LBA-ECO ND-08 Biomass, Nutrients, and Decomposition in Eucalyptus and Primary Forests

Summary:

This data set reports the concentrations of the nutrients nitrogen (N), phosphorus (P), magnesium (Mg), calcium (Ca), and potassium (K) in roots, litterfall, leaves, and twigs, biomass of fine roots and litterfall, and the decomposition of leaves and twigs in samples that were collected on the property of Jari Celulose, Monte Dourado, Para, Brazil, from 1999-2001.

Samples were collected from two study sites, a eucalyptus plantation and an adjacent primary forest, during both rainy and dry seasons. Roots were sampled from three depths (0-15 cm, 35-50 cm, and 85-100 cm).

There are five comma-delimited data files with this data set.

DATA QUALITY STATEMENT: The Data Center has determined that there are questions about the quality of the data reported in this data set. The data set has missing or incomplete data, metadata, or other documentation that diminishes the usability of the products.

KNOWN PROBLEMS: The data files do not identify the year in which samples were collected. The methods, precision, and accuracy, for nutrient, decomposition, and biomass sampling and analyses were not provided. The data file descriptions indicate that samples were collected from two soil types (sandy and clay) but there is no documentation of which data field provides that information. Also, there is no documentation for the Location or Block fields in the data files.

Data Citation:

Cite this data set as follows:

McNabb, K., M. Menezes, R. Keila de Paixao and E. Savaris. 2013. LBA-ECO ND-08 Biomass, Nutrients, and Decomposition in Eucalyptus and Primary Forests. Data set. Available on-line [http://daac.ornl.gov] from Oak Ridge National Laboratory Distributed Active Archive Center, Oak Ridge, Tennessee, U.S.A. http://dx.doi.org/10.3334/ORNLDAAC/1148

Implementation of the LBA Data and Publication Policy by Data Users:

The LBA Data and Publication Policy [http://daac.ornl.gov/LBA/lba_data_policy.html] is in effect for a period of five (5) years from the date of archiving and should be followed by data users who have obtained LBA data sets from the ORNL DAAC. Users who download LBA data in the five years after data have been archived must contact the investigators who collected the data, per provisions 6 and 7 in the Policy.

This data set was archived in March 2013. Users who download the data between March 2013 and February 2018 must comply with the LBA Data and Publication Policy.

Data users should use the investigator contact information in this document to communicate with the data provider.

Data users should use the Data Set Citation and other applicable references provided in this document to acknowledge use of the data.

Table of Contents:

1. Data Set Overview:

Project: LBA (Large-Scale Biosphere-Atmosphere Experiment in the Amazon)

Activity: LBA-ECO

LBA Science Component: Nutrient Dynamics

Team ID: ND-08 (McNabb / Costa)

The investigators were McNabb, Ken; Costa, Luiz Gonzaga da Silva; Menezes, Marlon; Paixao, Rosiene Keila de; Savaris, Elisson and Lockaby, Bruce Graeme. You may contact McNabb, Ken (mcnabb@auburn.edu).

LBA Data Set Inventory ID: ND08_Biomass_Jari

This data set reports the concentrations of the nutrients nitrogen (N), phosphorus (P), magnesium (Mg), calcium (Ca), and potassium (K) in roots, litterfall, leaves, and twigs, biomass of fine roots and litterfall, and the decomposition of leaves and twigs in samples that were collected on the property of Jari Celulose, Monte Dourado, Para, Brazil, from 1999-2001.

Samples were collected from two study sites, a eucalyptus plantation and an adjacent primary forest, during both rainy and dry seasons. Roots were sampled from three depths (0-15 cm, 35-50 cm, and 85-100 cm).

2. Data Characteristics:

Data are provided as five comma-delimited ASCII files:

ND08_Fine_Root_Biomass.csv

ND08_Fine_Root_Nutrients.csv

ND08_Litterfall_Data.csv

ND08_Leaf_Decomposition_Data.csv

ND08_Twig_Decomposition_Data.csv

File #1: ND08_Fine_Root_Biomass.csv

Data description: bimonthly sampling of roots at 3 soil depths in native forest and adjacent plantation on two soil types. Roots are separated into four classes: dead, less than 1 mm, 1-3 mm, and greater than 3 mm diameter. This data set reports root dry weight.

