

**Figure 1 R & D areas for the conservation of biodiversity and the sustainable use of biological resources**

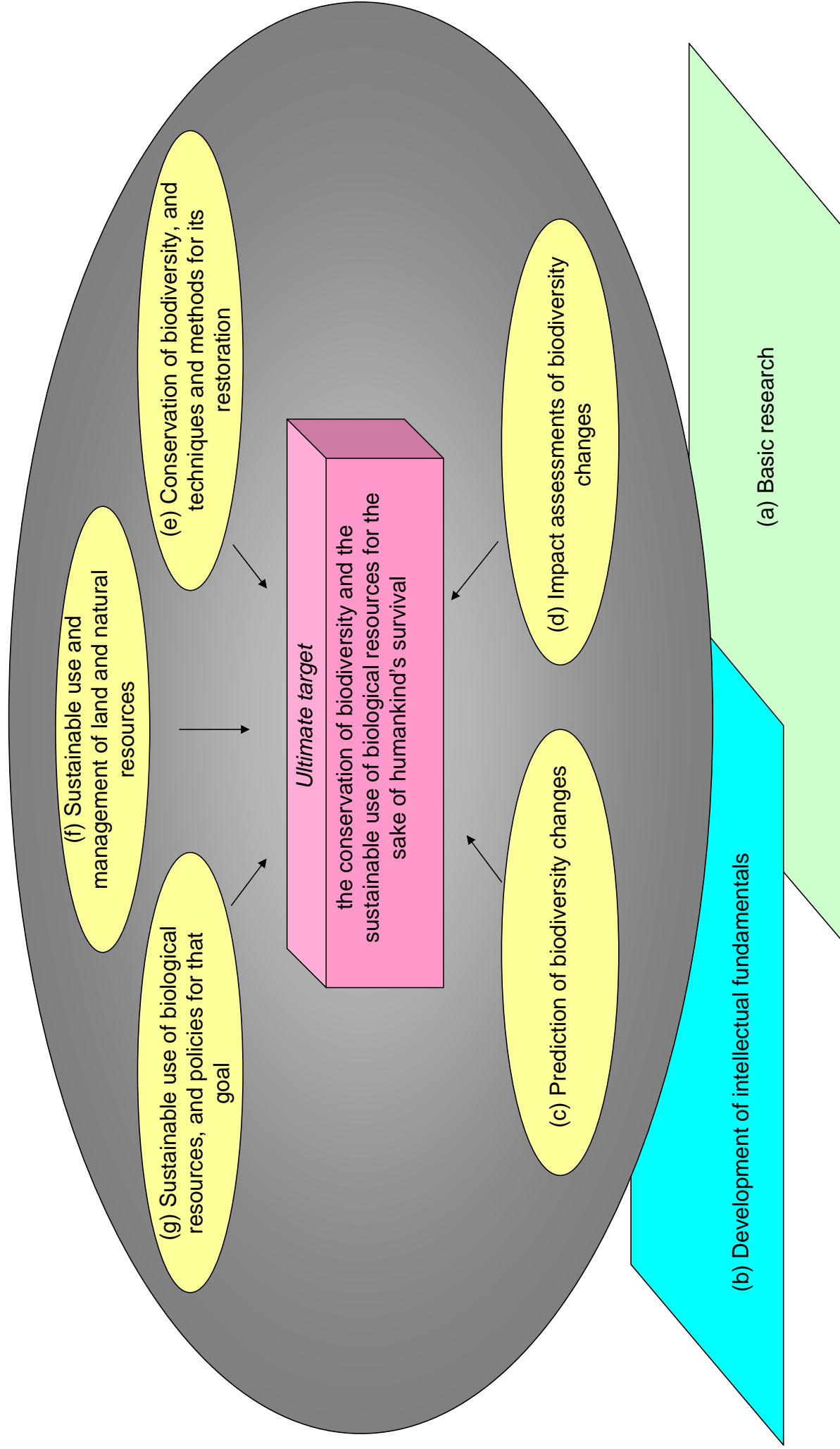
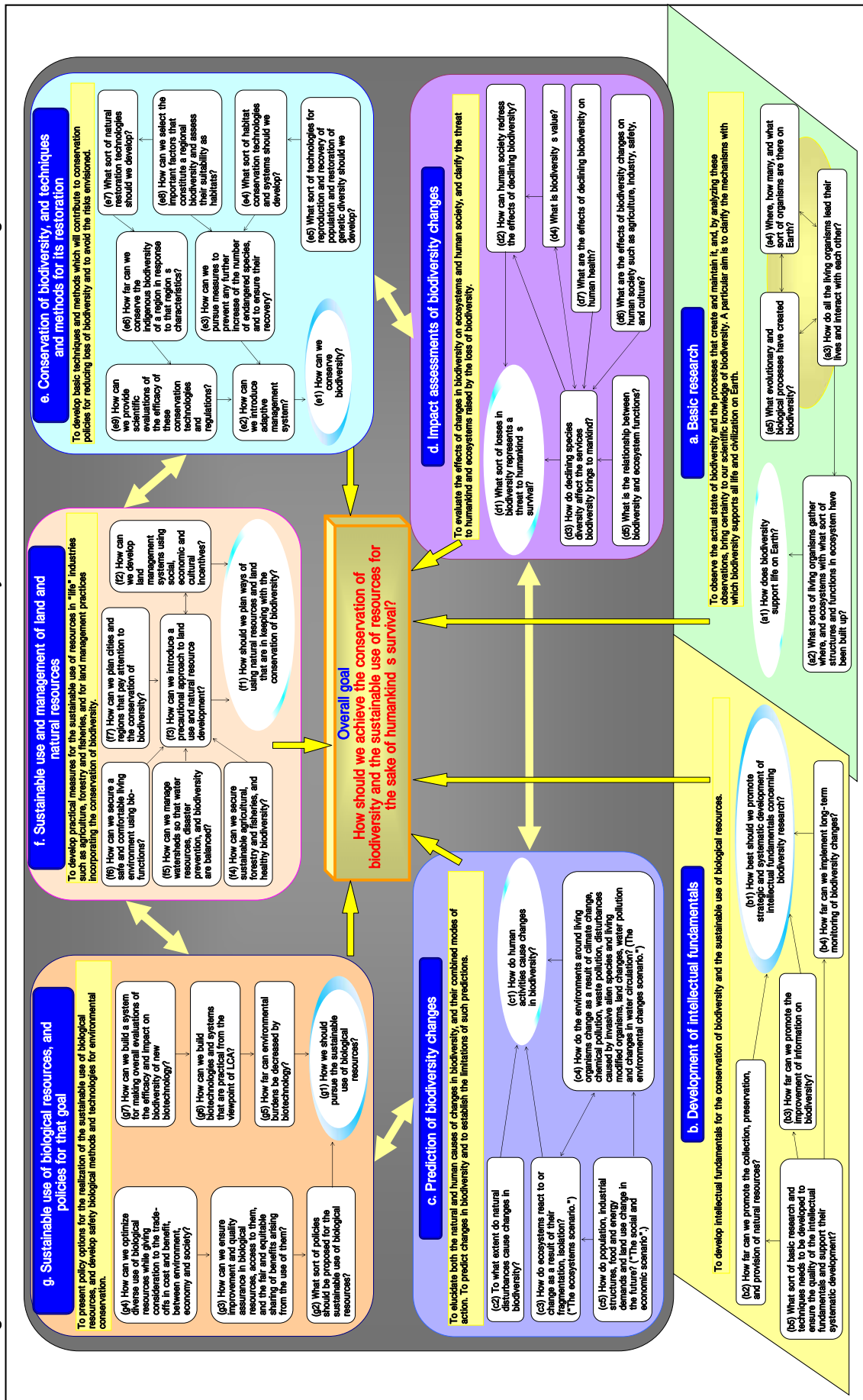


