

# Carbon Impacts of forest restoration of natural degraded forest in Ha Tinh Province, Vietnam

DAAD FOREST ASIA WORKSHOP

Jakarta, Indonesia 16 – 22 March, 2014

*Nguyen The Chien*

# REDD+

- REDD+ goes beyond deforestation and forest degradation
- Includes the role of conservation, sustainable management of forests and enhancement of forest carbon stocks
  - Reducing emissions from deforestation
  - Reducing emissions from forest degradation
  - Forest carbon conservation
  - Sustainable management of forest resources
  - Enhancement of forest carbon stocks

# REDD+ Concepts

- **MRV** – compliance with UNFCCC guidelines and guidance
  - Principles, methods, data sources
  - Now accepted at COP 19 in Warsaw
- **Forest Reference Emission/ Removal Level (REL):**
  - RELs: the change of emission levels of GHGs resulting from the deforestation and forest degradation
  - RLs: the change of removal levels of GHGs resulting from forest enhancement, rehabilitation, and reforestation
- **For forest carbon measurement:**
  - **Activity Data (AD)** - The extent to which a human activity takes place
  - **Emission factor/removal factors (EF/RF)** - The emission or removal rate of GHG per unit of the activity.

# REDD+ and Vietnam

- National REDD+ Action Program
  - In June 2012, the GoV approved the National Action Programme on “Reducing Emissions from Deforestation and Forest Degradation, Sustainable Management of Forests, Conservation of Forests and Enhancement of Forest Carbon Stocks” in the period 2011-2020
- Target to reduce emissions from the forestry sector by 20% by 2020
- For the forestry sector, the main activities are:
  - Extend forestry plantations, and **restore degraded forests** with a target of 2.6 million ha for potential net GHG emission reduction of 702 million tons CO<sub>2</sub>e.
  - Protect, develop and sustainably manage forests to increase carbon sequestration and reduce GHG emissions over an area of 13.8 million ha, leading to a potential net GHG emission reduction of 669 million tons of CO<sub>2</sub>e.

# Project Data

**Project title:** Advancing understanding of Natural Forest Carbon Enhancement as part of REDD+, **ENRICH project**

**Project Donor:** The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB), Germany

**Implementing Agency:** The Netherland Development Organization, SNV

**Project pilot site:** Ha Tinh Province, Vietnam

**Project duration:** 2012 – 2014

**Project Aim:** To advance understanding of forest carbon stock enhancement as part of any future REDD+ agreement through exploring the technical and economic feasibility of different forest ecosystem sites, across Vietnam

# Project Area

- Ha Tinh province, north-central Vietnam
- “Protection” Forests
- Historically heavily logged
- “Poor” forest
  - Average timber volume ~59m<sup>3</sup>/ha
  - 43,800ha
- “Regrowth” forest
  - Average timber volume ~8m<sup>3</sup>/ha
  - ~5,000ha
- Broadleaf evergreen tropical rainforest



# Study Method

## 7 Steps to Estimate Carbon Impact of ENRICH:

1. Definition of the project area and the **baseline scenario**
  - including stratification of the forest into categories (poor and regrowth);
2. Determination of the carbon pools and GHGs to be included;
3. Estimation of the baseline or forest **reference removal level (RL)**,
  - baseline or reference standing carbon stock and forest productivity;
4. Definition of the scope of the ENRICH project (i.e. the **project scenario**)
  - Activity Data
5. Estimation of Emission Factors (EFs) of ENRICH activities
  - i.e. estimation of the impacts of each activity on forest productivity and biomass/ GHG removal;
6. Calculation of forest productivity and GHG emissions/ removals in the project scenario, based on the EFs;
7. Calculation of the estimated change in forest productivity and GHG emissions/ removals as a result of the ENRICH project
  - i.e. net GHG removal by the ENRICH compared to the baseline/ reference

# Carbon Pools

- In accordance with IPCC guidance, the six carbon pools are:
  1. **Aboveground biomass (AGB)**
  2. **Belowground biomass (BGB)**
  3. Standing and Lying Dead Wood (DW)
  4. Forest Floor (Litter Layer) (L)
  5. Soil Organic Carbon (SOC)
  6. Harvested Wood Products (HWP)
- GHGs - Carbon dioxide (CO<sub>2</sub>)