Column	Heading	Units/format	Description
1	Obs_num		Observation number
2	Month	mm	Month (mm): 2, 4, 6, 8, 10, 12
3	Location	F or SM	Location: Felipe (F) and São Militão (SM)
4	Block		Block number: 1 - 4
5	Forest	N or P	Forest type: N=Native forest or P=Plantation
6	Sample		Sample number: 1 - 4
7	Depth	A, B, or C	Soil depth class. Samples were taken at 3 soil depths: A=0-15 cm, B=35-50 cm, C=85-100 cm
8	Dead	g	Dry weight of dead roots in sample in grams (g)
9	Small	g	Dry weight of small (< 1 mm) roots in sample in grams (g)
10	Medium	g	Dry weight of medium (1-3 mm) roots in sample in grams (g)
11	Large	g	Dry weight of large (> 3 mm) roots in sample in grams (g)
Missing values are represented as -9999			

Example data records:

```
Obs_num,Month,Location,Block,Forest,Sample,Depth,Dead,Small,Medium,Large
1,2,F,1,N,1,A,0,0.12551,1.48882,1.62892
2,2,F,1,N,1,B,0.02524,0.05959,0.23493,0
...
600,8,F,2,N,4,C,0.0026,0.01235,0.00496,0
601,8,F,3,N,1,A,0.23305,0.38649,1.0816,0.95772
...
1151,12,SM,4,P,4,B,0.01586,0.02936,0.01352,0
1152,12,SM,4,P,4,C,0.14506,0.01455,0,0
```

File #2: ND08_Fine_Root_Nutrients.csv

Data description: bimonthly sampling of roots at three soil depths in native forest and adjacent plantation on two soil types. Roots are separated into four classes: dead, less than 1 mm, 1-3 mm, and greater than 3 mm diameter.

Column	Heading	Units/format	Description
1	Obs_num		Observation number
2	Nutrient		Nutrient: Ca, K, Mg, N, P

3	Month	mm	Month (mm): 2, 4, 6, 8, 10, 12
4	Location	F or SM	Location: Felipe (F) and São Militão (SM)
5	Block		Block number: 1 - 4
6	Forest	N or P	Forest type: N=Native forest or P=Plantation
7	Small	g/kg	Nutrient content in small (<1 mm) roots in g/kg
8	Medium	g/kg	Nutrient content in medium (1-3 mm) roots in g/kg
9	Large	g/kg	Nutrient content in large (>3 mm) roots in g/kg
Missing values are represented as -9999			

Example data records:

```
Obs_num,Nutrient,Month,Location,Block,Forest,Small,Medium,Large
1,N,2,F,1,N,15.1712,12.0608,6.5222
2,N,2,F,2,N,14.3825,13.2571,7.7806
...
210,K,4,F,2,N,0.733,1.1405,0.5455
211,K,4,F,3,N,0.853,1.6683,2.3855
...
479,Mg,12,SM,3,P,0.6133,0.84,0.4558
480,Mg,12,SM,4,P,0.6883,0.371,0.4558
```

File #3: ND08_Litterfall_Data.csv

Data description: monthly collections of litterfall for one year in natural forest and adjacent plantation on two soil types. Litter is divided into leaves, twigs, and reproduction materials. Dy weight and nutrient analysis for each sample are reported.

