出國報告（出國類別：研習開會）

出席「第三屆世界植物園大會」—亞太植物園網絡暨推廣教育活動報告書

服務機關：國立自然科學博物館
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派赴國家：大陸
出國期間：96 年4 月14 日～4 月20 日
報告日期：95 年7 月12 日

摘要

第三屆世界植物園大會的主題是“構建可持續發展的未來：植物園的作用”（**3GBGC: Building a Sustainable Future - the Role of Botanic Gardens**），會議研討的主要目標是：回顧世界各大植物園通過履行《全球植物園 2010 年目標》以實現《全球植物保護戰略》（Global Strategy for Plant Conservation 簡稱 GSPC）的目標所取得的成就。大會將突出成功案例，找出差距，爲全球植物園提供彼此學習和交流經驗的機會；並爲全球植物園界在 2007－2010 年的工作提供綱領和指導作用。大會議程包括**瞭解並記載植物多樣性、保護植物多樣性、可持續的利用植物多樣性、促進關於植物多樣性的教育和認識**等四大主題，出席研習培訓的主題爲“可持續發展的教育：一個循序漸進的過程”（Education for sustainable development, ESD），植物園是可持續發展教育的重心，從金字塔底醞釀累蓄觀念、資源、能量，從下往上運作，模擬大自然的網絡，利用循序漸進的過程，幫助大家自發性的發展出適合當地的推廣教育方式。

關鍵詞: 植物園、推廣教育、生物多樣性、保育

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目　　錄

頁次

壹、目的

世界植物園大會被公認爲世界植物園界最重要的國際會議，每 3 年舉辦一次，參加者爲世界主要植物園及網絡成員的專家和園長。大會由植物園保護國際（Botanic Gardens Conservation International，BGCI）組織、地方政府和（或）主管部門主辦，國際上有重要影響力的植物園承辦。一向有來自世界各地數百多個國家和地區植物園的數千多名植物學家、園藝學家和專家學者出席會議，因此國家級、甚至國際層級的植物園及植物園專家學者，應積極派員參與國際植物園相關協定制訂或議題討論，因此本次出席大會除了參加植物園推廣教育的研習，也參與亞太植物園網絡會議及大會重要的議程。

第三屆世界植物園大會的主題是"構建可持續發展的未來：植物園的作用"（**3GBGC: Building a Sustainable Future - the Role of Botanic Gardens**），會議研討的主要目標是：回顧世界各大植物園通過履行《全球植物園 2010 年目標》以實現《全球植物保護戰略》（Global Strategy for Plant Conservation 簡稱 GSPC）的目標所取得的成就。大會將突出成功案例，找出差距，爲全球植物園提供彼此學習和交流經驗的機會；並爲全球植物園界在 2007－2010 年的工作提供綱領和指導作用。

研習的培訓議程包括會前：1. 可持續發展的教育：一個循序漸進的過程；2. 高效的種子保存技術；3. 受脅植物的移植；4. 遷地活體植物的保存和記錄管理；5. 新的互聯網溝通工具：讓你的工作如虎添翼；6. 《紅色清單》：爲什麼它如此重要？；7. 區域性的網絡會議等。 會後：8. 亞洲各國履行《全球植物保護戰略》情況培訓班：履行權的探索與經驗的分享。還有同期舉行「園藝暨綠色科技展」，其中展出內容涉及與植物園相關的各種資源，包括綠色能源、科研及學術成果、生物科技、生物製藥、植物園藝設備、育種育苗、應用軟件、環境保護、出版、科普教育以及各種花卉等。

由於議題豐富，議程緊湊重疊，很難一人各項目均全程參加，必須重點式的選擇規劃，因此本次參加大會重點參與議程第四主題「增進植物多樣性的教育和認識」（Promoting education and awareness about plant diversity）：包括參加 1. 亞太植物園網絡會議研習植物園如何成功地參與國際實力建構項目（international capacity-building programs），藉此研討機會提供來自各國植物園相互結識建立有效的協作。 2. 教育爲永續發展（Education for sustainable development, ESD），由聯合國倡導的 2005-2014 年是 ESD 期，BGCI 教育團隊將領導教育師研習突破傳統的環境教育，專注在強化持續性、系統思考、文化意識和扶貧的永續發展教育，研習活動以按部就班過程，介紹突出的世界植物園的 ESD 案例，探索植物和地球的未來。 3．出席其他植物園和推廣教育相關議題，及資料蒐集。

貳、過程

一、　主題、目標及研習議程

第三屆世界植物園大會於 2007 年 4 月 15-20 日在大陸武漢召開，會議主題探討「植物園的作用爲構建可持續發展的未來」，爲達成本屆大會目標：回顧世界各大植物園通過履行《全球植物園 2010 年目標》以實現《全球植物保護戰略》（簡稱 GSPC）目標的努力，規劃了研討會的四大主題（附件 1），「主題 5：建構保育植物多樣性的能力」則整合在四大主題中。

主題 1：瞭解並記載植物多樣性

- 已知植物物種工作清單的編制工作進展：國際植物園間的合作
- 中國植物研究進展
- 本土植物保護狀況評估的案例研究
- 分類學在保育行動中的作用
- 地理資訊系統（GIS）工具： 支持植物園的工作
- 植物保育科學
- 活體植物收集管理的實踐
- 《全球日程》對保育的框架作用
- 保育、研究和教育的培訓
- 保育的模式和方法

主題 2：保護植物多樣性

- 全球植物園保護戰略》和植物園
- 在氣候不斷變化下的植物保育：應對氣候改變的挑戰
- 植物園和就地保育
- 全球樹木保護運動
- 本土受脅植物在植物園的保育
- 種子的保存
- 生物收集：保育的重要性
- 園藝和保育
- 再引種：保護野生種群
- 入侵物種

主題 3：可持續的利用植物多樣性

- 藥用植物和社會經濟植物的保育和可持續利用
- 本土分類群：觀賞樹木和市容美化植物資源
- 植物園對實施 CITES 的貢獻
- 植物園可持續的實踐：資源利用
- 植物園尋求資金支持

- 植物園在經濟植物開發中的作用
- 資訊和利益共用
- 生物多樣性和人類福利的聯繫
- 可持續收穫的實踐
- 分子工具在保育和可持續利用植物工作中的作用

主題 4：促進關於植物多樣性的教育和認識

- 植物保育和環境教育的公眾參與
- 全球氣候變化的宣傳
- 植物園：我們的遺產
- 植物基礎教育的全球研究
- 瞭解您的遊客並積極回應他們的需求
- 通過解說來傳達資訊
- 《全球植物保護戰略》目標 14：接受挑戰
- 市場：向動物園界學習
- 植物園和它們的保育合作夥伴
- 生態旅遊和植物園

本次大會由中國科學院、植物園保護國際組織、湖北省政府和武漢市政府四方共同主辦，武漢植物園承辦。本次大會的主題是"構建可持續發展的未來：植物園的作用"。吸引了來自世界各地 67 個國家和地區植物園的 1000 多名植物學家、園藝學家和專家學者出席會議，議程包括 4 個全體會議、42 個研討會議、7 個培訓研習會、6 個區域網絡會議，共有 202 個論文宣讀和 145 專研海報。

培訓研習會議：

1. 可持續發展的教育：一個循序漸進的過程
2. 高效的種子保存技術
3. 受脅植物的移植
4. 遷地活體植物的保存和記錄管理
5. 新的互聯網溝通工具：讓你的工作如虎添翼
6. 《紅色清單》：爲什麼它如此重要？
7. 亞洲各國履行《全球植物保護戰略》情況培訓班：履行權的探索與經驗的分享。

7 個研習的培訓議程除了第 7 個在會後舉行，其他 6 個全在 4 月 15 日同時不同場地舉行，因此報名參加了推廣教育相關的「可持續發展的教育：一個循序漸進的過程」。

區域性的網絡會議：

區域性的網絡會議工作重點集中到《全球植物保護戰略》的實施及各區域內植物園的聯繫與合作。目前各區域網絡組織的協調員名單如下：

亞太：Etelka Leadlay，BGCI，澳洲、紐西蘭及太平洋區，E-mail: Etelka.Leadlay@bgci.org
亞洲：Anle Tieu, BGCI 中國專案協調員，E-mail: anle.tieu@bgci.org
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Junko Oikawa, BGCI 日本項目協調員，E-mail: Junko.Oikawa@bgci.org
非洲：Christopher Dalzell，非洲植物園網路協調員(ABGN)，E-Mail: dalzellc@durban gov.za
北美：David Galbraith，植物保育北美合作夥伴主席，E-mail: dgalbraith@rbg.ca
美洲（拉丁美洲及加勒比地區）：Alberto Gomez Mejia，拉丁美洲及加勒比地區植物園協會主席（ALCJB），E-mail: gomezmejia@cable.net.co
歐洲：Suzanne Sharrock, BGCI 全球專案官員，E-mail: suzanne.sharrock@bgci.org

二、 研習行程及內容

時 間	行 程 地 點	工 作 內 容
4 月 14 日	台中-桃園-香港-武漢	往程、註冊報到及處理會籍會費
4 月 15 日	武漢	推廣教育研習會暨亞太植物園網絡會議
4 月 16-18 日	武漢	大會議程暨推廣教育研討會議
4 月 19 日	武漢-香港	植物園參訪
4 月 20 日	香港-臺灣	返程

目前由於植物園保護國際（Botanic Gardens Conservation International，BGCI）組織包括臺灣區域的植物園僅 4 個：國立自然科學博物館植物園、行政院農業委員會林業試驗所的台北植物園、福山植物園及恆春熱帶植物園，大陸約含 140 個，曾經在 2005 年 BGCI 在網路資料重整時，就誤把臺灣的植物園全部歸入中國大陸區域範圍，爲此本館植物園拒繳會費，並和行政院農業委員會林業試驗所的植物園聯合抗議，因此 BGCI 曾派亞洲網絡協調員日本和澳洲代表來台溝通，自此臺灣區域植物園歸於臺灣，不再隸屬於中國大陸區域。植物園資料授權由各園自行修正，但本館的帳號和密碼卻一直無法進入修正，又不得正確申述窗口，直到今年大會前，發信重申本館植物園的立場，終於申請到正確帳號和密碼，修正會籍資料完成。因此於大會註冊報到時，再次確認會籍會費疑義的處理，蒐集到 BGCI 會籍會費處理主任秘書的聯絡方式，及溝通未來本館植物園繳會費的優惠等級和選擇較低廉的幣別。
研究及會籍服務部長：Dr. Etelka Leadlay, Head of Research and Membership Services
會場服務主秘：Dr. Douglas Gibbs, Membership

I. 推廣教育研習會—**可持續發展的教育：一個循序漸進的過程**（Education for Sustainable Development, ESD: ）

植物園保護國際（BGCI）組織推廣教育組的 **Julia Willison** 爲此會教育負責人，
Sarah Kneebone 爲共同主持的教育講師

簡介：當今，傳統的環境與植物園科普教育方法在可持續性、系統思維、文化意識和緩解貧窮等方面得到了不斷的加強。這種教育方法就是逐漸爲人們所熟悉的“可持續發展教育”（ESD）。可持續發展教育是一種趨勢，因此聯合國確定 2005～-2014 年爲“可持續發展教育的 10 年”。作爲 EE 領域的領頭人，植物園是可持續發展教育的重心。通過本培訓班，參加者將掌握如何就可持續發展教育書寫各種專案計畫。通過介紹、討論、實際操作、以及分組交流等方式，BGCI 的教育團隊將爲大家介紹“可持續發展教育”的歷史與框架，幫助大家如何就可持續發展教育項目提出自己的觀點，重點研究世界各大植物園的可持續發展教育案例。通過本培訓班，參加者還將掌握如何在實際工作中開展可持續發展教育工作。

研習過程首先從國際文件追溯永續性的環境、保育及教育的議題，人類從環境教育和發展教育，經過和平、人權、政治、性別、健康等因素的刺激與融合，演變到目前追求永續發展的教育。

環境教育如何轉變至永續發展的教育？除了個人行爲、認知、知識、技能等逐年增進人類感性對生態多樣性的瞭解，另一方面社會經濟、政治結構、生活方式的衝擊，也必須經過平權、公義、民主、尊重等道德平衡的洗練，因此嶄新的「可持續發展教育」自然衍生是一種趨勢。觀念從金字塔頂往下瀑布式的教育推廣方式，轉變從塔底醞釀累蓄觀念、資源、能量，從下往上運作，這是模擬大自然的網絡，利用循序漸進的過程，幫助大家自發性的發展出適合當地的推廣教育，研習概念細節如附錄一。

研習方式以環境瞭解的賓果遊戲開場，接著利用小組及集體討論的方式，探索環境保育議題與社會政經衝突的解答，過程利用個人、社會等不同的價值層面，循序漸進的釐清、辯駁和討論，藉者熱烈的參與和深層的啓發誘導，與會者可從同伴和過程激發學習不少可持續發展教育的重點，推廣教育的規劃設計與技巧，最後此會希望從研習中，提供大家可適用的可持續發展教育規劃架構。簡潔的研習過程案例講義於附錄一。

II. 亞太植物園網絡會議（Asia Pacific Botanic Gardens Network Meeting）

7 個區域植物園網絡會議中，亞洲分開東亞及亞太兩個小組討論，二者均與臺灣植物園相關，但事先會議訊息的傳遞似乎有落差，結果林業試驗所台北植物園受邀參與東亞區域植物園網絡會議（Eastern Asia Botanic Gardens Network Meeting），而本館植物園受邀參與亞太植物園網絡會議，根據邱文良組長參與轉述重點：1. 建立東亞區域植物園網絡過程，2. 提名區域協調員，網絡會議主要推舉各區域代表或窗口，因爲只有台北植物園出席，所以成爲臺灣區當然代表。相關議程資料如附錄二。

受邀出席的亞太區域植物園網絡會議（Asia Pacific Botanic Gardens Network Meeting）議程重點與亞太區域各植物園網絡相關主要在如何成功地參與國際實力建構項目（international capacity-building programs），藉此研討機會提供來自各國植物園相互結識建立有效的協作。

亞太植物園網絡會議研習討論的植物園代表包括：

Dr. Lawrence K. C. Chau (周錦超)嘉道理農場暨植物園公司 kflkchau@kfbg.org http://www.kfbg.org 介紹嘉道理農場的經營管理，與大陸植物園、東南亞植物園間建教合作，特別推舉蘭花研究生在新加坡植物園學習、研究進而回饋提供新見解的成功三贏案例。

Dr. Wong, Wei-Har （黃偉霞）Depty Director, Singapore Botanic Gardens, National Parks Board wong_wei_har@nparks.gov.sg http://www.nparks.gov.sg 介紹新加坡植物園的經營管理、提供觀光休憩、教學合作等相關成果。

Prof. Wei-Bang Sun（孫衛邦）Excutive Director of Kunming Botanic Gardens wbsun@mail.kib.ac.cn http://www.kib.ac.cn 介紹昆明植物園的蒐藏特色與未來展望。

相關詳細會議記錄如附錄二。

III. 參與大會議程內容

除了全會報告之外，依四大主題還有三十多個同時進行的研討會，無法同時出席聆聽，基於此次補助參加大會的重點爲推廣教育，所以主要選擇出席推廣教育相關的專題：植物多樣性的科普及公眾教育（Theme D：Promoting education and awareness about plant diversity）研討會的演講。僅就參加的精彩內容概述如下：

圖： 第三屆世界植物園大會的主席暨籌備委員、分組總代表、四主題主持人、全會報告講員共同主持盛況。

第一天的全會報告由美國院士密蘇里植物園園長 Dr. Peter H. Raven 主講「建立一個全球的植物數據庫」，現代資訊處理科技已經可以讓我們逐年將所有有關植物的資訊

集結建構在一起。以系統分類的架構，包容所有生物多樣性的資料整合處理，可提供全球植物相關的保育措施，這樣共通共享的資料庫並可清晰有條理的留給世人做永續經營的基礎，應該是本會及全球共同努力的目標。

Monday - April 16, 2007

11:30-13:00 **PLENARY SESSION** (WSTCEC:4th Floor Auditorium)

11:30-12:00 • **Toward a World Plant Data Base**

Peter H. RAVEN
President Missouri Botanical Garden, .PO. Box 299, St. Louis, MO 63166-0299, USA and George Engelmann Professor of Botany at Washington University in St. Louis,, Missouir, USA

Modern information technology has given us the ability to collect, edit, and make available all of the information on plants that has been gathered through the years. A taxonomic framework for all plants can be constructed and agreed, with the data involved in its construction preserved in the system and subject to review for any purpose. Firm editorial arrangements will need to be established to improve the taxonomic framework continuously, with references to the reasons for the arrangements selected. All specimens, illustrations, annotations, and literature references can be made accessible within the system. As many specimens as desired can be imaged and these images made available on the Web. Rapid gains are being made in all of these areas and will be reviewed, with an emphasis on what is being done, and what it would be most useful to undertake for the future. Efforts to develop this valuable, comprehensive system are accelerating, and this meeting should afford an excellent opportunity to discuss next steps. For conservation purposes, as for any other uses to which information about plants might be put, the construction of a world plant data base clearly has fundamental importance.

