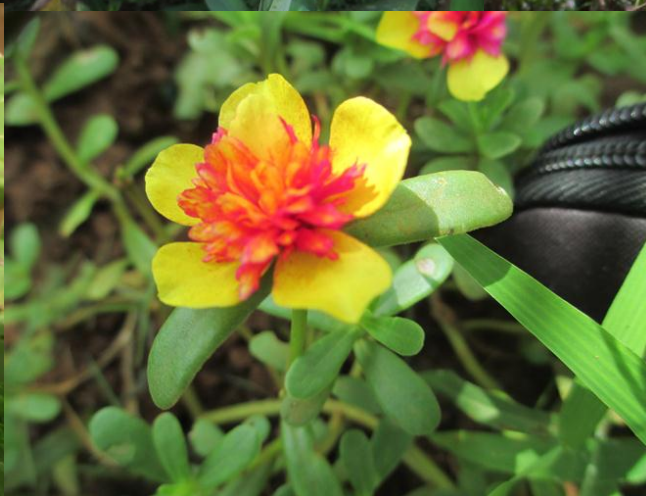


PEANUT



Winged Beans
Psophecarpus tetraolobus









**Kenaf growth after 6 months:
Ave. diameter: 2-3cm
Ave. height: 3.5-4.5 m**











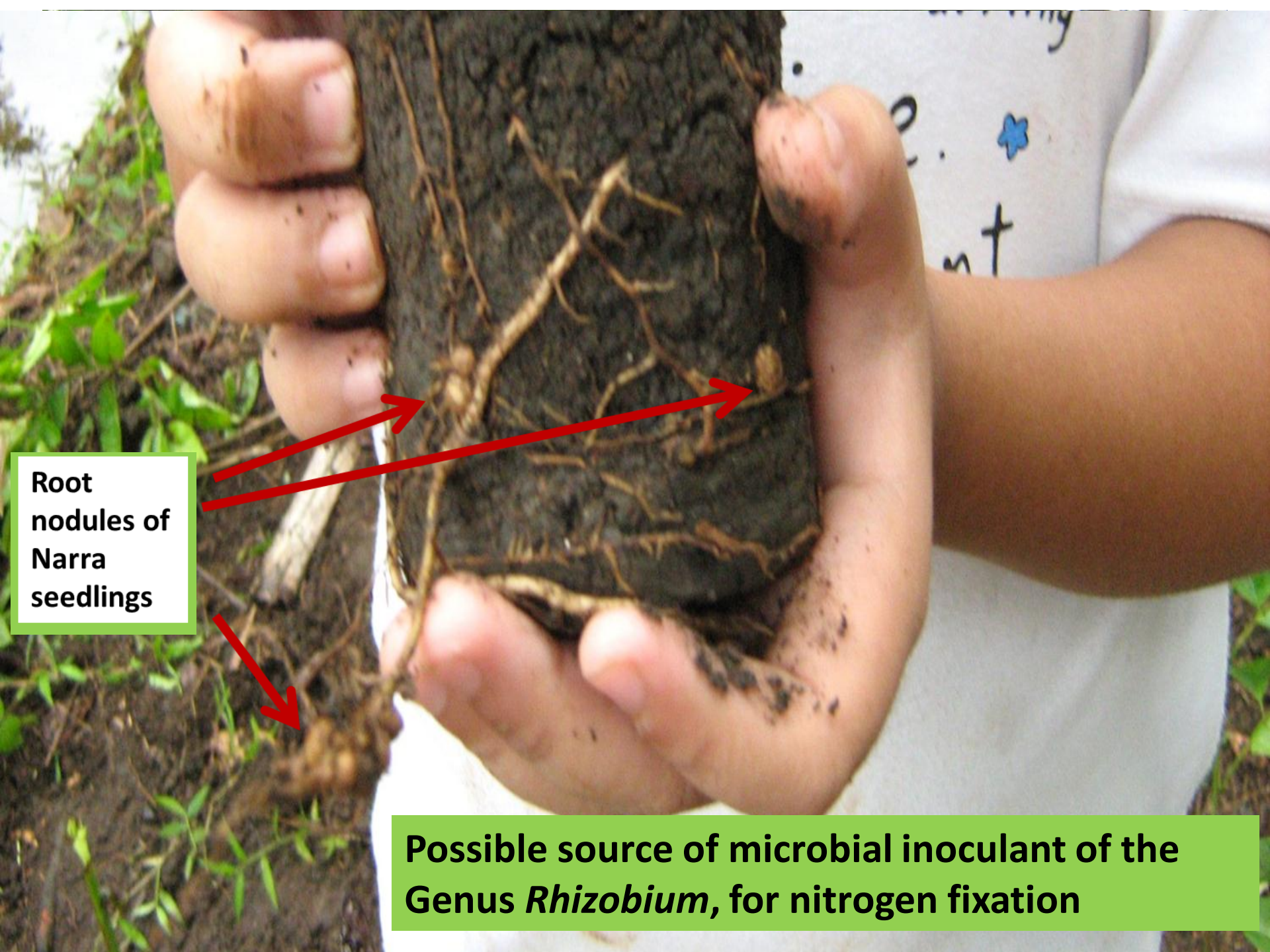












Root nodules of Narra seedlings

Possible source of microbial inoculant of the Genus *Rhizobium*, for nitrogen fixation

Root Nodules of Agoho Tree – possible source of actinomycete inoculant of Genus *Frankia*



MRRU CENTRAL NURSERY

- ❑ The area covered by RTNMC MRRU Field Office Central Nursery is approximately 5 hectares and has a capacity to produce 500,000 to 1,000,000 seedlings

Aerial view of the nursery



Narra, Ipil, Kalumpang, Kupang, Apitong, Udling, Tongkat-ali, Mahogany, Auri, Mangium, are some of the forest tree species raised in the nursery. Cover crop species include Australian peanuts and Vetiver.

RTNMC CENTER FOR BIODIVERSITY CONSERVATION FOR SOUTHERN PALAWAN

Implemented by: RTNMC-MRRU



DENR (Region IV-B Office, PENRO Palawan, CENRO
Brooke's Point, ERDS IV-B)

PCSDS



SOME ENDEMIC FOREST TREE SPECIES RAISED IN THE MRRU CENTRAL NURSERY



MACROSOMATIC CLONAL LABORATORY PROJECT



RESULTS OF PHOTO-DOCUMENTATION OF RECOLONIZING FAUNAL FORMS OBSERVED AT GP-4 BEGINNING 24 MONTHS AFTER ESTABLISHMENT

- 1. Invertebrates – more than 30 spp.**
- 2. Fish – 1 species**
- 3. Amphibians – 2 species**
- 4. Reptiles – 7 species**