Column	Heading	Units/format	Description
1	Obs_num		Observation number
2	Forest	N or P	Forest type: Native forest (N) or Plantation (P)
3	Location	F or SM	Location: Felipe (F) and São Militão (SM)
4	Mon	mon	Month (mon): Jan - Dec
5	Month	mm	Month (mm): 1 - 12
6	Block		Block number: 1 - 4
7	Trap_num		Collection trap number: 1-4
8	Leaf_wt	kg/ha	Dry weight of leaves in litter sample in kilograms per hectare (kg/ha)
9	Woody_wt	kg/ha	Dry weight of branches and woody material in litter sample (kg/ha)
10	Repro_wt	kg/ha	Dry weight of reproductive materials in litter sample (kg/ha)
11	N	%	Nitrogen (N) expressed as percent (%)
12	P	g/kg	Phosphorus (P) measured in combined materials found in litter trap, in grams per kilogram (g/kg)
13	K	g/kg	Potassium (K) measured in combined materials found in litter trap, in grams per kilogram (g/kg)
14	Ca	g/kg	Calcium (Ca) ,measured in combined materials found in litter trap, in grams per kilogram (g/kg)
15	Mg	g/kg	Magnesium (Mg) measured in combined materials found in litter trap, in grams per kilogram (g/kg)

Missing values are represented as -9999

Example data records:

```
Obs_num,Forest,Location,Mon,Month,Block,Trap_num,Leaf_wt,Woody_wt,Repro_wt,N,P,K,Ca,Mg
1,P,F,Nov,11,1,1,128.8,10,0,5.7,0.6,4.8,10.1,3.9
2,P,F,Nov,11,1,2,202.8,15.2,0,7,0.5,6.5,10.4,4.4
...
380,N,F,Oct,10,3,4,1002.6,525.4,67.2,14.5,0.2,2.6,12.1,5.6
381,N,F,Oct,10,4,1,823.6,61,0,13.3,0.2,2.1,7.4,4.9
...
767,N,SM,Oct,10,4,3,810.6,28.2,0,13,0.4,1.9,6.8,2.1
768,N,SM,Oct,10,4,4,1108,20.4,0,11.6,0.2,1.2,8.1,2.7
```

File #4: ND08_Leaf_Decomposition_Data.csv

Data description: litter decomposition sampled at 1, 2, 4, 8, and 12 months in native forest and adjacent plantation site, from two soil types. The study was repeated in both the dry and wet seasons. Data for weight loss and nutrient content over time are provided.

Column	Heading	Units/format	Description
1	Obs_num		Observation number
2	Season		Season: Wet (rainy) or Dry
3	Location	F or SM	Location: Felipe (F) or São Militão (SM)
4	Block		Block number: 1 - 4
5	Forest	N or P	Forest type: Native Forest (N) or Plantation (P)
6	Source		Source: GF or GG [archivist note: This column is suspect. It is not known if 'Source' is the same as 'Twig_size' in the Twig Decomposition data file (see file #5 below)]. Twig size: GF or GG. Small twigs (<2.5 cm diameter, 20 cm in length) and large twigs (2.5 -10 cm diameter, 40 cm in length)
7	Month	mm	Month sampled (mm): 2, 4, 8, or 12
8	Initial_wt	g	Air dry weight of sample in grams (g)
9	Final_wt	g	Dry weight of sample in grams (g) when taken from field
10	Stick_wt	g	Dry weight in grams (g) of a Popsicle stick used for calibration
11	N	%	Nitrogen (N) expressed as percent (%)
12	P	g/kg	Phosphorus (P) in grams per kilogram (g/kg)
13	K	g/kg	Potassium (K) in grams per kilogram (g/kg)
14	Mg	g/kg	Magnesium (Mg) in grams per kilogram (g/kg)
15	Ca	g/kg	Calcium (Ca) in grams per kilogram (g/kg)
Missing values are represented as -9999			

Example data records:

```
Obs_num,Season,Location,Block,Forest,Source,Month,Initial_wt,Final_wt,Stick_wt,N,P,K,Mg,Ca
1,Wet,F,1,N,GF,2,29.955,13.02,-9999,0.682,0.145,-9999,0.161,0.637
2,Wet,F,2,N,GF,2,70.575,33.53,-9999,0.558,0.112,-9999,0.11,0.491
```

```
...
144,Wet,SM,4,N,GG,4,1326.37,935.78,-9999,0.88,0.209,-9999,0.219,0.442
145,Wet,SM,4,N,GG,4,3354.37,2480.27,-9999,1.022,0.318,-9999,0.298,0.443
...
304,Dry,SM,4,P,GG,12,1288.56,479.13,-9999,0.318,0.342,-9999,0.131,0.501
305,Dry,SM,4,P,GG,12,3227.56,1172.31,-9999,0.273,0.211,-9999,0.319,0.601
```