12:00-12:30 • **A brief introduction to China's Strategy for Plant Conservation**

Dr. JIA Jiansheng
Deputy Director-General, Department of Wildlife Conservation, State Forestry Administration, 18 Hepingli Dongjie, Beijing 100714 P. R. China

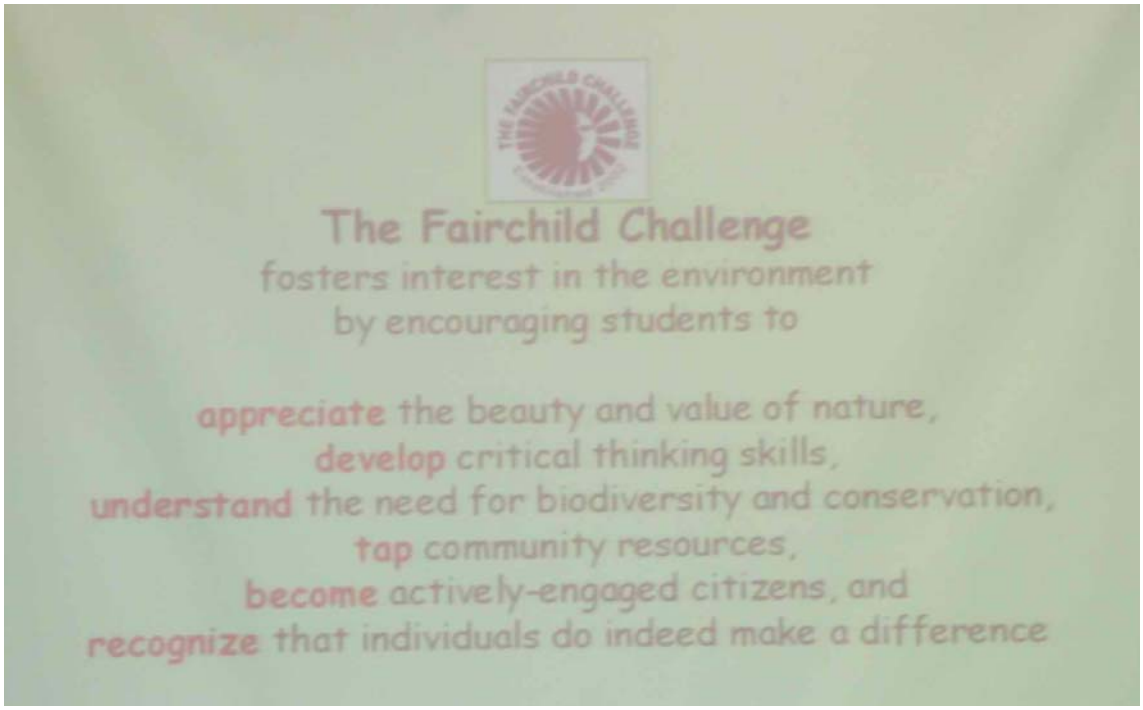
For conserving plant diversity and implementing the *Convention on Biological Diversity*, the relevant agencies of the Chinese government have prepared the text of *China's Strategy for Plant Conservation* based on the 16 targets of the *Global Strategy for Plant Conservation*. The presentation will give a brief introduction to *China's Strategy for Plant Conservation* including the aims and objectives, background and also the 16 targets in China. Each target has three aspects; the current status of plant conservation, problems and constraints that are faced, and the actions necessary in the near future. The implementation of *China's Strategy for Plant Conservation* will further strengthen the conservation of China's plant diversity and make a great contribution to the implementation of the *Global Strategy for Plant Conservation.*

植物多樣性的科普及公眾教育（Theme D：Promoting education and awareness about plant diversity）主題：通過學生教育促進可持續發展（Involving and engaging students for sustainability）

1. Community change with the Fairchild Challenge
2. Schools' education in Prague Botanic Garden
3. The role of Maseno University Botanic Garden, Maeno University, Kenya
4. Theme gardens and interpretation in a South African NBG context

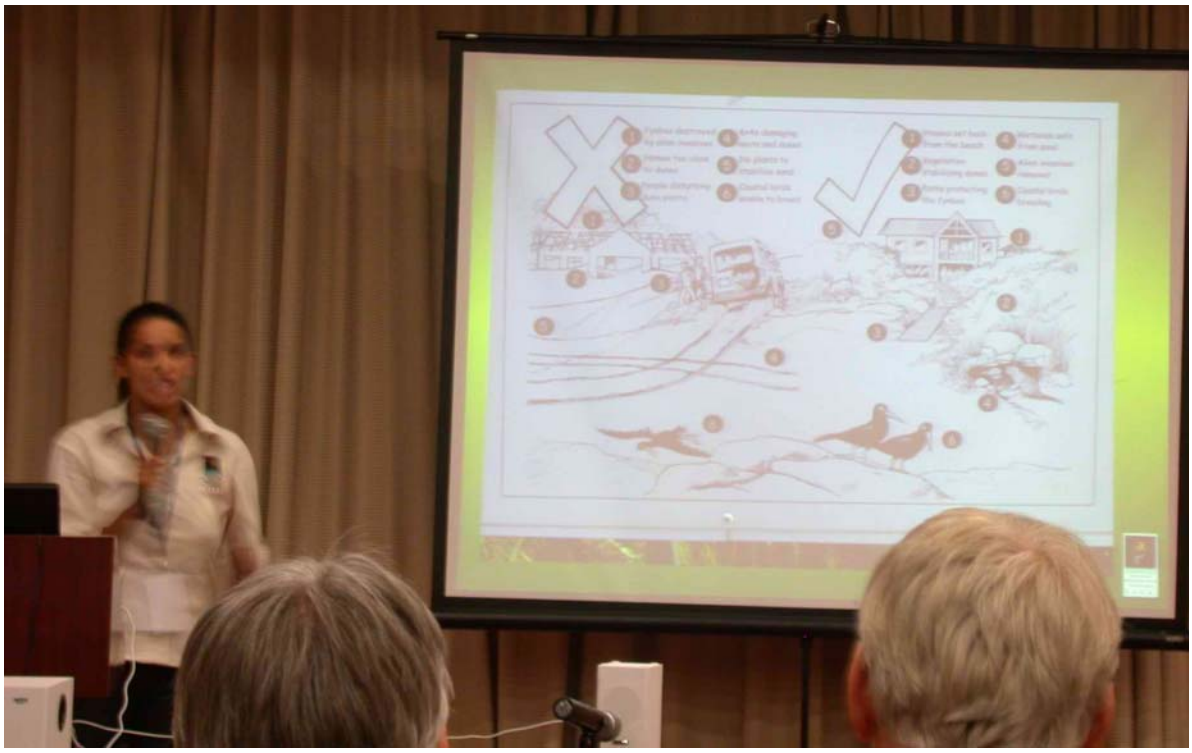
植物多樣性的科普及公眾教育（Theme D：Promoting education and awareness about plant diversity）主題：生動的植物解說（Bring plants to life through interpretation）

5. Convey the conservation message in a more interactive way
6. What’ s new in a deciduous oak forest? The ‘Path of Plant Biodiversity’ in the Balkan Botanic Garden
7. World Heritage links for botanic gardens- a case study
8. Theme gardens and interpretation in a South African NBG context



與學校互動，提供建教參與互動活動，包括珍惜自然之美與價值、發展犀利的思

考方式、瞭解生物多樣性與保育的需求、標示出社群的資源、變成主動參與的居民以及認知個人真的可以進一步改變。



南非植物園結合當地不同區域環境特色、部落、民俗及主題動線規劃，做出相當多成功的案例，包括不同標示牌、看板的設計。

南非植物多樣性網絡（SABONET，http://www.sabonet.org.za/）是具相當豐富資源的網站，這個網絡連結與發展南非區域的標本館、植物園和植物專家，網站上有許多新聞、教材、研究報告，甚至植物多樣性的資訊、稀有和瀕危植物的名錄，值得參訪學習及運用。

（The Southern African Botanical Diversity Network - SABONET - is a GEF Project aimed at developing botany in southern Africa. The network connected and developed southern African herbaria, botanic gardens, botanists and other plant specialists through workshops, courses, and funding. SABONET also published a newsletter, SABONET News, and books in the SABONET Report Series with information on southern African plant biodiversity and rare and threatened plants, including checklists of the plants of Angola, Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland, Zambia, and Zimbabwe.）

第二天的全會報告由 BGCI 主席 Sara Oldfield 主講「植物滅絕－威脅因素和解決途徑」，Dr. David Bramwell 主講「在變化的世界中保護植物：如何應對全球氣候的變化」。這是當下全球都很關心的議題，演講內容提出目前植物滅絕的危機，強調現知全球瀕危植物及所面對的威脅，目前及潛在的植物園對於原地和移地的保育能力除了各自努力，更應透過合作團隊完成更有效的成果。

當今全球環境變遷比人類歷史上的其他時間更快，最大的改變是氣候。人類的命運是與植物命運息息相關的，如何討論呼籲建立「氣候變遷和植物保育密切相關」的重要政策、保育研究和保育行動，儘快提出修正生物多樣性政策、研究需求和保育行動是全人類重要的課題。

Tuesday - April 17, 2007

9:00-10:50 **PLENARY SESSION** (WSTCEC:4th Floor Auditorium)

9:00-9:30 • **Plant extinction – threats and solutions**

Sara OLDFIELD
Secretary General BGCI, Descanso House, 199 Kew Road, Richmond, Surrey TW9 3BW, UK

This paper will provide an overview of the current plant extinction crisis, highlighting what is currently known about threatened plants worldwide, the threats faced by plant species and the effectiveness of measures to save them. The Millennium Ecosystem Assessment will be used to provide context. The role of international policy mechanisms in plant conservation will be discussed with a particular focus on CBD and with reference to CITES. The current and potential scope for in situ and ex situ conservation activities by botanic gardens working individually and through partnerships will be emphasised.

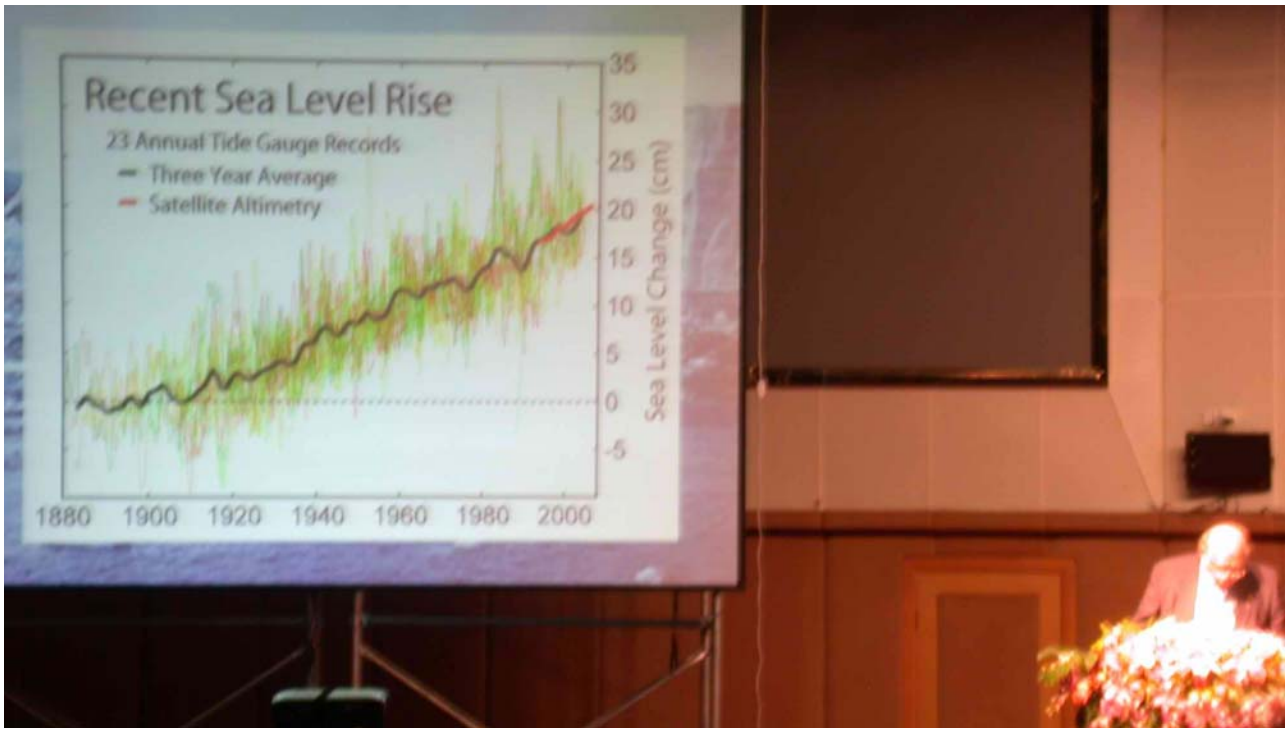
9:40-10:10 • **Conservation in a changing world: responding to the challenge of climate change**