- 5. Birds – 35 species**
- 6. Mammals – 6 species**

INVERTEBRATES



BUTTERFLIES



DRAGONFLIES



GRASSHOPPER



Freshwater Crab



SPIDERS



Centipedes



Millipede



BEETLES



FISH



Pait

AMPHIBIANS



FROGS

REPTILES



SNAKES



TOKAY GECKO
(GEKKO GECKO)



SKINK



HOUSE LIZARD



MONITOR LIZARD
(VARANUS SALVATOR)

BIRDS



**Malay Banded
Crake**



Grey Wagtail
Motacilla cinerea



Palawan malkoha
Phaenicophaeus curvirostris



White-collared Kingfisher
Halcyon chloris



Richard's Pipit
Anthus novaeseelandiae



**Philippine Glossy
Starling**
Aplonis panayanensis



Great Egret
Egretta alba



Barred Button-Quail
Turnix suscitator



Olive-backed Sunbird
*Nectarinia jugularis
aurora*



**Eurasian Tree
Sparrow**
Passer montanus



**Philippine
Megapode**



Zebra Dove
Geopelia striata



Nutmeg Munia
Lonchura punctulata



Chestnut Munia
*Lonchura malacca
jagori*



Osprey



Olive-Brown Bulbul
Pycnonotus plumosus





MAMMALS



Palawan Scaly Ant-eater
(*Paramanis culionensis*)



Palawan River-Otter



Rice Field Rat
(*Rattus sp.*)



Leopard Cat

Usually 30%-40% of the hired IP labor force are females.



For economic empowerment of the IPs, it is company policy to hire only members of the IP communities within the mining impact areas, to fill-up the labor requirements of mining rehabilitation projects . The company seasonally maintains 50-150 IP laborers.