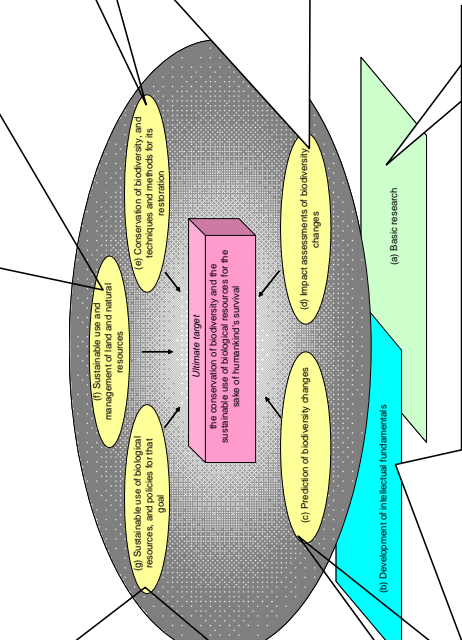
Figure 2 Hierarchical R & D structure for the conservation of biodiversity and the sustainable use of biological resources



# Figure 3 Current state and needs of R & D in the field of living organisms and ecosystems in FY2003

(C26) Study on risk management of recombinant organisms in industrial uses.  
 (C27) Technological innovation for environmentally friendly industrial system using biotechnology (Development of monitoring methods for microorganisms in the environment).  
 (C52) Gene-bank project on biological resources for agriculture.  
 (C61) Study on recycling biomass-resources at the country level.  
 (C62) Study to establish a new resource-cycle system by transforming degraded recycled-paper fibers into nano-particles.  
 (C63) Development of recycling technology to sterilize food-industry wastes by sequential micro-wave irradiation under low pressure.  
 (C64) Reassessment of disposal techniques by evaluating microbial activity.  
 (C65) Research and development on social technology for food recycling.  
 (C66) Development of technology to transform garbage disposal into chicken feed by high-pressure decomposition.  
 (C67) Study on extended use of wood wastes.  
 (C68) Project to achieve the practical use of bioprocess.  
 (C69) Development of fundamental technologies for controlling the process of industrial material production by plants.  
 (C70) Technological innovation for environmentally friendly industrial system using biotechnology (Development of a technological infrastructure for industrial bioprocesses).  
 (C71) Technological innovation for environmentally friendly industrial system using biotechnology (Development of technology for analyzing and controlling the mechanism of biodegrading and processing.)  
 (C72) Promoting access to genetic resources based on Convention on Biological Diversity.  
 (C73) Survey on recycling technology to transform organic wastes into useful by using bio-solids.  
 (C74) Development of comprehensive management technology to prevent cadmium absorption and accumulation from major crops.  
 (C75) Development of decomposition and elimination technology for hazardous chemicals in agriculture, forestry, and fishery ecosystems.  
 (C76) Ecological Science Research  
 (C77) Development of mitigation techniques to cope with global warming.  
 (C78) Development of technology recycling waste from the agriculture, forestry and fisheries industry.  
 (C79) Local systemization of biomass recycling and its assessment method.  
 (C80) Development of recycling technology for organic wood-processing wastes.  
 (C81) Development of recycling technology for food wastes.  
 (C82) Development of recycling technology for organic livestock excreta.  
 (C83) Development of recycling technology for fish-processing wastes.  
 (C84) Development of technology to produce biomass-energy for agriculture and forestry.  
**(F05) Unraveling marine ecosystems and developing technology for sustainable use of marine-resource.**  
**(F17) Exploration and release of bioremediation organisms for environmental conservation and technological development for their use.**  
**(F34) Promoting practical use of biomass and biomass-assisted technology.**

(C51) Development of nature-friendly technology to improve the national land.  
 (C53) Environmentally-friendly improvement project of agriculture and rural areas  
 (C54) Technological verification for the proper population management applied to wildlife.  
 (C55) Unraveling relationships between management systems of agriculture and forestry area, and suitable wildlife habitat.  
 (C56) Unraveling occurrence factors of wildlife damage on agriculture and forestry, and development of methods to predict and reduce the damage.  
 (C57) Unraveling water and material cycle processes from forest to coasts.  
 (C58) Development of a water-circulation and -transportation model from forests to coasts.  
 (C59) Development of an integrated model of the water circulation and ecosystem change.  
 (C60) Development of management technology for the watershed environment.  
 (C61) Study on recycling biomass-resources at the country level.  
**(F15) Unraveling dynamics of nutrient salts in watersheds, streams, and coasts, and study on ecosystem conservation management.**  
**(F30) Unraveling ecological service-functions by creating an experimental system in central uplands.**  
**(F31) Study on understanding seashore ecosystem to improve seashore facilities that are compatible with conserving natural habitats and biodiversity. (tentative title).**  
**(F32) Technical development of sustainable agriculture and field management that is harmonious with conservation of nature.**  
**(F33) Enlightening farmers and farming-area residents on incentives for biodiversity conservation.**