Dr David BRAMWELL
Director, Jardín Botánico 'Viera y Clavijo' Las Palmas, Spain

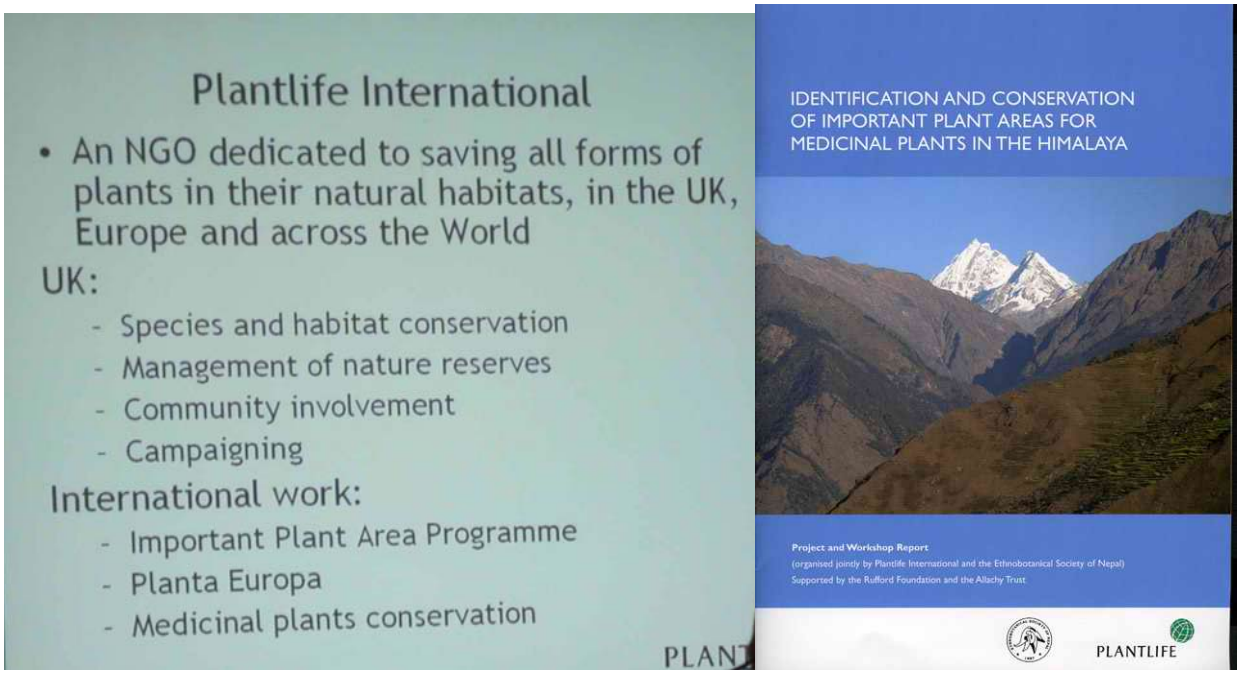
The world today is changing more rapidly than at any time in human history. The greatest alterations of all concern the Earth's climate. These changes are intimately connected with plants, which harness the energy of the sun through photosynthesis and maintain the conditions for all life on the planet. The fate of humanity is inseparable from the fate of plants.

At a meeting held on *Climate Change and Plant Conservation*, in Gran Canaria, Spain in April, 2006, an action plan was proposed encompassing policy, conservation research and conservation actions. They are designed to prevent plant species extinction and the failure of ecosystem functioning under current and future climate change scenarios. Modifications to biodiversity policy, research needs and conservation actions are proposed for immediate implementation.

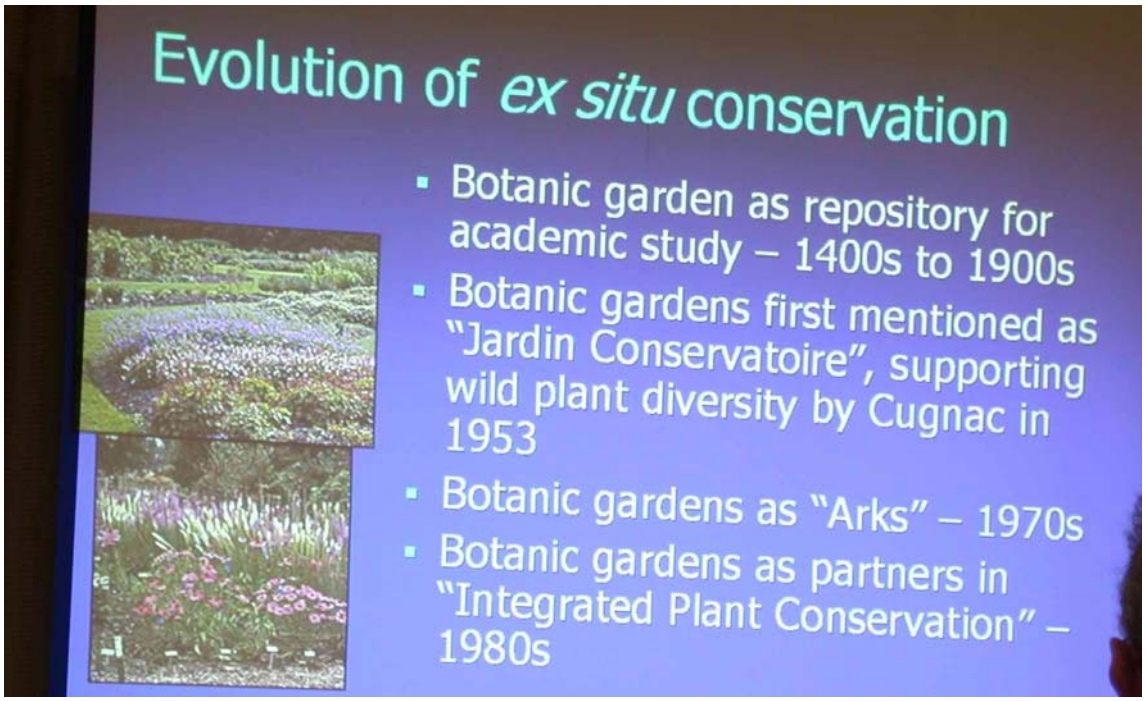

(a)
How different will this map look in 50 years time


Recent Sea Level Rise
23 Annual Tide Gauge Records
Three Year Average
Satellite Altimetry
Sea Level Change (cm)
35
30
25
20
15
10
5
0
-5
1880
1900
1920
1940
1960
1980
2000

圖：近來海平面上升曲線



圖：植物報卡可推廣到調查資訊的標準化，與未來全球植物資料庫的整合（The floral report card: monitoring floristic change in an era of global climate change）



圖：移地植物保育的演化

植物多樣性的科普及公眾教育（Theme D：Promoting education and awareness about plant diversity）主題：景觀設計的啓示：通過蒐集的植物進行科普及公眾交流（Learning from Landscapes: Communication through Collections）

9. Communicating the mission of Lake Baikal region botanic garden
10. Education to conserve plant diversity through sustainable landscapeing

11. Conservation interpretation at the United States Botanic Garden
12. Plants and humans: landscape design and the botanical education programme

圖：巴卡湖區植物園的規劃任務研討

主題：植物基礎教育的全球研究（Global research on plant-based education）

13. Flourishing collaborations – the story of Wakehurst Place, Royal Botanic Garden, Kew and a local school
14. Using image to attract visitors in botanic gardens
15. A global snapshot of botanic garden education provision
16. The ‘Garden Window’ project

主題：瞭解滿足遊客的需求（Knowing your visitors – responding to needs）

17. Ways of listening and making change
18. Are we preaching at the right level?
19. New directions for developing botanic gardens
20. Children’s education in Singapore – responding to a need

圖：保育展示推廣配合觀眾互動行為的規劃，變化成解說員成休憩定點，展演主題植物。

第三天海報展覽、「園藝暨綠色科技展」、參觀武漢植物園及武漢博物館

因大會議程四個主題從早到晚同步進行，與會專家學者的交流幾乎必須分秒必爭，所以第三天的議程讓大家經過三天的腦力激盪，餘意迴旋之時，把握討論交流的延續，讓大家較自由的選擇，著重在參觀展覽海報數百個，且同期舉行「園藝暨綠色科技展」，其中展出內容涉及與植物園相關的各種資源，包括綠色能源、科研及學術成果、生物科技、生物製藥、植物園藝設備、育種育苗、應用軟件、環境保護、出版、科普教育以及各種花卉等。大會也安排了參訪當地重要的相關單位：中國科學院武漢植物園及武漢博物館。

海報閱覽：簡介幾種代表性項目包括植物園的建構與規劃經營、植物園保育目標與成果、保育研究與推廣教育…等。

1. 發展中的愛爾蘭國家植物園－Kimacurragh 樹木園：衛星植物園的規劃建構

national botanic gardens of Ireland

KILMACURRAGH ARBORETUM: DEVELOPING A SATELLITE GARDEN FOR THE NATIONAL BOTANIC GARDENS OF IRELAND

Peter Wyse Jackson* & Seamus O'Brien**,
* National Botanic Gardens of Ireland, Glasnevin, Dublin 9. Ireland
** Kilmacurragh Arboretum, Kilbride, Co. Wicklow, Ireland

Map of the Kilmacurragh Arboretum

The Arboretum at **Kilmacurragh**, Kilbride, Co. Wicklow, south of Dublin, Ireland's capital, is an important and **historic garden** now managed by the **National Botanic Gardens of Ireland**. A major **restoration** programme has been undertaken since 1996. Following decades of neglect, a new development plan is now being implemented.

The Arboretum is particularly famous for its **conifers** and **calcifuges** and was planted during the 19th Century by Thomas Acton, in association with the curators of the National Botanic Gardens at Glasnevin. Planting began on the estate in the 1850s when a wide range of plants were introduced that could not be grown in the less favourable climate and soils at the National Botanic Gardens Glasnevin. During the early part of the twentieth century the estate passed from the hands of the Acton family and fell into a state of neglect. In 1970 the property was taken over by the government. A 58 acre portion comprising the house, arboretum, walled garden and entrance drive-way was handed over to the State before becoming part of the National Botanic Gardens in 1996.

Thomas Acton and his sister Janet began planting the arboretum in 1850. It is said he had a rule of thumb to plant three of every tree or shrub: one to be planted where others told him it would definitely survive, one where he thought it would thrive, and one where he was informed it would definitely not survive. Alas we do not know of any surviving records as to which was which.

An avenue of *Rhododendron arboreum* and Irish yews (*Taxus baccata* 'fastigiata') runs from the rear of the house, surrounded by glades of southern conifers and many other rhododendron species. Central to the estate is Kilmacurragh House, built in 1697. Disastrous fires in 1978 and 1982 destroyed the roof timbers and now the house is in ruins. Restoration of the house may be considered in the future.

Future Plans

In recent years a major programme of replanting the Arboretum has been put in place. This includes sections for plants of **China**, **Chile** and the **Himalaya**. A Visitor Services and Educational programme has been established, including programmes of guided tours, workshops and other educational opportunities. The ecological restoration of native woodland and grassland ecosystems is also being undertaken, including proposed genetic collections of native tree species. Kilmacurragh Arboretum provides not only an important new area where the scientific research and conservation programmes of the National Botanic Gardens can be developed further but also an important visitor and environmental education amenity for the growing metropolitan population of Dublin.

Rhododendron avenue at Kilmacurragh Arboretum

The **National Botanic Gardens of Ireland** welcomes the development of new links and collaboration with institutions worldwide. Opportunities are available at Glasnevin for:

- Horticultural placements and training
- University post-graduate opportunities
- Collaboration in science, conservation and horticulture

Please contact us for further information.

Email: botanicgardens@opw.ie
Website: www.botanicgardens.ie

Araucaria araucana avenue

2. 伊甸園的發展計畫：從建構理想到執行現況。

What is the Eden Project?

Opened in 2001 the Eden Project's mission is **"To promote the understanding and responsible management of the vital relationship between plants, people and resources, leading to a sustainable future for all."** Eden is a social enterprise, the primary purpose of which is to maintain and develop a place of incomparable beauty and interest that draws and educates people from across the globe. Eden aims to play a major role in significant social and environmental change globally. Eden is amongst the top five paid-for visitor attractions in the UK, has raised £130 million in grants, hosted 8 million visitors, maintains a workforce of 430 and has made an astounding contribution of £750 million to the local economy.

Photograph taken in 1995 of the former Cornish china clay pit.

Facilitating Change!

Eden presents, to the widest possible public audience, the need for environmental care through celebrating what nature gives to us. Eden illustrates the choices we can make to foster a better world.

Eden believes that people really want to do something positive to make a difference but are:

- **Confused about the complex issues**
- **Held back by a lack of understanding about the connections between them**
- **Overwhelmed by the scale of the challenges**
- **Unclear what actions are really effective, what changes are under their control and generally worried that there will not be a positive route to the future**

Eden's role is to tackle these barriers by developing an interpretation and education programme that builds connections, illustrates choices and builds an understanding that we can rise to the challenge and face change with hope.

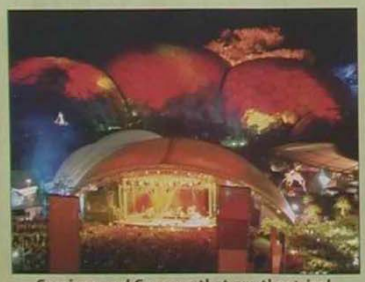
Photograph taken in 2001 of the Eden Project with the two biomes the larger being the Rainforest Biome, the smaller, the Mediterranean Biome.

Here are some of the ways we do this...

A World class visitor destination
(Eight Million visitors through our doors in the last five years)

Celebrate campaigns which reflect our mission statement

The Core Education building is a model of sustainability



Sessions and Seasons that are theatrical, provide hope, stir emotions and inspire change.

Provides displays without plants...
(Sexy Green Car Show held at the Eden Project March 2007)

Eden Projects messaging extends through our books, catering, and retail

We aspire to demonstrate best practices...

Deliver change through Partnerships

Bringing people together to hold conversations that just might lead somewhere...

The Future, The Edge!

projects short listed to go through to the second stage

eden

3. 植物園保護國際（BGCI）組織推行植物保育的全球政策

The Global Partnership for Plant Conservation

The Global Strategy for Plant Conservation (GSPC) was adopted by the Convention on Biological Diversity in April 2002. The objective of the GSPC is to halt the current and continuing loss of plant diversity. The GSPC includes 16 outcome-orientated targets to be achieved by 2010.

The Global Partnership for Plant Conservation (GPPC) is a voluntary initiative that brings together international, regional and national organisations in order to contribute to the implementation of the GSPC. The GPPC was launched on Friday 13th February 2004 during the 7th CBD COP meeting in Kuala Lumpur, Malaysia.

Aims of the Partnership The Partnership provides a framework to bring together existing initiatives for plant conservation, allowing gaps to be identified and promoting mobilization of the necessary resources.

Activities of the Partnership

- Activities organised or supported by the Partnership have included:
- Support for the development of national plant conservation strategies;
- Regional training courses in plant conservation;
- Development of GSPC-related 2010 targets at national and other levels (e.g. for botanic gardens);
- Undertaking plant conservation assessments at national, regional and global levels;
- Identifying and defining criteria for important areas for plant diversity;
- Developing projects at all levels for conservation and sustainable use of threatened plants and their habitats;
- Work towards completing a working list of all known plant species;
- Establishment of networks;
- Public awareness and education initiatives;
- Translations of the GSPC brochure into major world languages;
- The GPPC is supported by a Secretariat provided by BGCI.