File #5: ND08_Twig_Decomposition_Data.csv

Data description: small twig (<2.5 cm diameter, 20 cm in length) and large twig (2.5 -10 cm diameter, 40 cm in length) decomposition sampled at 2, 4, 8, and 12 months in native forest and adjacent plantation site, from two soil types. The study was repeated in both the dry and wet seasons. Data are reported for weight loss and nutrient content over time.

Column	Heading	Units/format	Description
1	Obs_num		Observation number
2	Season		Season: Rainy (C - Chuva) or Dry (Seca)
3	Location	F or SM	Location: Felipe (F) and São Militão (SM)
4	Block		Block number: 1 - 4
5	Forest	N or P	Forest type: N=Native forest or P=Plantation
6	Twig_size		Twig size: GF or GG. Small twigs (GF - Galhos Finos) (size: <2.5 cm diameter, 20 cm in length) and large twigs (GG - Galhos Grossos) (size: 2.5 -10 cm diameter, 40 cm in length)
7	Month	mm	Month sampled (mm): 2, 4, 8, or 12
8	Initial_wt	g	Air dry weight of sample in grams (g)
9	Final_wt	g	Dry weight of sample in grams (g) when taken from field
10	N	%	Nitrogen (N) expressed as percent (%)
11	P	g/kg	Phosphorus (P) in grams per kilogram (g/kg)
12	K	g/kg	Potassium (K) in grams per kilogram (g/kg)
13	Mg	g/kg	Magnesium (Mg) in grams per kilogram (g/kg)
14	Ca	g/kg	Calcium (Ca) in grams per kilogram (g/kg)
Missing values are represented as -9999			

Example data records

```
Obs_num,Season,Location,Block,Forest,Twig_size,Month,Initial_wt,Final_wt,N,P,K,Mg,Ca
1,C,F,1,N,GF,2,29.955,13.02,0.682,0.145,-9999,0.161,0.637
2,C,F,2,N,GF,2,70.575,33.53,0.558,0.112,-9999,0.11,0.491
...
131,C,F,1,N,GG,4,1078.35,719.41,0.439,0.164,-9999,0.149,0.455
132,C,F,2,N,GG,4,2149.35,1525.1,0.369,0.112,-9999,0.185,0.542
...
304,S,SM,4,P,GG,12,1288.56,479.13,0.318,0.342,-9999,0.131,0.501
305,S,SM,4,P,GG,12,3227.56,1172.31,0.273,0.211,-9999,0.319,0.601
```

Site boundaries: (All latitude and longitude given in decimal degrees)

Site (Region)	Westernmost Longitude	Easternmost Longitude	Northernmost Latitude	Southernmost Latitude	Geodetic Datum

Para Eastern (Belem) - Jari Celulose (Para Eastern (Belem))	-52.55	-52.55	-.86	-.86	World Geodetic System, 1984 (WGS-84)

Time period:

- The data set covers the period 1999/07/01 to 2001/12/31
- Temporal Resolution: Continuous

Platform/Sensor/Parameters measured include:

- FIELD INVESTIGATION / WEIGHING BALANCE / BIOMASS
- LABORATORY / ANALYSIS / NUTRIENTS

3. Data Application and Derivation:

The data is of importance to silvicultural management. Reductions in C and N in the clay soil micro-aggregates and the increases in C and N in micro-aggregates in the sandy soil could have detrimental effects on long-term nutrient cycling in these managed soils.

4. Quality Assessment:

The Data Center has determined that there are questions about the quality of the data reported in this data set. The data set has missing or incomplete data, metadata, or other documentation that diminishes the usability of the products.