# Study Data

- Local data applied where possible
- Specific to the eco-region and forest type (Tier 3)
  - Forest surveys and measurements of tree diameter (DBH) and height (H) undertaken in the poor evergreen broadleaf forests of Ke Go Nature Reserve, Ha Tinh in 2012 (Trieu et al., 2012b);
  - Forest surveys, detailed measurements of tree biomass and associated **allometric equations** for evergreen broadleaf forests in Ha Tinh undertaken as part of the UN REDD Programme (Khoa et al., 2012).
  - Ha Tinh Agriculture Extension Centre, results of ANR programme 2010 (limited)
- Estimates of the impact of ENRICH activities are based on available national and international studies

# ENRICH activities



- Forest Maintenance (FM)
  - Liberation cutting etc
  - Increased forest productivity from 3.28% in the baseline to 3.66%
- Assisted Natural Regeneration (ANR)
  - Enrichment planting and support
  - 313 trees (poor) and 150 trees (regrowth)
  - 60% survival over 20 years
  - Additional forest biomass and productivity
- FM and ANR - Two different components of the increase in forest productivity due to ENRICH

Parameter	Description	Value	Source
A:	Activity data in Ha Tinh	Regrowth: 4,981 ha Poor: 43,874 ha	Forest Protection Department, 2012
V:	Timber volume (m <sup>3</sup> /ha)	Regrowth: 8.3m <sup>3</sup> Poor: 58.8m <sup>3</sup>	Based on Dang 2012a and Dang 2012b, as above in Table 6.2
BEF:	Biomass expansion factor (m <sup>3</sup> of main stem volume is equivalent to m <sup>3</sup> of total biomass) for poor forest	1.3019	Khoa's Study
BCEF:	Conversion from m <sup>3</sup> to tonnes (i.e. accounting for WD) for poor forest	0.5983 t/m <sup>3</sup>	Khoa's Study
R:	Ratio of below-ground biomass to above ground biomass	0.18	Bao Huy, 2012
CF:	Carbon fraction of dry matter, tonne C per tonne dry matter	0.47	IPCC 2006
WD:	Wood density (g/cm <sup>3</sup> )	0.4835	Khoa's Study

# Estimated Forest Standing Stock

Current Standing Forest Stock	Regrowth Forest	Poor Forest
Average DBH	9.5	11.9
Trees per ha	306	821
Volume (m <sup>3</sup> timber/ ha)	8.3	58.7
tAGB/ha (Khoa, 2012)	7.8	33.6
tBGB/ha	1.4	6.2
Total biomass (t/ha)	9.2	39.8
Total carbon (t/ha)	4.3	18.7
<b>Total tCO<sub>2</sub> (t/ha)</b>	<b>15.8</b>	<b>68.5</b>
Total tCO <sub>2</sub> , ENRICH Project Area	78,759	3,006,917