GPPC Conference

In October 2005 the 1st Conference of the GPPC was held in Dublin, hosted and sponsored by the National Botanic Gardens of Ireland, with the OPW, BGCI and HSBC. The conference discussed progress in implementing the Global Strategy for Plant Conservation worldwide. Proceedings of the conference including case studies on GSPC implementation are available on ***www.botanicgardens.ie***

Website: *www.plants2010.org*

Contact:

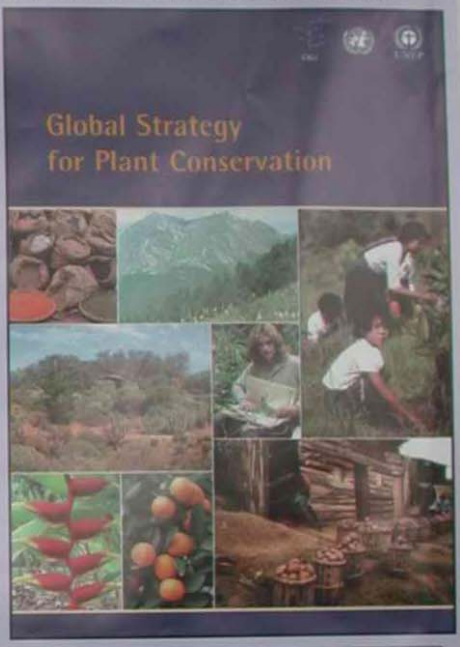
Peter Wyse Jackson, Chairman, GPPC (peter.wysejackson@opw.ie)
Stella Simiyu, BGCI / GSPC Programme Officer (stella.simiyu@biodiv.org)
Suzanne Sharrock, BGCI / GPPC Secretariat (suzanne.sharrock@bgci.org)

National dimensions

A major objective of the Partnership is to provide practical assistance, support and technical guidance for national implementation of the GSPC. Relevant organisations are invited to participate in and support the work of the Partnership at all levels. Please contact the GPPC Secretariat for further information.

International Liaison Group

In October 2006 the GPPC cooperated with the Secretariat of the Convention on Biological Diversity to organise an international Liaison Goup meeting on the Global Strategy for Plant Conservation, to consider progress on GSPC implementation; to help prepare for a forthcoming in-depth review of the GSPC by the Conservence of the Parties of the CBD in 2008 and to advise on options for the GSPC post 2010.



Members of the Global Partnership for Plant Conservation (GPPC)

Asociación Latinoamericana y del Caribe de Jardines Botánicos (ALCJB)
BioNET International
Botanic Gardens Conservation International (BGCI)
BGCI/ABG European Botanic Gardens Consortium
Chinese Academy of Sciences – Botanic Garden Network
Earthwatch
Fauna and Flora International (FFI)
Food and Agriculture Organization of the United Nations (FAO)
Global Biodiversity Information Facility (GBIF)
Global Invasive Species Programme (GISP)
International Plant Genetic Resources Institute (IPGRI)
IUCN - The World Conservation Union - Species Survival Commission
Jardí Botànic de la Universitat de València, Spain
King's Park and Botanic Gardens, Australia
Missouri Botanical Garden, St Louis, U.S.A.
National Botanic Gardens of Ireland
National Museum of Natural History - Smithsonian Institution, Washington D.C., U.S.A. (NMNH-SI)
People and Plants International (PPI)
Planta Europa
Plantlife International
PRONAPLAMED project, University of Costa Rica, Costa Rica
Rede Brasileira de Jardins Botânicos (RBJB)
Red Latinoamericana de Botánica
Red Nacional de Jardines Botánicos de Colombia (RNJB)
Royal Botanic Gardens Kew, U.K.
Royal Botanic Garden, Edinburgh, U.K.
South African National Biodiversity Institute (SANBI), South Africa
Species 2000
UNEP World Conservation Monitoring Centre (UNEP-WCMC)
University of Oxford Botanic Garden & Harcourt Arboretum
World Agroforestry Centre, ICRAF
WWF International (WWF)

4. 華中野生果樹種原的蒐集、建設與發展

5. 對短暫生活史的植物所做原地與移地保育的策略

Ex situ and *in situ* conservation strategies for spontaneous plant species in Puglia (ITALY)

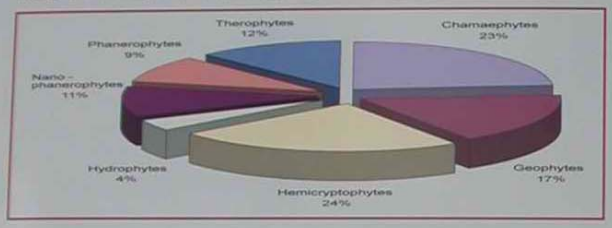
R. Accogli, P.Medagli, F. Ippolito, S. Marchiori

Botanical Garden - Department of Biological and Environmental Science and Technology
University of Salento (ITALY)

ABSTRACT

Of all nature conservation strategies, cultivation *ex situ* in botanical gardens is the most immediate; it enables the medium- and long-term survival of endangered and rare plants. The Botanical Garden of the University of the Salento has the following objectives: analysis of regional biodiversity; standardization of cultivation methods; propagation of those plant species which provide the structure of the main natural habitats; restoration of degraded environments with reintroduction of species typical of Mediterranean habitats (maquis, wetlands, dunes, evergreen woods). *In situ* conservation entails protecting endangered plants in their natural habitat; it provides for the rehabilitation and enhancement of natural ecosystems which host the above-mentioned species, in contexts where they interact with other organisms. The Botanical Garden also aims to provide appropriate and constant management of protected areas and to work closely with local government, in order to draw up guidelines and regulations for the implementation of conservation measures in the region.

In situ reintroduction, after propagation and cultivation in the Botanical Garden, has been tested using species included in the Italian National Red List: schools and local government have also been involved in environmental rehabilitation.



MISSION STATEMENT

The most important function of a modern Botanical Garden is to protect regional biodiversity, paying special attention to the phytogeographical context in which it is situated and prioritising autochthonous and endangered flora.

The activities of the Lecce Botanical Garden include: analysis of regional biodiversity; collection of material for propagation; establishment of protocols for propagation and cultivation; multiplication of structural species, i.e., those which provide the main natural habitats; maintenance of thematic collections of living plants; measures to promote renaturalisation and restoration in degraded environments, reintroduction into the wild of species characteristic of the main habitats of the Salento peninsula; information and education activities.

ENDANGERED FLORA

Puglia is a region with a rich spontaneous flora, estimated to include 2075 species of vascular plants. As well as common species found all over the region, there are many rare and localised species. A quantitative survey of flora species considered to be at risk of extinction in Puglia was conducted with reference to the criteria set out in the Italian national Red Book of plants (Conti et al., 1992) and the Italian regional Red Lists of plants (Conti et al., 1997), as well as unpublished data acquired more recently. It was estimated that of the 2297 species of flora in Puglia (Beccarisi et al. 2006), 180 taxa are at risk, including 74 species from the National Red List and 106 from the Regional Red List. The species of flora in Puglia at risk of extinction are subdivided into the IUCN categories shown in the table on the right).

EW	Extinct in the wild	4 (2%)
CR	Critically endangered	69 (39%)
EN	Endangered	42 (25%)
VU	Vulnerable	46 (26%)
LR	Lower risk	9 (5%)
DD	Data deficient	9 (5%)

HABITATS AT RISK

EU Directive 92/43/EEC contains an annex listing habitats considered to be at risk and thus requiring protection within the European Union. These habitats are classified into **priority habitats** and **habitats of community interest**. The former include rare or fragile habitats, and those generally located in areas subject to modification by human beings, which thus require urgent measures for their protection. The latter include habitats which are representative of the biodiversity of the territory of the EU, more common and thus at lower risk than the former but which also require protection. Puglia contains 43 habitats listed in Directive 92/43/EEC, subdivided into 13 priority habitats and 30 habitats of community interest. To these may be added 13 other habitats not mentioned in the Directive, but judged to be deserving of protection on a national or regional level and defined as "additional habitats".

Code	Priority habitat of Puglia
1120	Posidonia beds (Posidonion oceanicae)
1150	Coastal lagoons
1510	Mediterranean salt steppes (Limonietalia)
2250	Coastal dunes with Juniperus spp.
2270	Wooded dunes with *Pinus pinea* and/or *P. pinaster*
3170	Mediterranean temporary ponds
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco Brometalia*) (*important orchid sites*)
6220	Pseudo-steppe with grasses and annuals of the species of the *Thero-Brachypodietea*
7210	Calcareous fens wint *Cladium mariscus* and species of the *Caricion davallianae*
9210	Apennine beech forest with *Taxus* and *Ilex*

CONSERVATION *EX SITU*

Cultivation *ex situ* in Botanical Gardens is the most immediate conservation strategy, enabling the medium- to long-term survival of species which are rare or at risk.

Conservation *ex situ* involves the following issues: seed banks, micro-propagation, mother plants, cultivation in pots, reintroduction *in situ*, and exchange of information and material with other organisations. The conservation of plants and their reproductive parts is important both for the conservation of plant biodiversity and the improvement of growing techniques which enable the survival of the species being cultivated.

For nearly all the species, experiments have been conducted with both agamic and gamic reproduction, in the most natural conditions possibly, in order to compare the capacity for diffusion and multiplication *in situ* and *ex situ*.

CONSERVATION *IN SITU* AND *ENVIRONMENTAL RECOVERY*

The Botanical Garden of Lecce regularly participates in protection programmes involving the recovery of seriously threatened or degraded habitats, via the reconstruction of natural plant populations. This entails propagation of species characteristic of Mediterranean habitats – inland, on the coast and in wetlands. The retrieval and collection of plant species helps to identify potential biogenetic reserves in the region, and facilitates studies of the germination potential of seeds.

The reintroduction *in situ* of *Periploca greca* L., and *Limoniastrum monopetalum* (L.) Boiss, required the reconstruction of the entire habitat, starting with the structural species. This intervention also has an educational function, involving schools and local government in the affected areas, thus encouraging their active participation.

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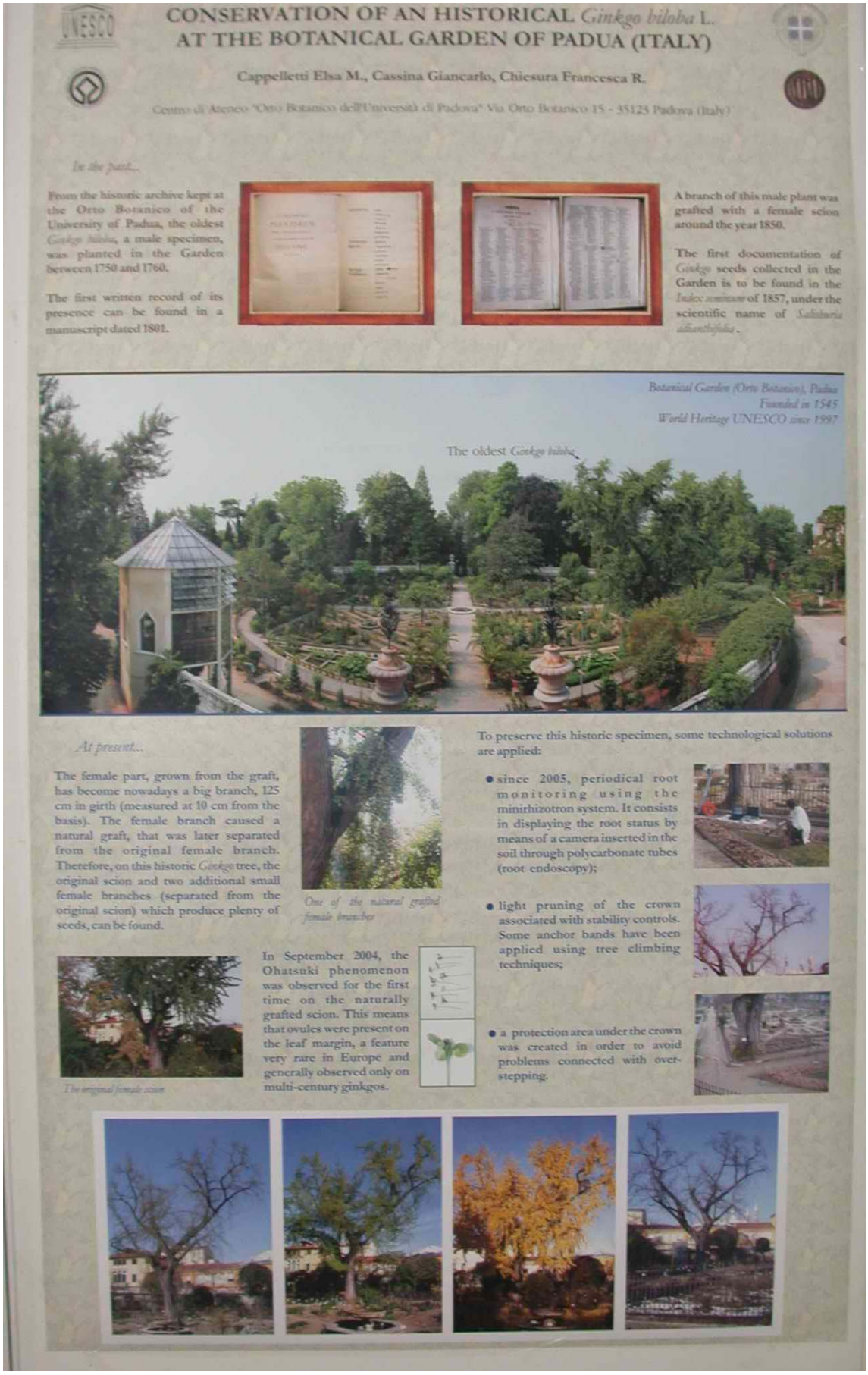
Our thanks to S. Arzeni for the graphics on this poster

6. 對歷史老樹（銀杏）的保育與展示



7. 霧社山櫻花種原保育的研究

Studies of seed dormancy and germination for conserving an endemic and vulnerable species, *Prunus taiwaniana*, in Taiwan

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Taiwan Forestry Research Institute, Taipei, Taiwan
E-mail: sychen@tfri.gov.tw

【Abstract】

Prunus taiwaniana is an endemic species in Taiwan and is considered to be a vulnerable species on the criteria of the IUCN Red List of threatened species. Seeds of *P. taiwaniana* did not germinate at alternating temperatures of 25/15°C, but slightly germinated at 20/10°C, and germination percentage was 6.7-22.6% after 22 weeks incubation. Cold stratification at 5°C for 8, 12 and 16 weeks increased germination to 15.6, 12.2 and 14.4%, respectively, and the ungerminated seeds remained dormancy. Seeds stratified at 25/15°C for 2 weeks followed by cold stratification at 5°C for 4 weeks significantly increased germination to >80%. Result showed that warm plus cold stratification is an effective method for promoting seed germination of *P. taiwaniana*. Seeds of *P. taiwaniana* that required cold stratification for dormancy break exhibit physiological dormancy.