(C09) Construct the genetic resource library of unidentified microbes based on genome information.  
 (C10) National BioResource Project  
 (C11) Promotion of BioResource-related projects  
 (C12) Study on aquatic-life toxicology to establish environmental water quality standards for protecting aquatic life.  
 (C13) Promotion of seashore life census.  
 (C14) Survey and study on land ecology using laser air survey-Taking Shirakami Mountains as an example.  
 (C15) Survey of environmental information related to agriculture and rural areas  
 (C16) Development of database of natural resources information on agriculture, forestry and fisheries.  
 (C17) Development of database of natural resources information on agriculture, forestry and fisheries.  
 (C18) Unraveling factors causing fluctuations of marine biological resources and development of high-precision predictions.  
**(F05) Unraveling marine ecosystems and developing technology for sustainable use of marine-resource.**  
**(F06) Study on technology for monitoring marine ecosystems with sea-floor observative stations.**  
**(F07) Study on marine-life survey using an unmanned submarine controlled with artificial intelligence and its technological improvement.**  
**(F08) Survey on marine-life distribution and functions using a submarine and drill-ship, and development of micro-sampling and drilling instruments.**  
**(F09) Survey on transplant guidelines for animals and plants.**  
**(F10) Survey on environmental conservation guidelines for diverse ecosystems.**  
**(F11) National mapping of biodiversity based on analysis of correlation between wild-life habitats and earth covering.**  
**(F12) Development of technology for animal identification and management by microchips.**  
**(F13) Exploration of indicator-species to estimate the fluctuation of biodiversity in agro-ecosystems.**  
**(F14) Risk assessment of watershed chemicals and study on risk-communication.**  
**(F15) Unraveling dynamics of nutrient salts in watersheds, streams, and coasts, and study on ecosystem conservation management.**  
**(F16) Development of technology to monitor and conserve endangered species in secondary natural environment.**  
**(F17) Exploration and release of bioremediation organisms for environmental conservation and technological development for their use.**

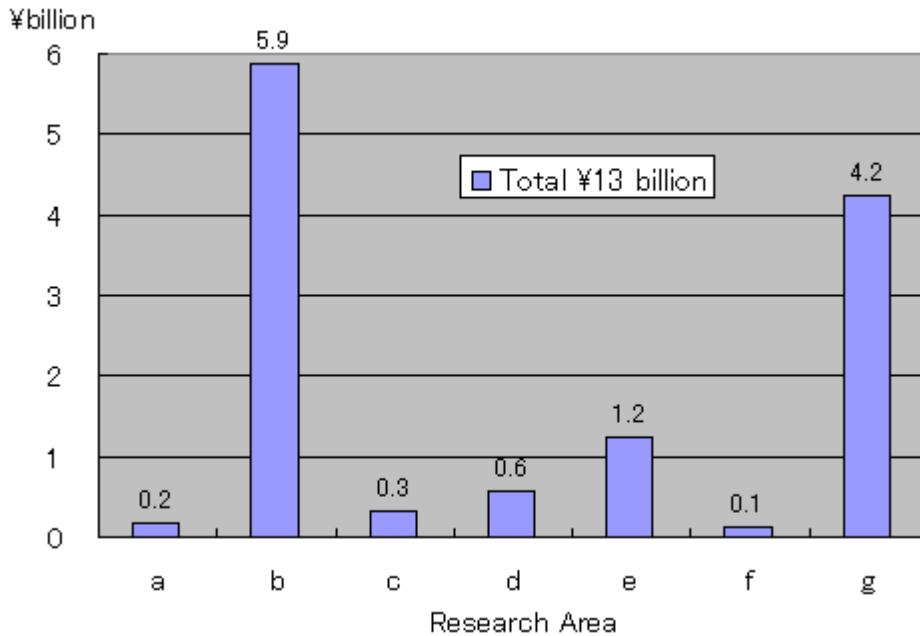
(C43) Research on the rehabilitation in the Landscape level of degraded tropical forest  
 (C44) Studies on ecosystem management approach in tropical landscapes  
 (C45) Study on the influence on wildlife and ecosystem functions of reed-bed management.  
 (C46) Quantitative study on habitat environment in stream ecosystems.  
 (C47) Study on technology for improving coastal environment by enhancing self-purification activities in tidal flats and shallows in coastal waters  
 (C48) Study on restoration technology of natural environment for streams and lakes.  
 (C49) Investigation of ecosystem conservation technologies  
 (C50) Development of technology to restore and improve water and material cycles, and ecosystem functions.  
 (C51) Development of nature-friendly technology to improve the national land.  
 (C52) Gene-bank project on biological resources for agriculture.  
**(F15) Unraveling dynamics of nutrient salts in watersheds, streams, and coasts, and study on ecosystem conservation management.**  
**(F16) Development of technology to monitor and conserve endangered species in secondary natural environment.**  
**(F24) Assessment of influence on biodiversity of extensive farming in central upland areas and development of technology and renovation technology.**  
**(F25) Study on technology improving coastal environment to conserve biodiversity at coasts.**  
**(F26) Development of methods for survey on the relationships between water management and water environment.**  
**(F27) Study on environmental restoration in watershed landscapes.**  
**(F28) Study and technical development on easing the influences of foreign species on ecosystems.**  
**(F29) Study on conservation of marine-ecosystem.**