# Baseline Forest Productivity and REL

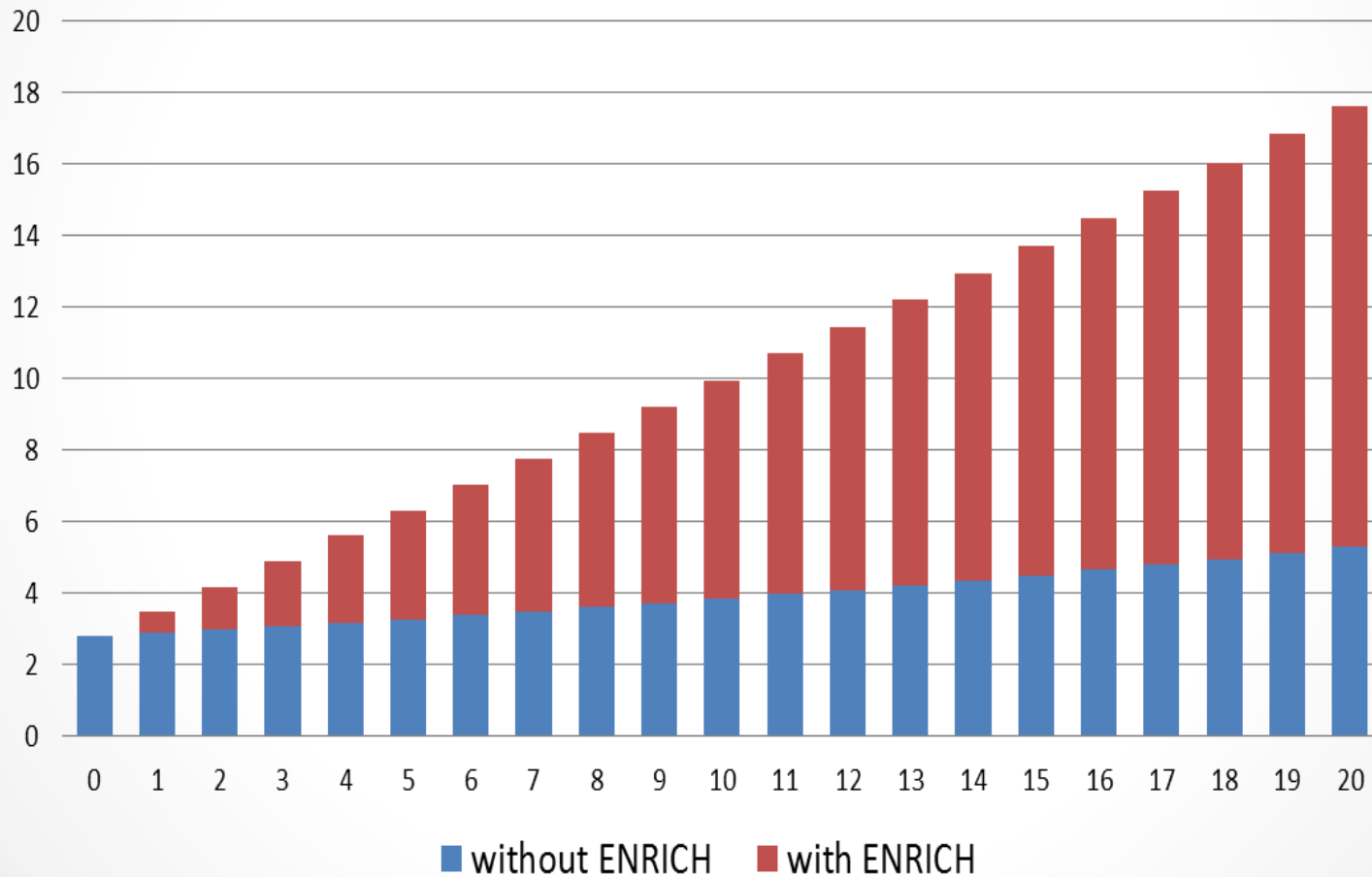
<b>Baseline Forest Productivity (RL)</b>	<b>Regrowth</b>	<b>Poor</b>
Volume growth rate	3.28%	3.28%
Volume (m3 timber/ ha/yr)	0.38	2.66
tAGB/ha/yr (IPCC)	0.23	1.59
Total biomass (t/ha/yr)	0.27	1.89
Total carbon (t/ha/yr)	0.13	0.89
Total tCO2 (t/ha/yr)	0.46	3.25

# ENRICH total estimated impacts on GHG removal

<b>Impact/ ENRICH activity</b>	<b>Regrowth</b>	<b>Poor</b>
C removal by ENRICH FM activities	0.02	0.14
C removal by ENRICH ANR activities	0.60	0.29
Total C removal by ENRICH (t/ha/yr)	0.62	0.43
Total GHG removal by ENRICH (t/ha/yr)	2.3	1.6