Introduction

Prunus taiwaniana Hayata (Rosaceae) is a deciduous tree that is sparsely distributed in central Taiwan between 900 and 2400 m elevations and is considered to be a vulnerable species. It is an endemic species in Taiwan and produces white flowers in February-March and dark red mature fruits in April-May, making it a valuable ornamental plant. Freshly harvested seeds of *P. taiwaniana* are dormant at maturity and germinate to low percentage. The purpose of our study was to characterize a method to enhance seed germination of *P. taiwaniana*. Two dormancy-breaking pretreatments were used in the study: one is moist cold stratification at 5°C, whereas the other one is warm stratification at 20/10 or 25/15°C plus cold stratification at 5°C.

Materials and methods

Seed collection and preparation

Mature dark red fruits of *P. taiwaniana* were harvested from Wushe and Aowanda, Nantou county, central Taiwan, at elevation of 1100 m in April 2005. Fruits were macerated by hand in water and the empty seeds were floated off and discarded. The clean sunken seeds were used for subsequent pretreatments.

Moist cold stratification at 5°C

Fresh seeds were mixed with moist sphagnum (small pieces) (water content of the sphagnum was about 400% of its dry mass), sealed inside polyethylene bags and stored at 5°C in darkness for 8, 12, and 16 weeks. The cold-stratified seeds were removed from storage room for germination test at 25/15°C (12/12 h).

Warm plus cold stratification

Freshly harvested seeds were placed in sealable polyethylene bags with moist sphagnum and sealed and then they were warm-stratified for 2 and 4 weeks at an alternating temperatures regime of 20/10 and 25/15°C in light. The warm-stratified seeds were then given 4, 8, and 12 weeks of cold moist stratification at 5°C.

Germination tests

Fresh, moist cold and warm plus cold stratification seeds were mixed with moist sphagnum and incubated at alternating temperatures of 20/10 and 25/15°C (12/12 h) with 12 hours of fluorescent light (80-100 μ mol m^{-2} s^{-1}, 400~700 nm) at the higher temperature. Germination, i.e. redicle at least 5 mm long, was recorded weekly for 12 weeks. Results are expressed as germination percentage (%) and as mean germination time (MGT) in days.

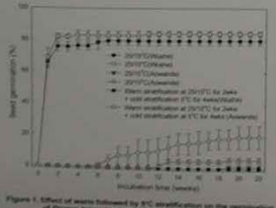
Statistical analysis

Germination percentages (mean ± SE) were calculated, and means were compared by analysis of variance (ANOVA) and by least significant difference (LSD) test at the 5% level of significance.

Results

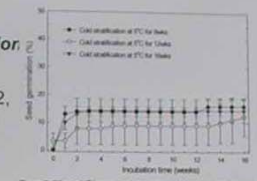
Seeds

Freshly harvested seeds of *P. taiwaniana* from Wushe and Aowanda germinated to 20% and 7%, respectively, at 20/10°C, and to below 2% at 25/15°C after 22 weeks incubation (Figure 1). No fresh seeds germinated during the first 5 weeks of incubation.



Effect of moist cold stratification at 5°C on germination

Cold stratification at 5°C for 8, 12, and 16 weeks slightly increased germination from 2% to 16% at 25/15°C incubation (Figure 2).



Effect of moist warm plus cold stratification on germination

Seeds stratified at 20/10 or 25/15°C for 2 weeks followed by 5°C for 4 or 8 weeks significantly increased germination percentage (Figure 1, Tables 1-3). Mean germination time (MGT) decreased (i.e. germination rate increase) drastically after warm and cold stratification. Meanwhile, we found that germination occurred during the stage of cold stratification for 8 or 12 weeks prior to incubation.

Table 1. Germination percentage of fresh-mature *Prunus taiwaniana* seeds that were collected from Wushe and stratified at 25/15°C followed by 5°C for various periods

Collection site (Wushe)	Fresh seeds	25/15°C 2 weeks + 5°C 4 wks	25/15°C 2 weeks + 5°C 8 wks	25/15°C 2 weeks + 5°C 12 wks	25/15°C 4 weeks + 5°C 4 wks	25/15°C 4 weeks + 5°C 8 wks	25/15°C 4 weeks + 5°C 12 wks
Germination (%)	0[b]	80[a]±2.7	77.8[a]±7.9	74.4[a]±8.7	73.3[a]±7.2	72.2[a]±8.7	81.1[a]±4.2
MGT (day)	>196	9.7	6.4	3.5	16.4	7.2	0.9

* Means (n = 3) with the same letter do not significantly differ (p = 0.05) by LSD test.

Table 2. Germination percentage of fresh-mature *Prunus taiwaniana* seeds that were collected from Aowanda and stratified at 25/15°C followed by 5°C for various periods

Collection site (Aowanda)	Fresh seeds	25/15°C 2 weeks + 5°C 4 wks	25/15°C 2 weeks + 5°C 8 wks	25/15°C 2 weeks + 5°C 12 wks	25/15°C 4 weeks + 5°C 4 wks	25/15°C 4 weeks + 5°C 8 wks	25/15°C 4 weeks + 5°C 12 wks
Germination (%)	1.1[d]	84.4[bc]±1.6	98.9[a]±1.6	91.1[abc]±8.3	83.3[c]±7.2	93.3[ab]±2.7	95.5[a]±4.7
MGT (day)	>196	9.3	6.4	0.2	16.5	7.3	1.4

* Means (n = 3) with the same letter do not significantly differ (p = 0.05) by LSD test.

Table 3. Germination percentage of fresh-mature *Prunus taiwaniana* seeds that were collected from Aowanda and stratified at 20/10°C followed by 5°C for various periods

Collection site (Aowanda)	Fresh seeds	20/10°C 2 weeks + 5°C 4 wks	20/10°C 2 weeks + 5°C 8 wks	20/10°C 2 weeks + 5°C 12 wks	20/10°C 4 weeks + 5°C 4 wks	20/10°C 4 weeks + 5°C 8 wks	20/10°C 4 weeks + 5°C 12 wks
Germination (%)	6.7[d]	88.9[c]±4.2	98.9[a]±1.6	91.1[bc]±4.2	95.6[ab]±3.1	95.6[ab]±1.6	86.9[c]±1.6
MGT (day)	112	15.7	5.3	1.1	19.7	6.8	0.6

* Means (n = 3) with the same letter do not significantly differ (p = 0.05) by LSD test.

Discussion

1. No fresh seeds of *P. taiwaniana* had germinated after 5 weeks incubation. Cold stratification slightly increased seed germination. Warm followed by cold moist stratification completely released dormancy and promoted germination. We concluded that the seeds exhibit physiological dormancy.
2. In the present study, warm stratification given before a cold stratification period caused a significant increase in germination percentage. The moist warm stratification may allow continued seeds development and release the hard endocarp of *Prunus* seed, i.e. covering layers changes.
3. It is possible that the dormancy break is accompanied by a decrease in abscisic acid content of the covering layers and germination by an increase of embryonic gibberellins content.

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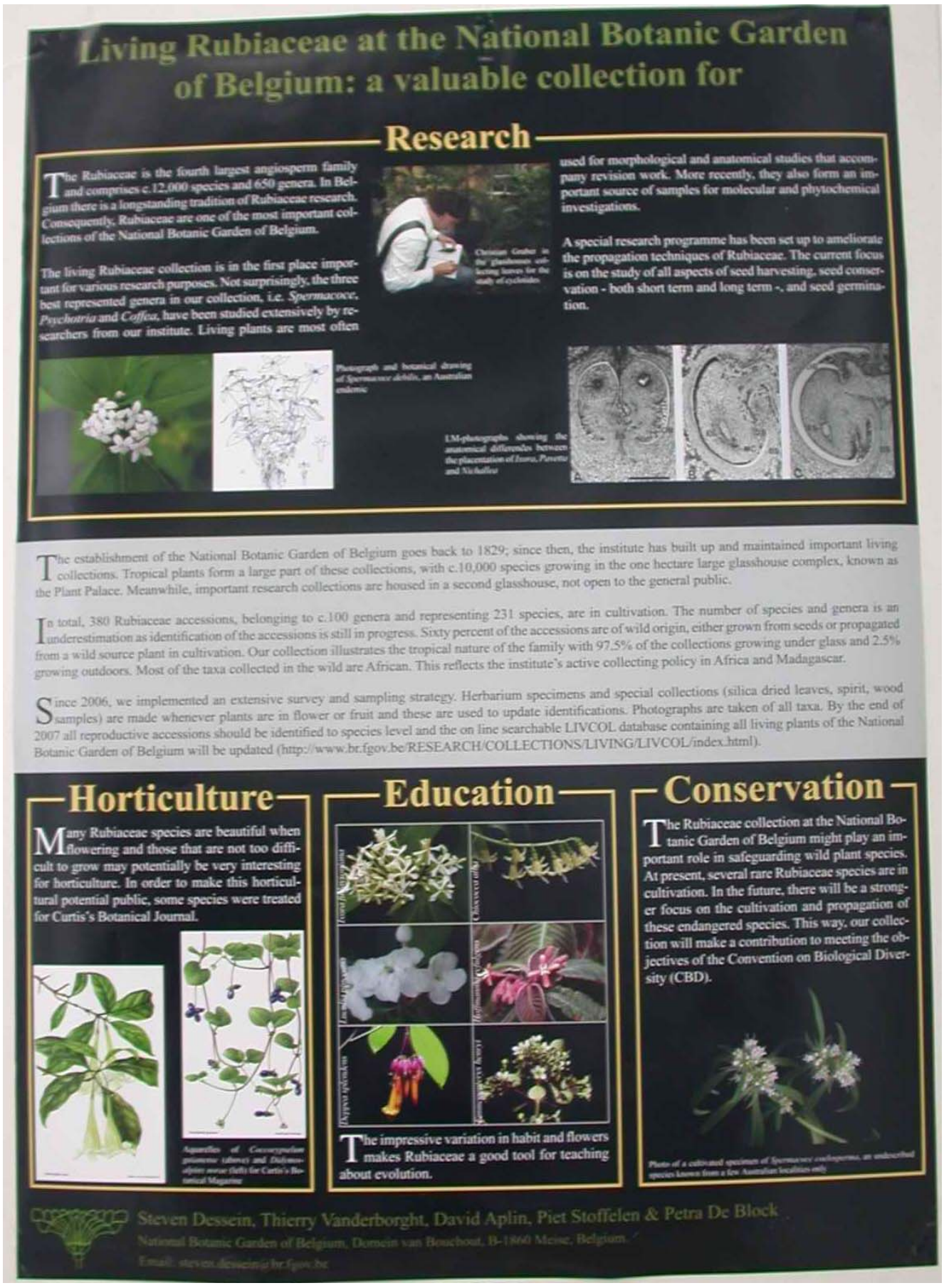
8. 活體蒐藏的價值與運用



9. 紅皮書名錄植物的原地保育規劃

10. 繁殖技術研習課程：courses@kew.org.uk

11. 植物園經營特色作爲教育應用的經驗分享

12. 台北植物園的教育項目

The Education Program of Taipei Botanic Garden (TPBG)

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[INTRODUCTION] Taipei Botanic Garden, built in 1896, is situated in Taipei City, occupies 8 ha, grows ca. 2000 species of plants, and is the most important center of environmental education for Taipei citizens. Every year, more than 2 millions people enter the TPBG. About 30% of them affirm that studying biology and nature is their goal of visiting the TPBG.

[GUIDED TOURS] On average, 30,000 elementary students request volunteers' guide every year. Regular tours are guided in the morning and afternoon every Sunday. Every month, an interpretative subject, such as ethnobotany, bamboos, ferns, etc. is defined and focused on.

[VOLUNTEER & TRAINNING] Volunteers, giving innovative and knowledgeable interpretation to visitors, are the most popular teachers in the TPBG. More than 200 volunteers have been well trained herein. To enhance their biodiversity awareness and interpretative skill, speeches given by specialists are arranged every 2 weeks. In addition, 3-year academic classes are scheduled covering taxonomy, ecology, conservation of biodiversity, and silviculture.

[INTERPRETATIVE PANELS] Visitors can learn by themselves through reading different kinds of placards which explain a general conservation concept, a subject of a section, or names of individual plants. Braille boards, on which plant information is punched, have also been set for blind people.

[PDA & 2D BARCODE] A program of Personal Digital Assistant (PDA) is being designed. Using PDA, visitors will be able to obtain information more detailed than from the placards in the TPBG. Another program, 2D barcode, is also being proposed to enable visitors to record what they learn in the Garden through wireless telecommunication.

[WEBSITE] Detail information is available on the website (http://tpbg.tfri.gov.tw) of the TPBG. Introduction, maps, events, descriptions and pictures of plants cultivated are accessible although plant descriptions are mostly in Mandarin. Specimen information can be acquired through either the Garden's website or herbarium's own database (http://taif.tfri.gov.tw).

武漢植物園以華中地區植物特色如牡丹、杜鵑、水生植物…等爲展示重點，此

次參觀時正值最大溫室剛落成不久，舉行多漿多肉植物展示的盛況。

牡丹園盛開的牡丹：

下降型水生植物展示區：

多漿多肉植物展示：

用仙人掌排出的歡迎：

彌猴桃園的展示迴廊與種原保存的大面積棚架果園：

（註：所有的看板都有不小面積的招商廣告）

武漢博物館主要爲曾乙侯墓出土文物的銅器、樂器特色的在地博物館，保存各式各樣的鐘、磬、笙…等古物，展示場地、技法、文物保存看起來仍然是舊式，但主題「排鐘」的壯觀、重大意義，卻相當引人入勝。


最精彩的是真人表演的排鐘劇場，帶領觀眾將歷史重現，回歸過去體認古代使用樂器奏樂的情境，更讓人拍案叫絕的是利用中國樂器演奏西洋古典樂曲「快樂頌」，達到寓教於樂的效果。

第四天的全會報告由馬克平教授主講「從國家植物的名錄到中國虛擬標本館」，以及 Professor Stephen Hopper 主講「在新老景觀中保存植物多樣性－理論上的深化」（Conserivng plant diversity on old and young landscapes rethinking theory）

Thursday - April 19, 2007

9:00-10:50 **PLENARY SESSION 3** (WSTCEC:4th Floor Auditorium)

9:00-9:30 • **From a National Plant Checklist to Chinese Virtual Herbarium**

Professor MA Keping
Director General, Institute of Botany, Chinese Academy of Sciences, Beijing, 100093, China

China is one of the mega-diversity countries worldwide. According to *Flora Reipublicae Popularis Sinicae*, there are 31142 plant species, 52% of which are endemic to China. In order to provide sound basis for plant conservation and sustainable use in China, we set up the Chinese Virtual Herbarium (CVH, http://www.cvh.org.cn). In the CVH, there are 4 major components, namely digitized specimens, plant database, e-floras and photos. From the digitized specimen module, you can find information for more than 2 million regular specimens and 3000 type specimens; For plant database module, a number of databases are ready for query, such as national plant checklist, botanical literature database, Chinese herbaria database and interactive keys; E-floras include *Flora Reipublicae Popularis Sinicae, Flora of China, Flora of Tibet, Flora of Qinghai, Flora of Qinling Mt., Flora of Sichuan and Flora of Hainan;* Over 26000 plant color photos were uploaded to CVH, which belong to 236 families 1437genera and 3654 species. In addition, we also developed a searching engine for major international herbaria and related databases. From late 2006, we started to prepare a CD ROM for *Catalogue of Life China*. Now, we have the trial version and will complete the first version in late 2007, which will include a national checklist for higher plants, vertebrate and some fungi and bacteria.