RIO TUBA
RESCUE AND REHABILITATION CENTER

RTNMC

"NATIONAL GREENING PROGRAM"

Location : GK Ocayan, Bgy. Ocayan, Bataraza, Palawan.
 Area : 90 has
 Species : Mahogany, Ipil, Narra, Yemane
 Density/Spacing : 5m x 4m
 Total Planted : 1,125

MRRU

Cuyonon

Ilonggo

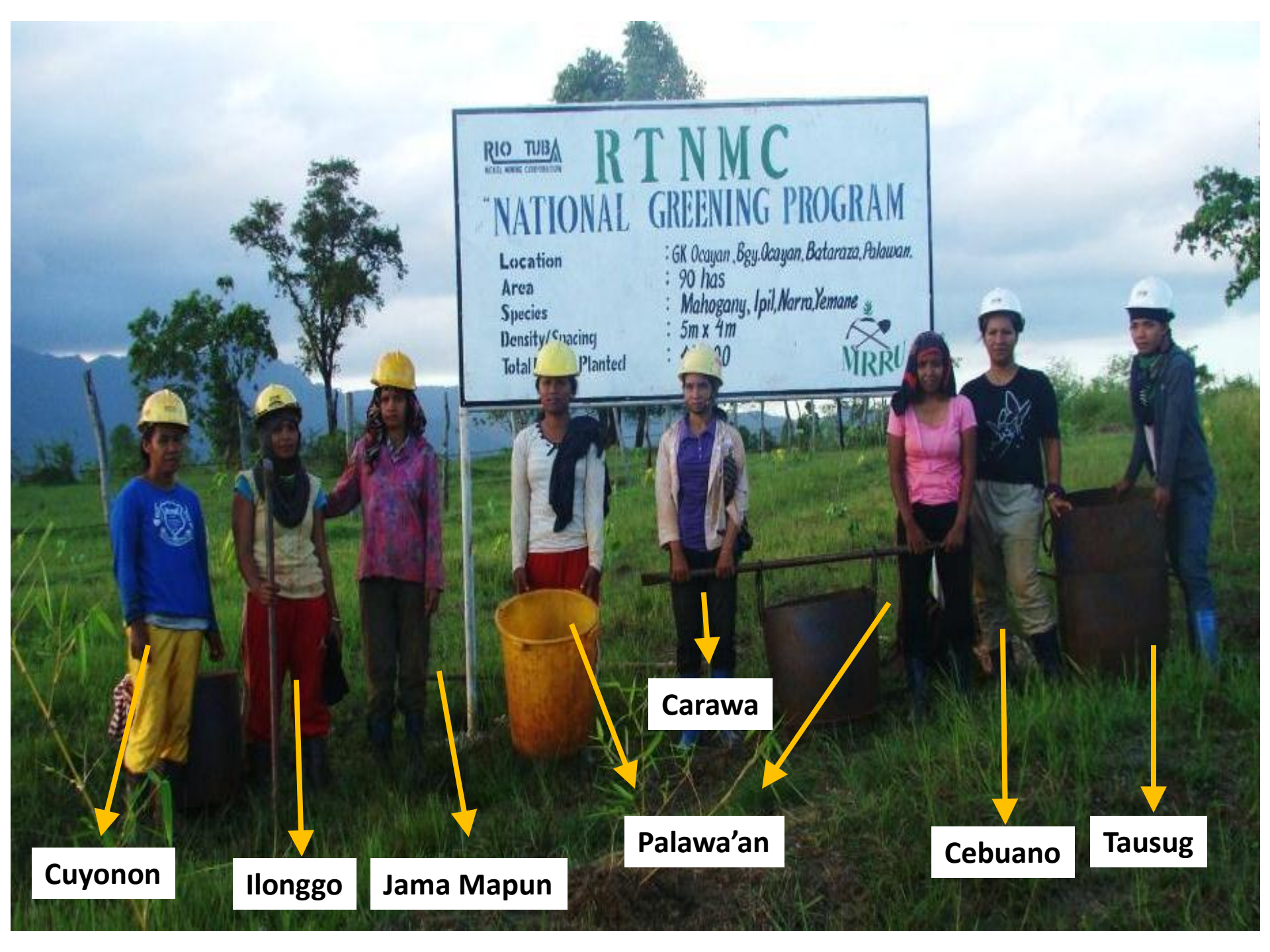
Jama Mapun

Palawa'an

Carawa

Cebuano

Tausug



THE RTNMC'S EXPERIENCE ON MULTI-OBJECTIVE APPROACH TO MINING REHABILITATION

Developmental stages of a rehabilitated 25-ha totally mined-out area at GP-4



MAY 2008



SEPT 2008



SEPT 2009



JUNE 2014

We have shown that a totally mined-out area can be significantly revegetated in just 12-18 months. Target: 3-6 months!

