

Global Climate Change

Global climate change is perhaps the greatest environmental challenge of our time. Agriculture, land-use change, forestry together make up 33% of global greenhouse gas emissions.¹ While forestry offset schemes like Reducing Emissions through Deforestation and Degradation (REDD) are in principle low cost with significant ecological benefits, aligning incentives to keep forests standing has been a significant barrier to their implementation and enforcement.

Greenhouse Gas Mitigation

As part of its environmental mandate, MHV's hazelnut trees will be planted exclusively on fallow and degraded land. Replacing these unused slopes with hazelnut groves will have several positive climate change impacts:

- Long-term sequestration of biomass in the tree and roots, as typical hazelnut plantations are productive for over 50 years.
- Increase in soil carbon sequestration due to leaf mulching.
- Displacement of fuelwood use from neighboring forests through the use of hazelnut prunings.
- Reduces the risk of forest fires through microclimatic improvement and decreases incentives for farmers to engage in slash and burn cultivation.

As a result, MHV projects sequestering up to 1.4 million metric tonnes of CO₂-eq over the productive lifetime of the trees, comparable to almost three times the annual CO₂ emissions generated by the entire population of Bhutan,² or 3.5 million barrels of oil.

Greenhouse Gas Model

	Tonnes CO₂-eq Sequestered*
Hazelnut Tree Sequestration	1,617,196
Fuelwood Use Offset	343,445
Baseline Vegetation	(273,753)
Grazing Leakage	(33,909)
Nursery and Tree Transport	(238)
Nut Transport Field to Calcutta	(255,211)
Net Carbon Sequestration	1,397,530

New emissions are negative in brackets, Sequestered carbon are positive

¹ World Resources Institute, *Slicing the Pie Report* (2007).

² United Nations Statistics Division, Millennium Development Goals indicators (collected by CDIAC).

1. Sequestration by Hazelnut Trees

- Tree carbon sequestration after pruning and emissions for fertilizers and farm machinery are deducted is 89.8 tonnes CO₂-eq/acre after 54 years.
- Total of 1.617 million tonnes CO₂-eq sequestered
- Methodology and growth model validated by CarbonFix for a hazelnut plantation in Georgiaⁱ.
- CarbonFix is a leading standard for the creation of CO₂ certificates for new forests. ⁱⁱ

2. Sequestration from Offset Fuelwood Use

- Hazelnut orchard prunings are equivalent to 0.70 tonnes of CO₂/acre/yr of firewoodⁱⁱⁱ
- Total of 0.46 million tonnes CO₂-eq of fuelwood offset from prunings after 54 years
- Total of 0.12 million tonnes CO₂-eq of fuelwood from same land if no orchards are planted.
- Net 0.34 million tonnes CO₂-eq of fuelwood collection from forests would be offset by orchard prunings over 54 years

3. Emissions from Land Use Change and Loss of Baseline Vegetation

- Baseline vegetation is 90% fallow pasture/crop land and 10% scrub forest
- Carbon sequestered is as per IPCC standards for that vegetation type:
 - Fallow pasture/crop land has 11.95 tonnes CO₂/acre^{iv} of sequestered carbon.
 - Scrub forest has 44.5 tonnes CO₂/acre^v of sequestered carbon.
- Model assumes that current vegetation biomass is in balance with grazing and fuelwood collection pressure and that there is no net accumulation of biomass.
- Total sequestered carbon in baseline vegetation is 0.273 million tonnes CO₂-eq.

4. Emissions from Grazing Leakage

- Additional emissions from grazing displaced to other land (leakage) was calculated using the UNFCCC Tool “Estimation of GHG emissions related to displacement of grazing activities in A/R CDM project activity”^{vi}
- Additional emission of 2.09 tonnes of CO₂/acre of orchard
- Total of 33,909 tonnes CO₂-eq of additional emissions for displaced grazing

5. Emissions from Tree Transport, and Nursery

- Electrical energy generated from low emission hydropower sources
- Assumes nuts sold in the shell with minimal processing
 - Emissions from processing plant construction materials have not yet been included in the model but will not be significant.
- Emissions of 238 tonnes CO₂-eq mostly from fossil fuels used in transportation of trees

6. Emissions from Transportation of Nuts/Product

- Emissions from fossil fuels used to transport nuts/product by:
 - Trucks from field to factory
 - Trucks from factory to railhead in India
 - Train to Calcutta
- Total of 0.255 million tonnes CO₂-eq of emissions from transportation of the nuts

ⁱ <http://www.carbonfix.info/HAP/>

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^{iv} 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol 4, Ch 6, p 27. Used maximum climatic zone "tropical-moist & wet grassland" for conservatism.

^v 2006 IPCC Guidelines for National Greenhouse Gas Inventories, Vol 4, Ch 4, p 53. Use estimate for "Tropical, shrubland - Asia (continental)," which is consistent with the lower range of estimates for full forest in "Subtropical mountain system"

^{vi} EB 39 Report Annex 12 UNFCCC