KNOWN PROBLEMS: The data files do not identify the year in which samples were collected. The methods, precision, and accuracy, for nutrient, decomposition, and biomass sampling and analyses were not provided. The data file descriptions indicate that samples were collected from two soil types (sandy and clay) but there is no documentation of which data field provides that information. Also, there is no documentation for the Location or Block fields in the data files.

5. Data Acquisition Materials and Methods:

Site Description:

This project was conducted on the property of Jari Celulose, Monte Dourado, Para, Brazil where 55,000 ha of Eucalyptus spp. (Jari, 2009) are harvested on approximately 6 year rotations to produce bleached kraft pulp for international and domestic sales (McNabb & Wadauski, 1999). The regions climate is classified as Amw – hot and humid in the Koppen system. The annual rainfall average is 2,115 mm, with a dry season from September to November. The natural vegetation is tropical ombrophilous lowland forest (UNESCO, 1973).

The initial clearing of native forest for plantations began in 1968. Each site was converted from native forest using slash-and-burn methods, in 1971 for the sandy site and 1988 for the clay one. Site preparation methods included burning, root removal, soil ripping and sub-soiling. Seedlings were hand planted in planting beds, and came from clonally propagated stock that was matched to the specific conditions at each site. Each study site had a plantation and adjacent primary forest within 5 m. Within each site, relief, slope, soil parent material and texture were uniform. Soil consisted of macro aggregates (> 250 um diameter) and micro-aggregates (<250 u, diameter).

Field sampling and analyses

Fine Root Biomass:

Bimonthly sampling occurred over one year at 3 soil depths ((0-15 cm, 35-50 cm, and 85-100 cm) in native forest and the adjacent eucalyptus plantations from two soil types. Roots were separated into four classes (dead, <1 mm, 1-3 mm, and > 3 mm diameter) and analyzed for N, P, K, Mg, and Ca content.

Litterfall:

Monthly litterfall collections occurred over a 12 month period for adjacent native forests and eucalyptus plantations on two soil types (sand and clay). Litterfall was divided into leaf, woody material, and reproductive material and analyzed for N, P, K, Mg, and Ca content..

Leaf decomposition:

Leaf litter was sampled from a eucalyptus plantation and adjacent native forest and decomposition followed over one year. The study was repeated on clay and sandy soils and during the wet and dry season. Dry weight and nutrient analysis (N, P, K, Mg, and Ca) were obtained for specific sampling times during the 12 months.

Twig decomposition:

Small (<2.5 cm diameter and 20 cm in length) and large (2.5-10 cm diameter and 40 cm length) twigs were sampled from a eucalyptus plantation and adjacent native forest and decomposition followed over one year. The study was repeated on clay and sandy soils and during the wet and dry season. Dry weight and nutrient analysis (N, P, K, Mg, and Ca) were obtained for specific sampling times during the 12 months.

6. Data Access:

This data is available through the Oak Ridge National Laboratory (ORNL) Distributed Active Archive Center (DAAC).

Data Archive Center:

Contact for Data Center Access Information:
E-mail: uso@daac.ornl.gov
Telephone: +1 (865) 241-3952

7. References:

Jari, 2009. Operaco es florestais. Available at: http://www.jari.com.br/ web/pt/operacoes/florestal.htm, accessed 12／12／2008.

McNabb, K.L. & Wadauski, L. 1999. Multiple rotation yields for intensively managed plantations in the Amazon basin. New Forests, 18, 5–15.

T. P. Beldini, K. L. Mcnabb, B. G. Lockaby, F. G. Sanchez & O. Navegantes-Cancio, 2009. The effect of Amazonian Eucalyptus plantations on soil aggregates and organic matter density fractions. Soil Use and Management, March 2010, 26, 53–60, doi: 10.1111/j.1475-2743.2009.00248.x

UNESCO, 1973. The Unesco international classification system and mapping of vegetation. Available at: http://unesdoc.unesco.org/ images/0000/000050/005032MB.pdf