Have initialized harmonization of inputs to address concerns on biodiversity conservation for post-mining ecosystems restoration!

Have started the development of protocols for amelioration of lateritic soil condition for food productivity!

Through priority employment policy, measures have been institutionalized by the company to hopefully contribute to the sustainable capacitation of the IPs in preserving their cultural heritage!

Have enhanced the role of women for more productive involvement in mine rehabilitation works!

GP - 7



MP-26



MP(O-15)







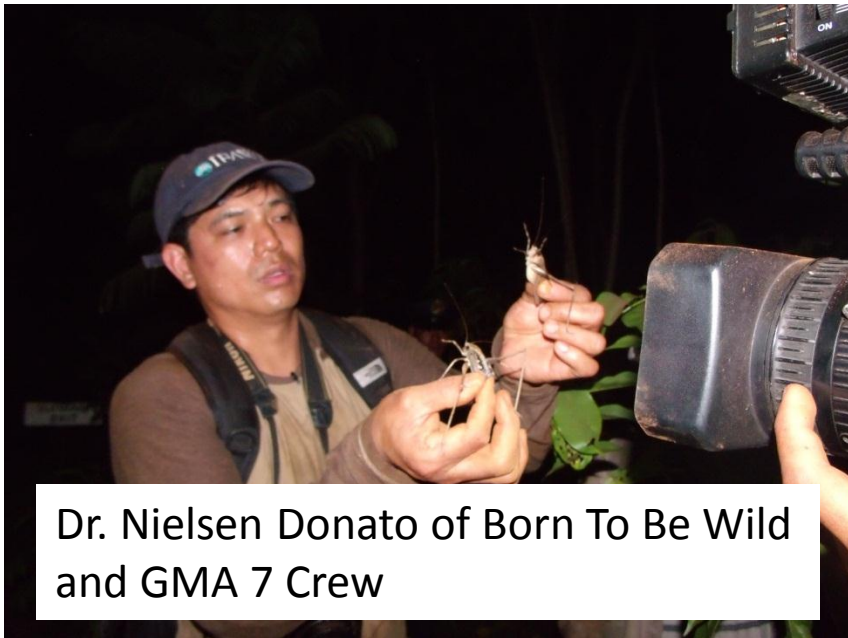
Sen. Antonio Trillanes III



Al-Jazeera TV Crew



Ms. Ces Drilon of ABS CBN



Dr. Nielsen Donato of Born To Be Wild and GMA 7 Crew



Channel 5 TV Crew

08.25.2013

RIO TUBA
MINING CORPORATION

RTNMC

"TILAPIA Production Trials in Mined-out Area"

Initial Stocking: 1,000 fingerlings
Date of Stocking: October 9, 2011

Cooperating Agencies:
**BFAR, BROOKE'S POINT
HARIBON PALAAN**



Mr. Cris Tiu



Ms. Kakay Bautista



Ms. Denise Patricia Tan
UST Volleyball Player

Ms. Rachel Anne Daquis
FEU Volleyball Player





Mr. Brian Poe Llamanzares

Ms. Mercedes Zobel



MS. RIDA REYES
News Reporter, GMA Channel 7

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MS. KORINA SANCHEZ
News Anchor, ABS-CBN Channel 2

**POST MINING ECOSYSTEMS
RESTORATION LABORATORY**
RTHMC CBNC DENR MGB PCSDS

**PARADIGMS OF MINING
REHABILITATION AND
REFORESTATION STRATEGIES OF
RTHMC**
1. PRIORITY CONSERVATION
2. GENERATION OF LIVELIHOOD AND LIFE
SUPPORT SYSTEMS FOR UPLAND FARMERS
3. PRESERVATION OF CULTURAL
HERITAGE OF INDIGENOUS PEOPLE
4. RESEARCH AND DEVELOPMENT