9:40-10:10 • **Conserving plant diversity on old and young landscapes - rethinking theory**

Professor Stephen HOPPER
Director, Royal Botanic Gardens, Kew, Richmond, Surrey, TW9 3AB, UK

Old climatically-buffered infertile landscapes (OCBILs) are globally rare today, but are prominent in the Southwest Australian Floristic Region, South Africa's Greater Cape, and Venezuela's Pantepui Highlands. They may have been more common globally before Pleistocene glaciations. OCBILs are important for conserving plant diversity, being rich in rare local endemics, phylogenetic relicts and unnamed new species. Insights that may help conservation are emerging from predictions of OCBIL theory. Conventional conservation management has developed primarily from observations and experiments on species from young, often-disturbed, fertile landscapes (YODFLs). It may be that many applications of such theory are contrary to best practice for species under threat on OCBILs.

植物多樣性的科普及公眾教育（Theme D：Promoting education and awareness about plant diversity）主題：生態旅遊和植物園（Ecotourism and botanic gardens）

21. Ecotourism and botanic gardens — and education perspective
22. Trails of inheritance
23. Ecotours — towards sustainable tourism for botanic gardens

Friday - April 20, 2007

9.00-10:50 **PLENARY SESSION 4** (WSTCEC:4th Floor Auditorium)

9:00-9:30 • **Botanic gardens as introduction centres for plants of economic importance**

Professor Vernon H HEYWOOD
Emeritus Professor, Plant Science Laboratories, School of Biological Sciences, University of Reading RG6 6AS, UK

Botanic gardens have played many different roles over the centuries. In recent years plant conservation has been a major focus and major advances have been made in that area. Historically, however, botanic gardens have been key centres for plant introduction, including many important crops, notably as part of the colonization process in the 18th and 19th centuries. Today, however, those gardens that are engaged in plant introduction direct most of their efforts at plants of horticultural merit and plant exploration for this purpose remains active, for example, in the United States and the United Kingdom, while the cultivation and domestication of medicinal and aromatic plants is being undertaken by a number of gardens, notably in China and India. But it is perhaps time to revisit this whole area and take a broad look at the needs for introduction of plants of economic and social importance, especially in the light of global change, develop a coherent policy and assess what role the botanic garden community might play and how it could cooperate with the agricultural germplasm sector. Suggestions for achieving this are made. A critical reassessment should be made of the concept of acclimatization, the function of acclimatization gardens and societies and the part that the botanic garden community might play. The part that botanic gardens have played in the introduction of species that later escape and become invasive remains a serious concern but does not negate the key role of plant introductions for the world's economy.

IV. 第三屆世界植物園大會總結

1． 瞭解和記載植物多樣性

所取得的成就：

- 通過諸如植物分類學、遺傳多樣性、保護和恢復生態學等領域的研究，植物園爲增進我們對植物多樣性的認識作出了重要貢獻；
- 技術的進步使植物園變得更加高效同時積累了豐富的資料，並促進管理和資訊交流。

面臨的挑戰：

- 對大多數類群保護地位的評估還是初步和不完全的；
- 有關植物園收藏植物的資訊品質不高或不完全；

- 各研究單位之間植物資訊的整合和共用非常有限；
- 由於體制的制約，利用新技術處理資料的潛力還沒實現。

建議：

- 鼓勵不同國家的廣泛參與來編制世界植物名錄；
- 對某些物種,表達保育行動的急迫性,採用一個切實可行的做法來確認和界定受威脅物種；
- 對氣候變化影響的研究和資訊交流是必須的，以便於開發模型去減輕和適應氣候變化；
- 加強資料庫建設以方便植物綜合資訊的獲取,包括採集地點和積極的保護方案。

2． 保護植物多樣性

所取得的成就：

- 植物園在植物保護收藏方面扮演越來越重要的角色；

——世界上很多需要立即引起注意的受威脅植物被收藏在植物園、種子庫或基因庫裏，以 1997 紅色名錄爲基準,並使用 BGCI 的 PlantSearchDatabase，我們知道至少有 35%的受威脅植物被易地保存。

- 植物園在植物就地保護、恢復與重建方面起著越來越大的作用；

——有 400 多個植物園參與了保護區的管理；

——在過去十年，植物園參加了很多植物恢復項目；

- 針對全球環境的快速變化，植物園開始採取行動。

——參與當地社區，監測氣候變化對植物的影響（象美國一樣）；

——努力建設具有代表性的種子庫（如：96%的英國植物保存在千年種子庫裏（MBS））；

——更多的關注‘問題’種子，頑拗型種子，易乾燥種子等等，提高種子庫技術；

——意識到外來入侵種的影響，積極採取控制和根除方案；

- 這樣，通過實現植物就地和遷地保護一體化，植物園在保護植物多樣性方面日益擁有全面的方式。

面臨的挑戰：

- 植物園的有效保護行動受制於對植物生物學和生態系統功能認識不足,尤其在當今全球環境變化的情況下；

——成功的植物恢復項目取決於對物種傳播/發芽的清楚認識，還要考慮那些頑固型、對乾燥敏感的品種,它們因爲難以貯存，往往會在易地收藏中被忽略了；

——對基於模型和潛在的全球變暖情景產生的遷移模式瞭解有限，對由於氣候變化增加外來物種入侵性的瞭解有限；

- 易地收藏的遺傳代表性常常不完整；
- 許多植物保護重要地區還在保護區系統之外,其中大部份薄弱地區還沒確定；

建議：

- 保護行動應更加注重把當地情況和科學基礎知識結合起來；
- 包括園藝和教育在內的良好的科學研究是生物多樣性有效保護必不可少的支撐；
- 植物園在推進生態型管理方式中的角色值得提倡；
- 加強夥伴關係和發展新夥伴關係,以確保就地保護和遷地保護相結合；
- 雖然已經有一些優秀的培訓課程,但是很有必要更加注重植物保護的能力建設，要考慮到當地的需求和語言。

3． 植物多樣性的可持續利用

所取得的成就：

- 世界各地植物園的研究重點是努力開發和可持續利用本地植物。這包括研究生產具有商業潛力的改良品種，爲具有廣泛用途的植物發展繁育和生產規範；
- 植物園往往參與涉及當地社區的項目，以可持續的方式利用植物多樣性,改善人類福利；這包括對藥用植物和營養植物的研究工作，以及旨在減輕貧困和解決社會問題的專案；
- 很多植物園正與 CITIES 一起用各種方式保護那些因國際貿易而受到威脅的野生植物。這些工作包括：提供綜合保護模式；培訓 CITIES 官員的鑒別能力，爲可持續貿易提供替代品（如：雜交種）；
- 在植物園爲社會所作出的諸多貢獻中，植物園提供了一系列的健康福利，在日益城市化的世界，植物園在爲城市中心提供綠色空間方面發揮了重要

作用；

- 通過建立遺傳資源獲取和惠益分享原則以及國際植物交換網路，植物園已開始回應 CBD 中的獲取和惠益分享要求。此外,利用植物遺傳資源創造和共用惠益的創新模式也正在形成；
- 發展植物園作爲可持續性模式已取得良好進展，技術和創新正用於支持創新。這些模式現在需要得到更廣泛的應用。

面臨的挑戰：

- 很多植物種類具有藥用作用（50-70000 種）。然而缺乏很多資訊，如藥用植物交易的範圍以及藥用植物被挖掘的基本種群資料都很缺乏；
- 在野外採集植物往往是唯一的選擇，但並不清楚是什麼構成一個可持續的收穫水準；
- CITIES 在保護野生植物中的角色並沒有被很好地理解，儘管它並沒有阻止貿易和損壞生計；
- 當地植物資源不足以滿足城市規劃者在城市裏發展綠色空間的需要，而植物園在解決這一差距中發揮重要的作用；
- 政策制定者和決策者在許多層面不知道植物園在保護和可持續利用植物資源方面所起的作用。

建議：

- 許多野生植物資源由於不可持續的採伐技術而受到威脅,栽培這些植物並非總能解 決問題--雖然它往往也發揮著重要作用. 植物園也應把目光放在支持可持續收穫上——倡議使用最近制訂的指南,尤其注意與當地社區一起工作；
- 植物園應確保保護工作涵蓋了種內多樣性和作物野生近緣種,因爲它們爲開發新品種提供了重要的資源；
- 植物園和 BGCI 應同 CITIES 一起共同支援新的民生舉措，提供植物資訊和專業知識；
- 植物園需要不斷地更新它們與社會的聯繫. 它們有助於全球以及本地的利益, 但如果沒有當地社區的支持它們不可能繁榮起來；
- 按照 CBD 獲取和惠益分享條款,植物園應繼續尋求更多的合作機會和創新的方式來創造和分享利益，建設當地能力來保護和可持續利用植物資源；

- 植物園應該讓決策者瞭解植物園工作在保護和可持續利用中的重要性和相關性,使新的國家和國際法律能爲他們的工作創造有利環境；
- 有必要把可持續性納入植物園的行動.在新的設計、結構和園林景觀中應用,而不是被追溯適用，需要制訂和共用可持續性議定用以指導植物園。

4・促進教育和植物多樣性意識

所取得的成就：

- BGCI 進行了一項全球性調查顯示有 91%的植物園把教育作爲自己的使命，這是非常令人鼓舞的。會議表明,植物園開展了廣泛的教育和解釋活動,並且正加大環境教育和可持續發展教育；
- 教育和許多其他植物園活動是互補的， 比如,讓社區參與保護藥用植物和消滅侵入物種；
- 植物園發展了大批觀眾包括小學生到普羅大眾， 當地社區和遊客，爲他們提供傳統和創新性節目諸如標識,展覽,活動,班級和實地考察，植物園日益成爲學校的延伸教室和終身學習的教室；
- 通過把植物多樣性的重要性和對其進行保護的必要性納入宣傳,教育和公眾意識活動，植物園爲實施全球植物保護戰略中目標 14 作出了重大貢獻。

面臨的挑戰：

- 當今世界正面臨著重大的環境挑戰,如氣候變化,貧困,環境退化， 缺乏糧食系統的可持續性和快速城市化，相對少的植物園開展宣傳和教育活動以對付這些問題. 植物園需要去激發思考並與它們的遊客討論這些話題；
- 爲確保植物園爲適當的觀眾提供相關資訊，評估是必要的.在植物園提供的宣傳， 教育和公眾意識缺乏定性的評價和研究.這對活動的品質和形式並取得成功具有一定的影響.爲解決這個問題,植物園需要找到新的思路和方法來解讀訊息即箱外思維,並創造一個新的範例；
- 通過提供宣傳,教育和公眾意識,植物園達成大量具體的物件,例如: 大學生,中小學生和家庭. 但是與得到目標觀眾似乎有一定的差距,如決策者,商界領袖， 殘疾人士和目前尚未參觀植物園的觀眾；
- 許多植物園報告在宣傳和教育方面的投資比較缺乏,無論在資金、資源、員工或能力建設方面，這可能反映了與決策者和潛在的資助者缺乏聯繫；

- 在世界上許多地區的學校教學中植物科學有下降趨勢，植物園需要解決這個問題，通過它們的活動，與其他科學和教育機構形成網路從而影響政策；
- 植物園目前還沒有充分利用其獨特的機會向它們的遊客提供生態旅遊經驗，他們可以開始自己致力於可持續性，利用這些原則來指導他們的工作，並傳達給他們的遊客；

建議：

- 除了將目標 14 納入宣傳、教育和公眾意識活動中，植物園需要解決一些當代關鍵的環境問題和社會問題，包括氣候變化、消除貧窮、糧食安全、外來侵入物種和都市化. 在解決這些問題時必須注重態度和行爲的改變，以期實現可持續的發展；
- 植物園要爲他們的教育方案吸引或提供更多投資，這可以通過針對決策者、商界領袖和媒體結成夥伴關係和網路，提供能力建設，聘用合格教師，得到新的觀眾如生態旅遊者；
- 植物園應進行研究與評估來衡量觀眾，按要求設計方案，並確保這些要求得到滿足，植物園需要運用新技術如由互聯網提供的新技術， 需要把環保思想融合在方案設計中，如利用系統理論來說明生物的關聯性和複雜性；
- 植物園應意識到並正視植物科學教育的減少，通過提供教育，並與其他科學和教育機構形成網路和影響政策；
- 在多個層面上有各種各樣的培訓需求，但培訓教師有限，關鍵是要挖掘訓練潛力:
  1. 確定重點培訓需求；
  2. 開發標準化多種語言的培訓教材；
  3. 瞭解當地的問題、需求和資源可用性；
  4. 基於簡單但嚴格評估的適當認證。
- 植物園在宣傳、教育和公眾意識中具有越來越重要的角色，需要進行研究以確定它們的影響，並驗證它們在創造可持續全球社會中的重要性；
- 植物園需要確保是有樂趣的，刺激的，有吸引力的，有創新性的地方，供遊客遊玩並從事資訊交流的相關地方。

參、心得及建議

第三屆世界植物園大會的主題是“構建可持續發展的未來：植物園的作用”實在是大師專家雲集，議程、研習、展覽、參訪內容豐富的國際盛事，本次出席大會深感資訊多達分身乏術無法蒐集吸收完全，也很感慨臺灣派員出席的兩個單位勢單力薄，主要原因還是經費的捉襟見肘。尤其大陸近年經濟潛力增進不少，主辦植物園也顯示他們的雄厚資本所堆積出來的成果。

其實像這樣的類似奧林匹亞的國際專業研討會，國家單位、外交部門應該規劃持續派員出席增加臺灣的參與及曝光率，不僅有助於國內專業經營管理及學術交流的提升，也可擴展國際人脈和臺灣名聲。

依據本次大會探討植物園近 10 年對全球重大的使命，包含植物多樣性、保育、利用及永續發展教育等多方面的議題，至少需要 4 人以上代表參與蒐集，否則顧此失彼，研習範圍有限。即使臺灣出席的兩個單位合作分工，協力在會場互通有無，同時進行的主題幾乎沒有不與植物園業務息息相關，仍然很遺憾四大主題兩個單位根本無法參與另一半的議程交流。很可惜有關種原繁殖保育、多樣性資料庫方面，希望日後可再多增人力參與研習。

