B-1 Study on the Carbon Dioxide and Carbon Cycle Related to the Global Warming

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Total Budget for 1993-1995 267,636,000 Yen (FY1995; 95,168,000 Yen)

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(1) Most organic carbon and silica were transported from two sources of phytoplankton photosynthesis and through the continental shelf areas to the deep layers of the open ocean.
(2) Percentages of organic carbon reserved in surface sediments ranged from 0.1% observed in moderate or high productivity area to 0.008% in low productivity area in North Pacific.
(3) A sweet potato-chinese cabbage double cropping field and an abandoned field showed red carbon budgets. In a paddy field, (12+0.1)tC/ha of inputs from photosynthesis and rain/irrigation minus (5+0.1+5+0.3)tC/ha of outputs from respiration, methane emission, harvest and percolation, respectively, equals to 1.7tC/ha of net accumulation. Annual carbon accumulations in agro-forests were estimated 3.7, 3.5, 2.2tC/ha in plant bodies or -0.8, 1.3, 1.5tC/ha in soil of a managed plot, an abandoned plot and a natural forest, respectively. Absorption of CO_2 to a grassland estimated by the eddy correlation method was larger than emission in a year with cool summer and only in summer of the year with hot summer.
(4) Spatial variation of carbon budgets within each land-use unit in a temperate area was considerable, although a mean budget in the area was plus, showing the carbon sink.
(5) Biomass of *Sasa* community and its net assimilation were 5.36 and 1.09tC/ha, respectively. Emission was 6.23tC/ha/yr including 1.13gCO_2/m^2/day even in mid-winter with snow cover.
(6) Carbon cycling in a boreal forest was conducted mainly in or on the surface soil and its rate was smaller than those in a cool temperate forest. 0.1-0.2tC/ha/yr were sunk in the soil.
(7) CO_2 emission rate was correlated to the microbial biomass, which correlated more rather to nitrogen contents than to carbon contents in the soil. Soil respiration rate was the highest in F layer exceeding 50% of total CO_2 emission from soil in a boreal forest in Canada.
(8) A cool temperate forest absorbed CO_2 from May to September and emitted it from October to April. 210 or 460gCO_2/m^2/yr was absorbed by the forest ecosystem in successive two years.
(9) Fluxes simulated by a Biosphere-Atmosphere Interaction Model agreed well with those observed. A multi-layer canopy model well simulated CO_2/H_2O fluxes over a grassland.
(10) Oceanic air samples were collected over the Pacific Ocean by using Japan-Australia and Japan-Canada cargo ships. Methods for isotope ratios were applied to the samples, and carbon isotope ratios were found to decrease with increase of its concentration.