FROM A MINE TO A FOREST
Mother Nature Gives Us The Minerals,
We Give Her Back A Forest
(It's the truth that some self-appointed groups don't want you to see)

MAY 2008
SEPT 2008
OCT 2009
MARCH 2011
JUNE 2014



ANC Channel Crew



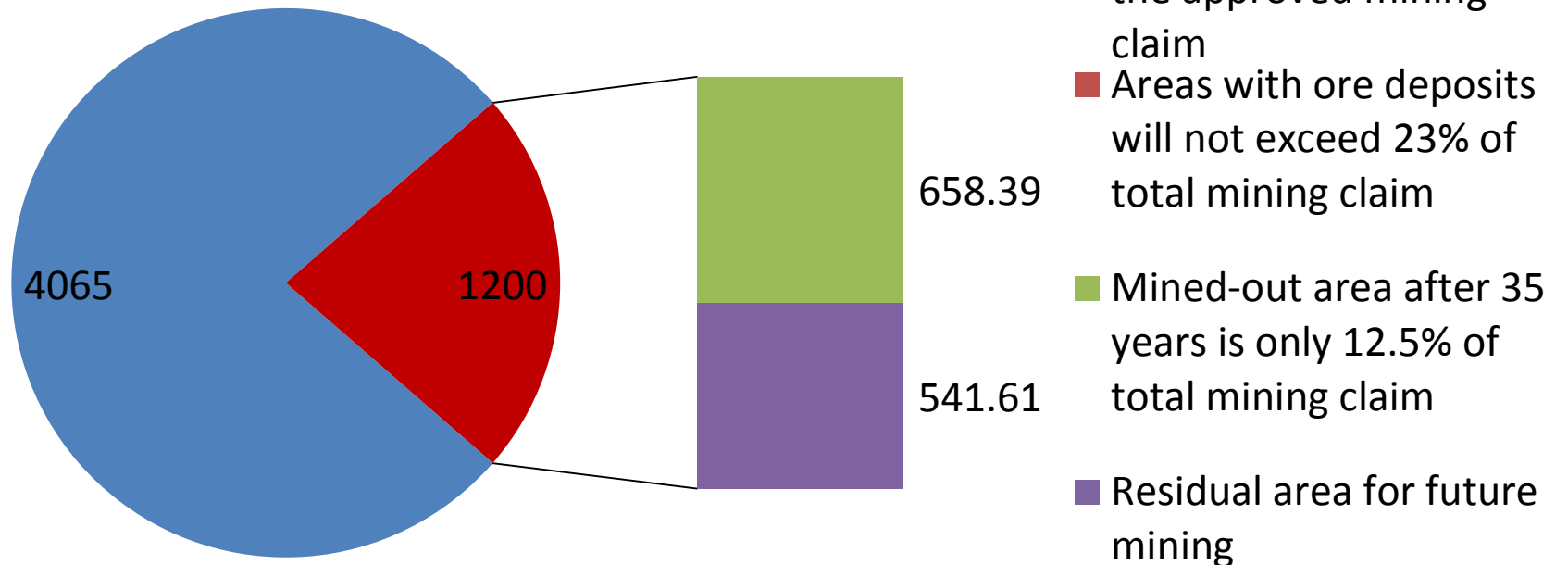
**MS. MARY CANDICE RAMOS –
Miss Earth Philippines (ECO Tourism) 2012**



Dr. Emil Q. Javier former President, UP System

RTNMC'S TOTAL MINING CLAIM VERSUS MINED-OUT AREAS

Total Mining Claim = 5,265 has.



For 38 years of operation, a disturbance rate of about 17.3 has. per year only, which is subjected to progressive mine rehabilitation!

Pls compare this with the total land area of Palawan of about 1.46 M has!

MINING REHABILITATION IS MORE FUN IN RIO TUBA, PALAWAN, THE PHILIPPINES!

Maraming salamat po!

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NAC COMREL Manager**

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RTNMC COMREL Supv.**

**Venice Natad/Jenny dela Vega
RTNMC COMREL Assistants**