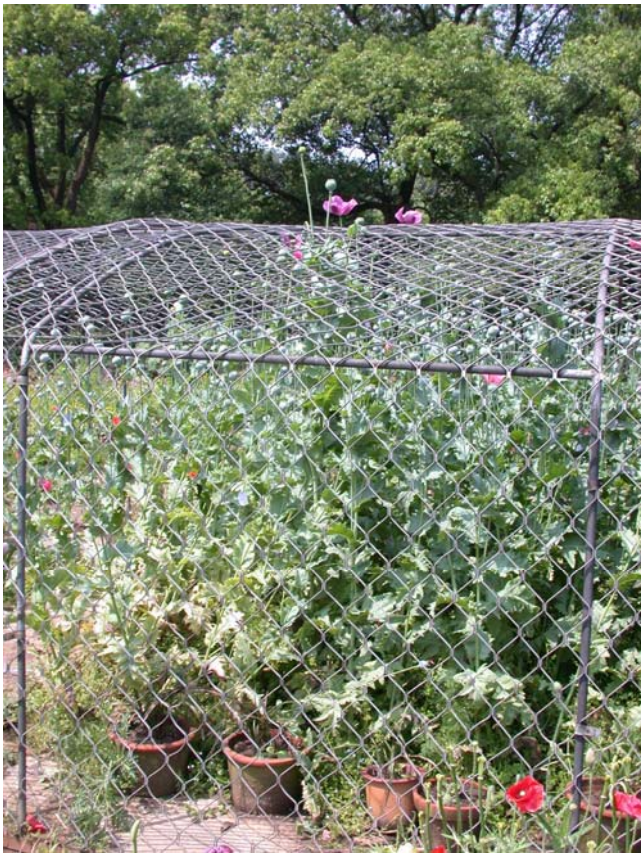
根據本次出席補助的目標以推廣教育爲主，研習參訪資訊如前述，國際上植物園所扮演推廣教育的作用有幾項重要的研習經驗及心得，可提供相關業務的經營運用參考。

1．聯合國提出 2005～-2014 年爲“可持續發展教育的 10 年”，除了提醒各國重視教育的品質端正風氣，更希望建構由下往上可持續發展的教育模式，本次大會推廣教育研習會提供的就是這樣培訓過程。植物園的推廣教育員可以先針對當地的資源、特色、教育目標，擬定啓發式的探索議題：你覺得家裡應該要擺幾盆植物？學校（公共工作場所）需要擺幾盆植物？台中市該種多少樹？…等，從個人、團體到社群，討論出大家合適的共識，以達到自發性認知、互相學習的瞭解我們周遭的環境、生物多樣性、生態系，才能深植對環境愛護、保育等概念，達到教育目標。

2. 植物園展示教育的推陳出新及潮流是可藉這樣的國際會議互相學習與交流，例如：植物園向來受限於戶外活體展現的方式，所以景觀規劃、看板設計成爲美學、知識溝通上極大挑戰。很多室內的展示雖然以精闢的設計，但不一定能突破觀眾的學習

及流行，所以展示手法的創新、推廣教案的精進，都關係著植物園的經營管理。推廣教育相關議程中「The ‘Garden Window’ project」具相當的啓發性，將百貨公司的櫥窗展示及焦點花車觀念，推展到植物園的展示教育，轉變了參訪植物園的習性，必須依著動線或尋找特定目標定點，變化性比固定展示和室內展示活潑，形式也較機動可塑性高，加上解說人員的展演設計，可以顛覆植物園觀眾移動式閱展習慣，會創造觀眾驚喜、期待的參訪心態，值得參考。

3. 社會議題的推廣教育貢獻，武漢植物園做了「遠離毒品」的罌粟花展示，一般可用的罌粟花科虞美人，到處搖曳生姿，鴉片用的罌粟則被層層鐵網罩住，形成很可笑的畫面，如何選擇主題，發揮展示效果，以達到推廣教育意義，是必須面面俱到的。



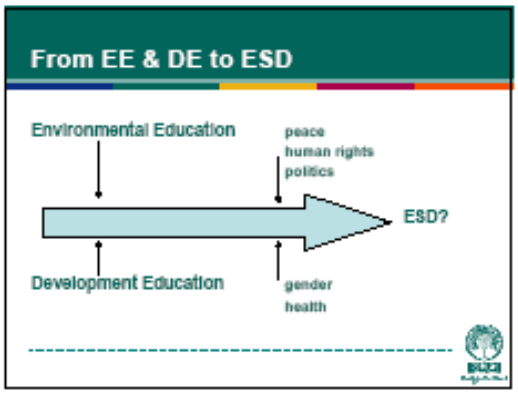
4. 全球環境變遷的議題在本次大會除了全會報告介紹氣候變遷的影響，植物園如何在變化的世界中保護植物，應對這樣的變化。針對重要植物區域做調查記錄、長期監測植被演替變化以及種子庫的重要性，英國皇家植物園（Kew）等各植物園提出規劃執行任務的經驗分享與討論，其中植物園網絡可整合這樣的資訊，並比對各植物園區域的氣候變遷變化的影響，對於尚未設立氣候監測的植物園，這是值得學習的理念。因爲氣候變遷對植物園的種植、保育、研究、經營，都可能會有重大的影響，長期監測記錄是未來檢視分析的重要資料，是植物園不可忽視的重要任務。

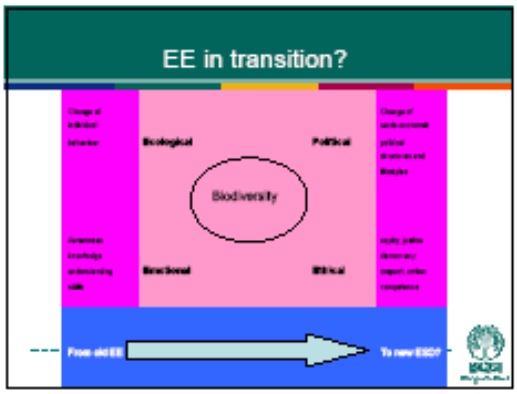
5. 植物園蒐藏特色除了活體植物之外，武漢植物園還展示了「葉畫」、押花立體畫等多種藝術品，可提供不同植物園經營的參考。

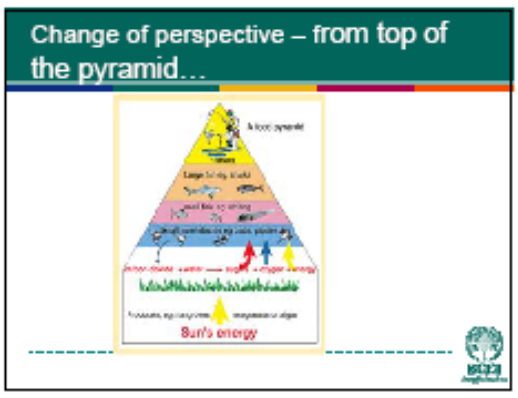
附錄一：

可持續發展的教育：一個循序漸進的過程

（Education for Sustainable Development）







Tracing sustainability and education through international documents**1972**

United Nations Conference on the Human Environment in Stockholm

1980 **World Conservation Strategy**

1987 **Brundtland Report 'Our Common Future'**

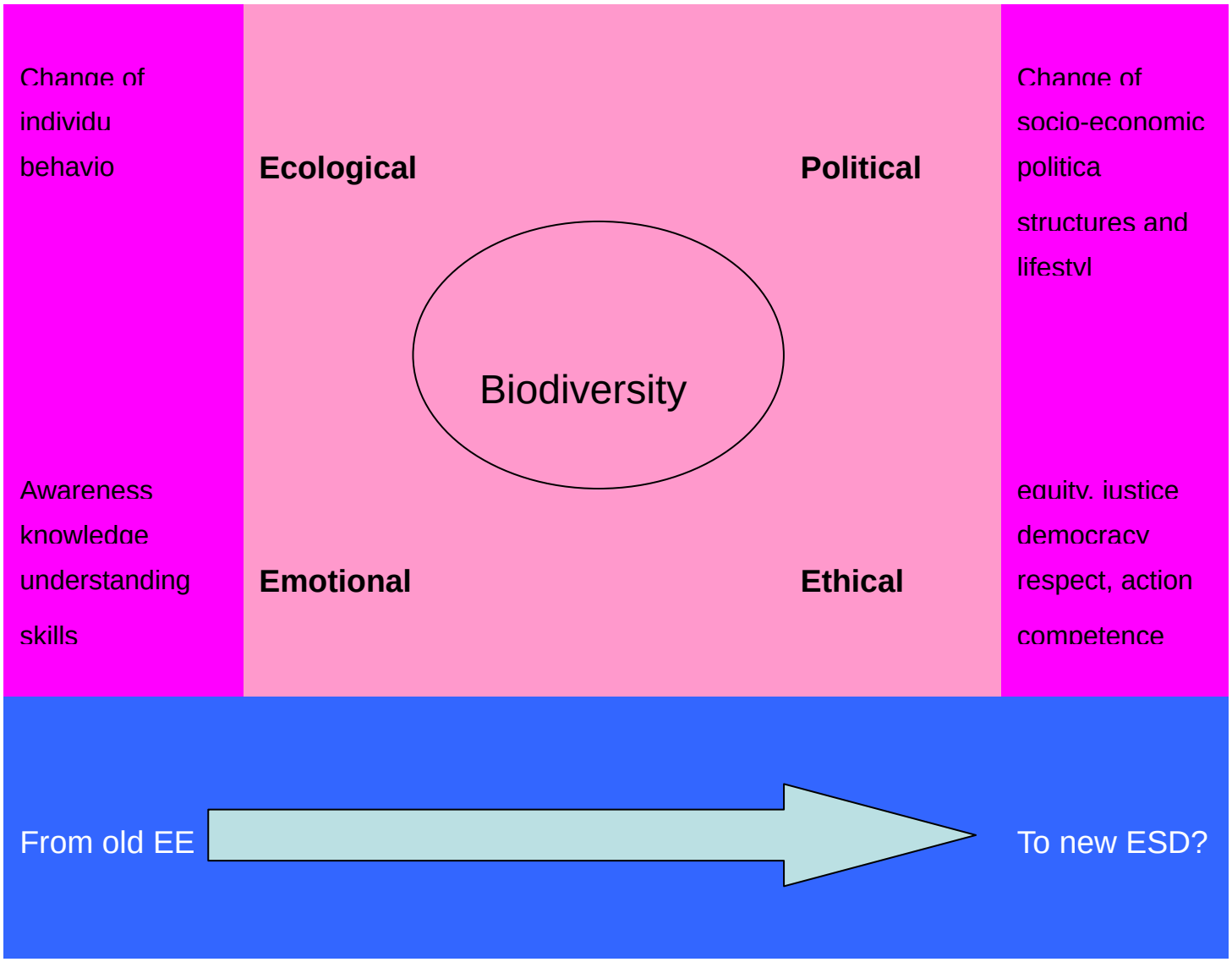
1991 **Caring for the Earth: a strategy for Sustainable Living**

1992 **United Nations Conference on Environment and Development (UNCED) held in Rio de Janeiro, Brazil.**

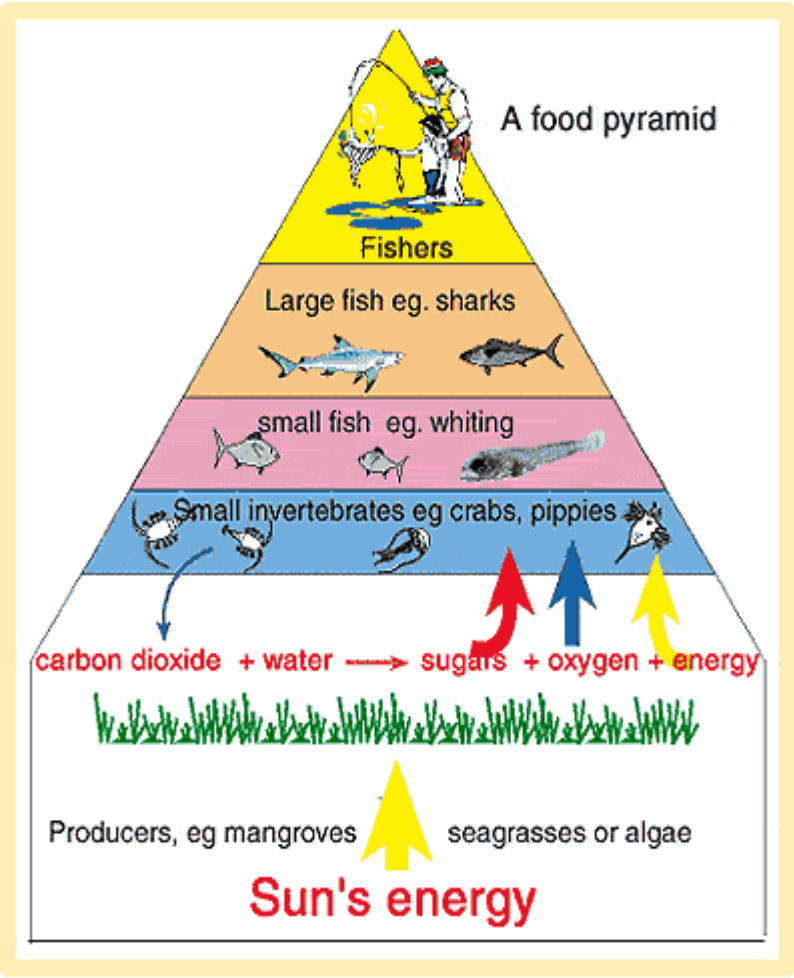
2002 **World Summit for Sustainable Development, Johannesburg, South Africa**

2005-2015 **UN Decade of Education for Sustainable Development**

From Environmental Education, Development Education to ESD (Education for Sustainable Development)



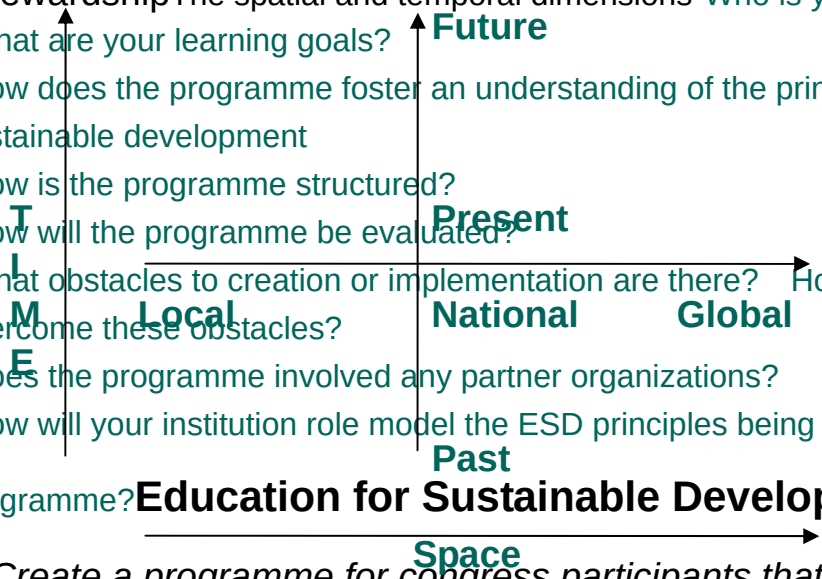
Change of perspective – from top of the pyramid…



…to part of th**uch thing as a neutral educational activity. Any action that one takes in the classroom is necessarily linked to the external economic, political and social order…all teaching is embedded in an ideological background and one cannot fully understand the significance or consequences of an activity unless one also considers that activity in light of the more general issues of social continuity and change.---(Grant & Zeichner, 1984)**Futures Education***We cannot alter the past, but we have common interests in achieving live-preserving sustainable futures. It follows that a central task for teachers is to explore with their pupils some of the major problems and possibilities that lie ahead and thereby sensitise them to the implications of choices and actions in the present.* **---(Rick Slaughter, 1985)**

Educational rationale for teaching futures•Pupil motivation
•Anticipating change
•Critical thinking
•Clarifying values
•Decision making
•Creative imagination

•A better world
•Responsible citizenship
•Stewardship



•Who is your audience?
•What are your learning goals?
•How does the programme foster an understanding of the principles of sustainable development
•How is the programme structured?
•How will the programme be evaluated?
•What obstacles to creation or implementation are there? How will you overcome these obstacles?
•Does the programme involved any partner organizations?
•How will your institution role model the ESD principles being conveyed in the programme?