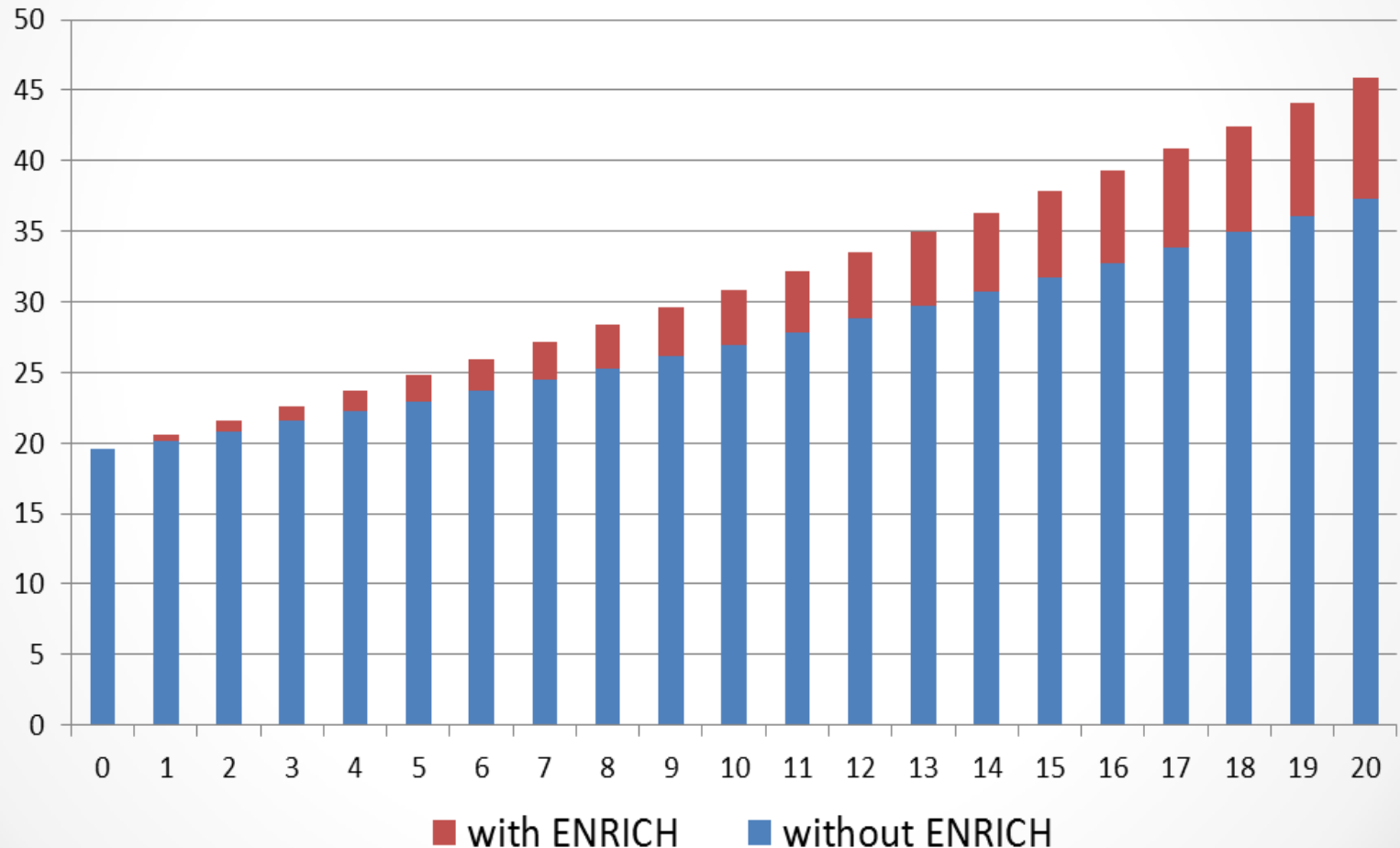
# Forest Carbon per hectare, with and without ENRICH over 20 years (tC/ha)