(C25) Impacts and risks of global warming.  
 (C28) Study on the habitat assessment models and evaluation procedure for biodiversity conservation  
 (C29) The study of the mechanism of biodiversity decrease caused by invasive species  
 (C30) Investigation of migration routes and habitats of migratory birds using advanced information and communication technology  
 (C31) Studies on gene transfer and influence of biological diversity by field application of living modified organisms  
 (C32) Preliminary study on environmental safety assessment of genetically modified crops-analysis of rice-pollen dispersal in agricultural field.  
 (C33) Study on ecological influence assessment of generically-modified organisms.  
 (C34) Nature-friendly water and material cycle.  
 (C35) Study on the current status of pollution by toxic chemicals in coastal sediments and its impact assessment to coastal ecosystems  
 (C36) Risk assessment on toxic chemicals in agricultural and fishery ecosystems.  
 (C37) Study on impact of environmental change on biodiversity in the Antarctic land ecosystem.  
 (C38) Global taxonomy initiatives for conservation of biodiversity in Asia and Oceania  
 (C39) Survey on technical development related to the influence on a land ecosystem of pesticides.  
 (C40) Unraveling mechanism reducing biodiversity and its conservation.  
 (C41) Study on influence of pathogenic organism on wildlife population.  
 (C42) Sustainability and biodiversity assessment on forest utilization options.  
**(F18) Ecological assessment influenced by invasive species or genetically-modified organisms.**  
**(F19) Environmental impact assessment of invasive alien species and development of preventive technology in agro-ecosystems.**  
**(F20) Impact assessment of genetically modified organisms on biodiversity and development of new assessment methods for environmental safety.**  
**(F21) Development of quantitative assessment for the environment influencing upper, typical, and special species of ecosystem.**  
**(F22) Development of quantitative assessment method of conservation measures for ecosystems.**  
**(F23) Elucidation of the spatial distribution of species and their ecological risk assessment.**  
**(F24) Assessment of influence on biodiversity of extensive farming in central upland areas and development of conservation and renovation technology.**

(C01) Study on a mechanism for conservation of biodiversity in watershed landscape.  
 (C02) Study on mechanism governing biodiversity in biological communities.  
 (C03) Development of a method to monitor genetic diversity among wildlife.  
 (C04) Study on biological production and material cycle in a deep-sea ecosystem.  
 (C05) Study on measurement of marine-ecosystem.  
 (C06) Study on a microbial ecosystem dependent on hydrothermal activity.  
 (C07) Interactions between natural environment and human social systems in subtropical islands.  
 (C08) Reconstructing the natural symbiosis: A historical approach to the cases in the far eastern archipelago and surrounding areas.  
**(F01) Fundamental survey on natural environmental for environmental assessment.**  
**(F02) Recognition of wild-life locality by gene sequences.**  
**(F03) Unraveling physiology and ecosystems of preserved animals.**  
**(F04) Investigation biological functionalities and development of application technologies for agro-environmental conservation.**  
**(F05) Unraveling marine ecosystems and developing technology for sustainable use of marine-resources.**

C: Current issue / F: Future issue

Figure 4 FY 2003 budget for living organism and ecosystems research



- (a) Basic research
- (b) Development of intellectual fundamentals
- (c) Prediction of biodiversity changes
- (d) Impact assessments of biodiversity changes
- (e) Conservation of biodiversity, and techniques and methods for its restoration
- (f) Sustainable use and management of land and natural resources
- (g) Sustainable use of biological resources, and policies for that goal

The FY 2003 budget for issues in Table 2. The table presents the approximate figure devoted to living organism and ecosystems research for issues registered as receiving subsidies at research institutions. Since Tab. 2 does not necessarily contain every single research issue, the total budget for research into living organisms and ecosystems is estimated at ¥13 billion, and the actual figure is thought to be somewhere in this range. Please refer to Fig.4 for details of the estimated figure for each research area.