## Regrowth Forest



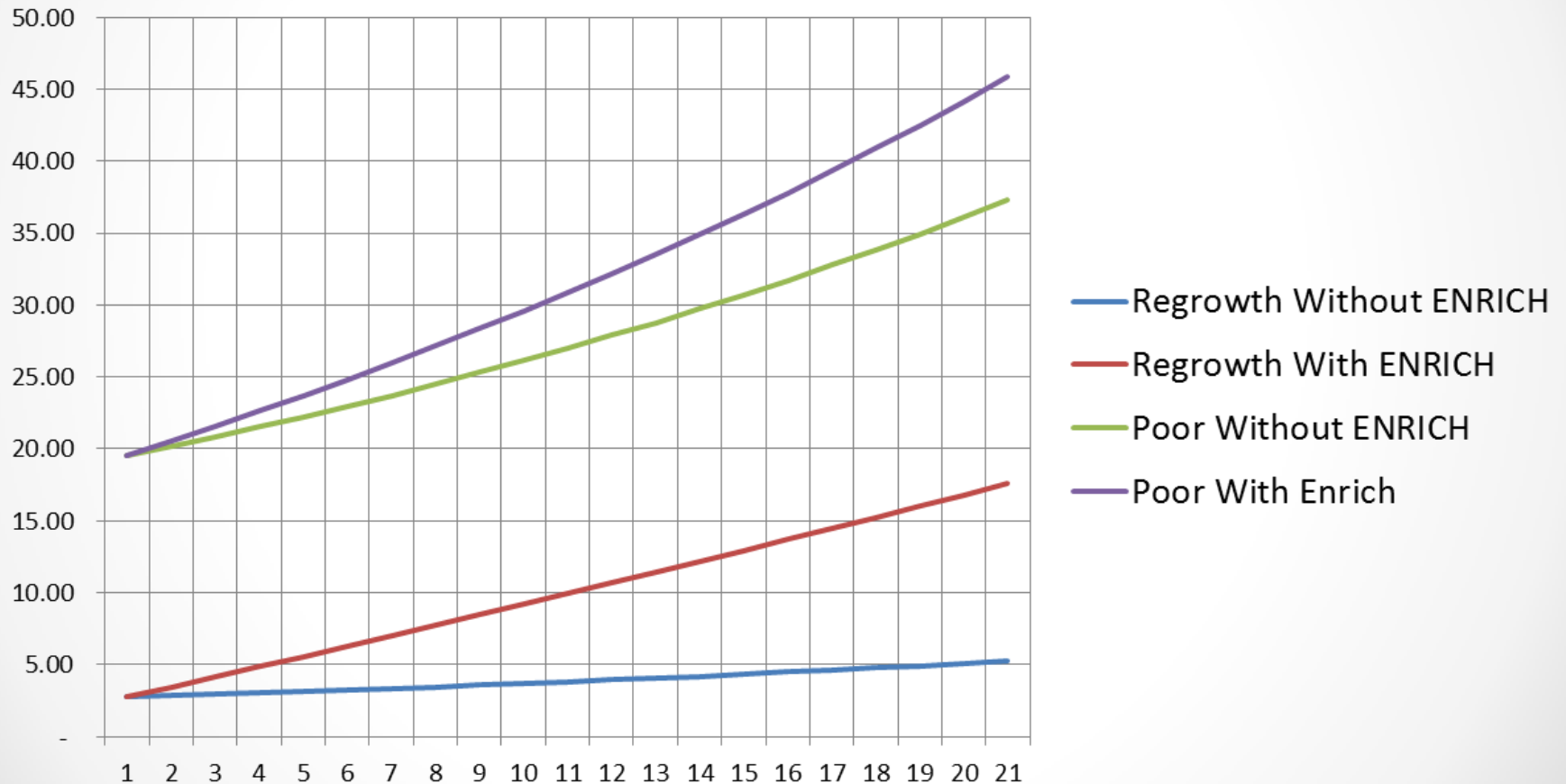
# Forest Carbon per hectare, with and without ENRICH over 20 years (tC/ha)

Poor Forest

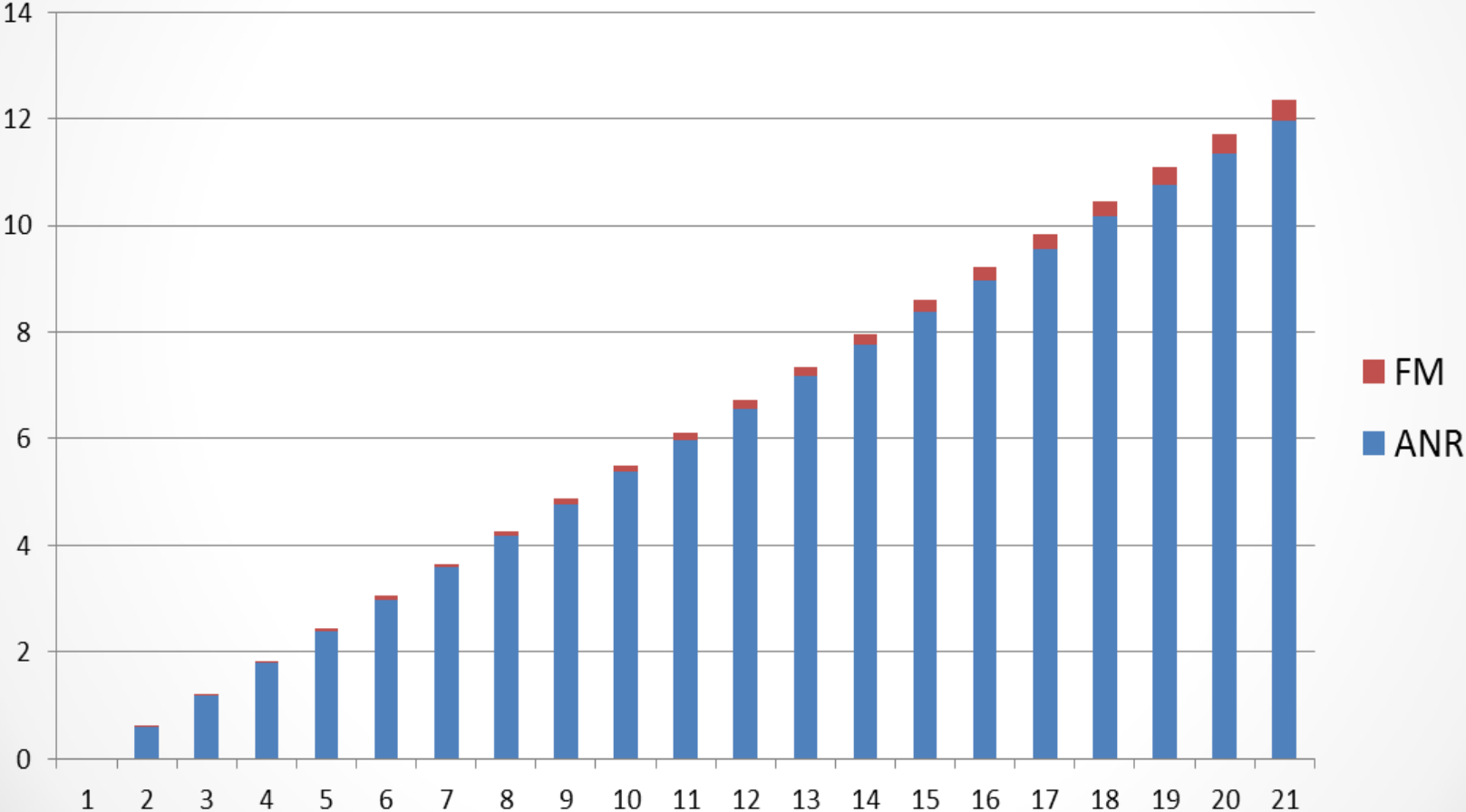




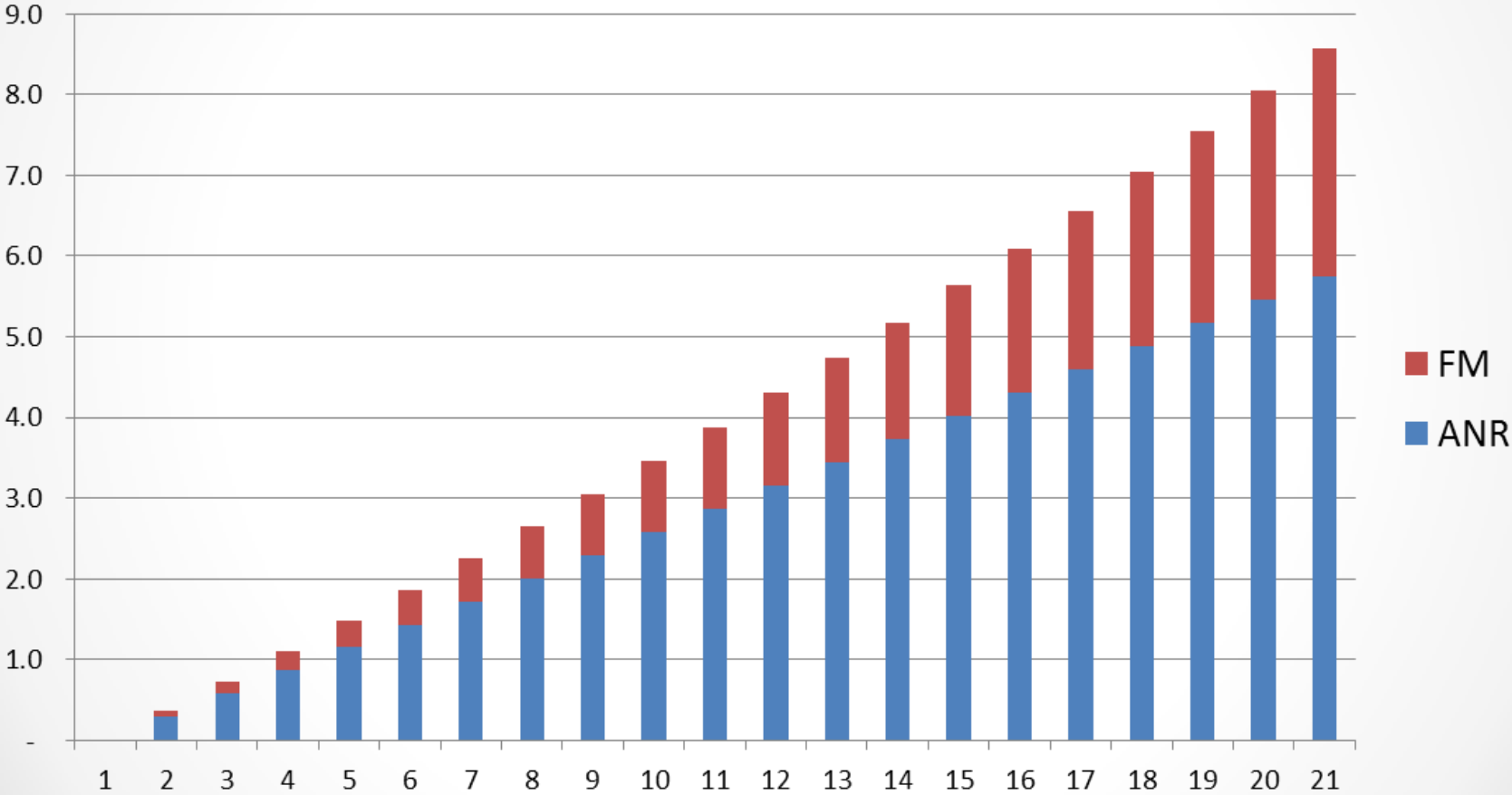
# Forest Carbon per hectare, with and without ENRICH over 20 years (tC/ha)



# Carbon removed due to ANR and FM (tC/ha) Regrowth Forest



# Carbon removed due to ANR and FM (tC/ha) Poor Forest



# ENRICH vs Baseline Scenario

ENRICH Scenario versus Baseline Scenario								
Forest classification	Total Increase		Av. Annual Increase		Total Increase per ha		Increase per ha per yr	
	Forest Carbon (tC)	CO2 removal (tCO2)	Forest Carbon (tC/yr)	CO2 removal (tCO2/yr)	Forest Carbon (tC/ha)	CO2 removal (tCO2/ha)	Forest Carbon (tC/ha/yr)	CO2 removal per year (tCO2/ha/yr)
Regrowth	61,506	225,521	3,075	11,276	12.3	45.3	0.617	2.26
Poor	375,720	1,377,640	18,786	68,882	8.6	31.4	0.428	1.57
Total	437,226	1,603,161	21,861	80,158				

# Results of Carbon Model

- Limited data so indicative estimates only
- Estimates are sensitive to assumptions:
  - Baseline forest growth rate
  - ANR planting rate, survival rate and growth rate
  - Increase in growth rate due to FM
- Linear growth rates assumed
- ANR, enrichment planting, has more impact on forest carbon than FM
- FM has a low impact due to:
  - Low baseline forest volume, particularly in regrowth forest
  - Low rate of baseline forest productivity
  - Increase in productivity of only 11.5% due to ENRICH activities (i.e. from 3.28% to 3.66%, increase of only 0.38%)
- However, ANR results may be partly due to FM activities

A photograph of a dense, lush green forest covering a hillside. The trees are tall and dense, with various shades of green. In the foreground, there is a grassy field with some fallen logs and a few small trees. The sky is a pale, clear blue.

Thank you for your attention!