- *Create a programme for congress participants that teaches about one or more principles of sustainable development.*
- *Refer to the Council for Environmental Education's "Principles of Good Practice" for guidance.*
- *Use the ESD Writing Frame to structure your presentation to the rest of the group.*

BGCI Presentation

可持續發展的教育：一個循序漸進的過程

未來計：ESD（可持續發展教育）的行動

3rd Global Botanic Gardens Congress

Education for Sustainable Development workshop
Sunday 19th April, 2007

Case studies – ESD in action

Craft School – Arkangelsk, Russia

- Through modernisation, risk of loss of traditional crafts
- School set up 1990
- 8 - 16 year olds attend after school
- Learn weaving wood painting, basket making, wood carving etc.
- Harvest own materials from surrounding forest.
- Preservation of indigenous knowledge and sustainable production

Craft School – Arkangelsk, Russia

Skills passed down from one generation to the next

Teachers at the school also learnt their craft there.

After three years, pupil becomes a 'master craftsperson'. Boosts confidence and self esteem.

Next step, encourage critical thinking to address issues of why the traditions were being lost in the first place.

Craft School – Arkangelsk, Russia

Traditional healers in Mexico

- Ethnobotanists at the IB-UNAM Botanic Garden, Mexico, share their technical and botanical expertise
- Healers share their knowledge on the traditional and ritual use of plants.
- Partnership means botanic garden able to share knowledge with other healers, housewives, professionals and alternative health practitioners in Mexico.

附錄二：

3rd Global Botanic Gardens Congress

Asia/Pacific Networking Workshop

Wuhan, 2-5pm, 15 April 2007

1. Introduction

Philip Moors (PM; RBG Melbourne): Welcome and introduction by participants

PM: Outcomes include how Botanic Gardens Australia and New Zealand (BGANZ) can better understand how they can assist BGs in Asia

Bian Tan (BT; Singapore Botanic Gardens) will present about South East Asian Gardens Network (SEAGN)

BT: presentation of SEAGN

Jie Cai (RBG Kew): exhibition created in each country?
BT: yes, each institution developed content for its own exhibition.

PM: Presentation of BGANZ
Aim of meeting: Seeking ways to work effectively to work with Asian and Pacific BGs to deliver best outcomes with resources you and we have available.
Two drivers for discussion- GSPC and support BGs to develop skills and knowledge
Australian participants here to hear how they can assist and pass information back to colleagues back home.

Dan Bishop (Botanic Gardens Trust Syney): Presentation of policy on collaborative work in region. BGANZ:

- wants to be active as a leading body
- Areas of interest- info sharing, influencing policy, plant exchanges
- Assistance is not funding but capacity building and will take time to achieve
- Gardens they choose to work should be open to public, conduct scientific and conservation work, in region (EA, Pacific), members of BGCI, committed to bioregion conservation, demonstrate commitment to GSPC. Institutions need to assist with identifying training needs, enter partnership to advance mission from both partners.

- Is personally interested in developing horticultural practices and feels expertise needs to be exchanged.

BT: copy of policy on line?
PM: BGANZ website under development but will be available

2. Case Studies

A. Dan Bishop: BG Trust of Sydney – 2 examples
1. Protection of medicinal plants in North Vietnam
Aim: Help conserve reduction of harvesting and agricultural practices around national park
Result: Vietnamese participants studied at the Sydney BG Trust – helped establish the Tam Dao Botanic Garden
Lessons: Conservation outcomes must be driven by needs of people. Time is needed to build relationships, there are different priorities of villages, simple solutions are usually the best.

2. Bogor Botanic Gardens
Aim: assist propagation techniques of *Amorphophallus*
Additional funding from Australia-Indonesia institute
Work involved: progagation workshops, trials, safe pesticide use.
Project was initiated by horticultural staff from Sydney and funding was obtained.
Lessons learnt: information must be captured in case of staff departure, new staff have different approaches.

B. Wong Wei Har: Singapore Botanic Gardens (SBG)
Work is mostly skill-sharing
Shanghai BG 3-month attachment of officer on growing and maintenance of tropical orchid display
He also contributed by helping out at the garden, so was not a one-way exchange
SBG benefited and programme continues with another attachment from Hong Kong Zoo & BG

C. Lawrence Chau: Kadoorie Farm and Botanic Garden, Hong Kong
Staff exchange programme through BGCI China programme
Aims: support closer working relationships, etc.

Gains: in depth understanding of specialty topics; exposure to different social culture, set up new projects, linkages established are not just individual but institutional, etc.

26 participants from 18 institutes in 4 years

Gains for the organizer

- learn training techniques, evaluations , stimulate own staff by young researchers, feedback from them assist in developing and improving policies, promote native plant conservation

D. Siegy Krauss: Botanic Gardens Authority, Perth
Opportunities for student and post-doctoral funding (AusAid, Australia-China Council) and research at Kings Park welcomed

Break

3. Discussion

Participants were asked to say what their plant conservation priorities were for their country or institution.

India - Wetland crops, medicinal plants etc. Not maintained carefully. Want to know if it can be included in the GSPC.

Lao (National Univ of Laos) - BG not yet established. System of protected areas in Laos. Priority of faculty is conserving economic and ecologically important plants, endangered species. 49 ha area. Location of campus in Vientiane is dry tropics – can be similar to parts of Australia. Goal is to increase number of native species on campus. Want to establish new BG (arboretum) on campus.

Irawati (Indonesia) - only have 4 BGs in Indonesia, not enough to conserve all plant diversity. 33 provinces in the country, aim to have BG in each province. Plan for 8 BG in next 10 years.

China, Turpan BG - conservation of germplasm, plant introduction, and rare and endangered of arid species, sand fixing plants in moving sand desert.

Taiwan (Dr. Chiu) Taichung City - New garden established in 1995. Would like to cooperate with EAsian BGs for plant conservation in their tropical greenhouse. As part of their work, they propagate native plants to give out to the public to grow. Would like to coordinate with other gardens to produce, for example, a travelling exhibition to promote plant conservation.

Singapore - in the process of building a new public garden – HortPark - with a more recreation focus so current BG can continue their research/pure BG role. Conservation focus of new garden will be cultivars of horticultural and economic significance.

Jie Cai from Millenium Seedbank (China) - Kunming Institute of Botany are working on orchid conservation and germplasm and can learn from Australian BGs (esp. Kings Park).

Japan - Japan has many national parks which conserve native plants. Conservation focuses on 3 main programmes. 1. Invasive species, most of species listed are animals and not plants 2. Large population of deer increase feeding on native plants 3. Change of traditional agriculture (hand cultivation of rice replaced by machinery, chemical regime etc.), over-collection of fuelwood.

Junko Oikawa (BGCI Japan) - Database of network of ex situ collections has started

Mongolia - Harsh climate conditions, vegetation is low. Difficult to build BG in such conditions. Mongolia BG only one in country with legal status.Would like to collaborate with you to develop the garden in scientific exchange and related programmes. They would specifically like to brainstorm ideas, keep track of progress. Guidelines of botanic garden are the main key to develop activities. Capacity building for staff is a priority, also botanic garden planning, project designing. Would like to meet and speak about these projects.

Joachim Gratzfeld (BGCI, Kew) - BGCI promotes and enhances work in *ex situ* and more increasingly in *in situ* conservation. Need to develop new proposals, need to be more specific. Need to demonstrate *in situ* conservation to attract donor funding. We have reps from Australia, networks here, partnership here will hopefully contribute to enhancing the leverage of new work in botanic gardens.

Rob Smith (BGT, Sydney)- Re: specific insitu actions. Would like to point out changing behaviours of people in cities, and this actually drives impacts in the countryside. To change behaviours, is an important role of BGs. In Australia, research has been done on multiculture communities on why they visit BGs. Most people felt National parks were not a safe environment and BGs were a place to understand plants in a safe place. BGS can interface with many individuals. Challenge of BGs I think – find ways to change lifestyles, so insitu conservation can continue.

Dr. Kang (Korea)- Strong initiative to protect wild areas. 5 Laws to protect plants from being collected. Korea doesn't have red list. Seed collection for seedbank storage undertaken. Korea uses 1/5 plants for food, both collected from wild and cultivated. Gathering information about plants used for food and medicine is an ongoing project. Another priority area is taxonomically difficult groups. Need to know about the plants before being able to conserve them. Recovery programmes of rare species.

4. Wrap up

Bian Tan -

Aquatic plants

Establishment of new BGs (Cambodia, Laos, Indonesia)

Environmental exhibits (and Environmental education)

Integration of *in situ* and *ex situ* conservation

Conservation of species in harsh climates

Sustainability issues in Japan

Philip Moors -

Hope today's session has triggered ideas for collaborative projects. Hopefully this will happen through supportive links with networks. Specific ideas may not have come forward yet, but when they do, contact can be through EABGN, SEAGN, BGCI and BGANZ. Digital copy will be sent to those on attendance list. Thanks to all for interest and attendance and contributions.

The East Botanic Gardens Network
3GBGC side event meeting

Date: 15 April 2007 10am
Venue: 3GBGC site
Chair: Prof Yong-Shik Kim, Junko Oikawa

Programme:

1. Welcome

2. Reviewing and up-dating
   - Pre Osaka meeting in 2005
   - 1st EABGN meeting in 2006
   - 2005-2006 working plan
     - Home page for EABGN,
     - Publication of EA theme BG Journal in four languages
     - First EABGN meeting in Kunming
     - Publication of Korean edition of GSPC
     - Side event to follow up the 1st meeting and to discuss further coordination efforts
3. Following up items recommended and suggested
   - nomination of the second EABGN co-ordinator
   - nomination of a co-ordinator at a country/ area level
   - development of the Advisory Board
   - developing of the sub-committees
     - Documentation of living and herbarium collections
     - Plant conservation
     - Education
     - Capacity Building

4. Developing a working plan for 2007-2008
   - Identifying priorities of plant conservation need of the region
   - Proposing projects of Mitsubishi funding year 3
   - Developing a framework for 2th meeting in Korea

5. Further issue and efforts in regional plant conservation
   - Fund raise to support EABG conservation activities
   - climate change and role of botanic gardens
   - etc.

Note:
- Discussions will be continued through the lunch time, if necessary, and lunch will be provided at the meeting venue by the Congress Organiser.
- The meeting will be finished by 1:45 pm at latest.

Summary of the First Meeting of the East Asia Botanic Gardens Network
Kunming Institute of Botany, 19-20 August, 2006

Introduction:

The preliminary EABGN meeting was held in Osaka, Japan on the 14th of April 2005, and had representation from the Korean Association of Botanic Gardens and Arboreta, the Japan Association of Botanic Gardens, the Botanic Gardens Working Committee of the Chinese Academy of Sciences, the Kadoorie Farm and Botanic Garden in Hong Kong and BGCI. At that meeting it was agreed that:

- the concept of the EABGN should be further developed
- Prof. Huang Hongwen would be the first general coordinator
- a special edition of the BGjournal would be produced to publicise the importance of East Asia and its botanic gardens
- the first meeting to further discuss the role and activities of the EABGN would be conducted in Kunming in 2006 (with a second meeting to be held in the Republic of Korea in 2008)
- an internet homepage would be launched to give information in the main languages of the region
- other English language publications (including a Korean translation of the Global Strategy for Plant Conservation) would be produced.

Main developments since the initial meeting:

1. BGjournal:

As proposed at the initial meeting, the July 2006 edition of the BGjournal was published with the Special theme of "the Botanic Gardens of East Asia". Articles about the botanic gardens in all of the countries and areas of the East Asia region including Mongolia and Far Eastern Russia were received. The journal was not only published in English but also Chinese, Japanese, Korean and Russian and will be distributed to all of the botanic gardens of the East Asia region as well as to BGCI members throughout the world.

2. EABGN Homepage:

The homepage is now under development at the Wuhan Botanical Garden.

First meeting of the EABGN:

As agreed at the initial meeting, the first meeting of the EABGN was held in Kunming on 19-20 August 2006. Representatives of botanic gardens from mainland China, Hong Kong, Japan, Republic of Korea, People's Democratic Republic of Korea, Taiwan and Mongolia attended the meeting.

The points raised in the meeting held in Osaka were reviewed and the following was recommended:

1. The purpose of the EABGN will be to:
   - Encourage and enhance information exchange and co-operation to improve education, research, conservation and the sustainable use of plant materials in botanic gardens.
   - Assist in the interpretation and implementation of the 2010 Targets of the Global Strategy for Plant Conservation (GSPC) drawn up to assist botanic gardens.
   - Assist efforts in East Asia plant conservation through training and staff exchange.

2. The membership of the Network will include botanic gardens networks and individual botanic gardens in all of the countries and areas in the East Asia region, including mainland China, Hong Kong, Macau, Taiwan, Democratic Peoples Republic of Korea, Republic of Korea, Japan, Mongolia and Far Eastern Russia.

3. All botanic gardens that are members of the in-country organisations are automatically eligible to become members of the regional network. For countries where no national organisation exists, all of the botanic gardens there will be individually eligible to be members.

4. Each country or area represented in the network will have an in-country co-ordinator as a part of their national association or at an individual garden if a national association does not exist.

5. Each country or area will be responsible for providing EABGN coordination for a period of two years. The second Network Co-ordinator will be nominated at the 3rd Global Botanic Gardens Congress in April, 2007 in Wuhan.

6. The EABGN will have an Advisory Board consisting of 1-4 members from each country or area.

7. A formal meeting of the EABGN will be held once every two years.

8. Four sub-committees will be established to cover:
   - Documentation of living and herbarium collections (3)
   - Plant Conservation (1)
   - Education (2)
   - Capacity Building (4)

9. Nominations for the Committees: Nominees for the Advisory Board and the Committees will be sought before the Global Congress in Wuhan.

10. Until otherwise decided, EABGN membership is free with funding for particular projects to be sought by the members from other sources.

Other comments made that could be incorporated into the above:

South Korea:
- EABGN has to be a bridge to share outcomes.
- There is a need for a secretary for fund raising.

Japan:
- The structure is still not clear.
- A deadline is needed for committee nominations.
- Exchange of data regarding collections and action plans is vital.
- A database is needed for each garden for them to be able to contribute to a regional database.
- Staff exchange could be difficult because of language.

North Korea:
- Exchange of both staff and information will be important.
- A better understanding of GSPC and 2010 Targets is needed.

Mainland China:
- There is a need for a central office or similar.
- Botanic gardens other than those that are a part of CAS need to be members.
- There is a continuing support from BGCI, and EABGN members and BGCI needs to decide what role(s) BGCI can play in developing and establishing EABGN.

Taiwan:
- EABGN can provide regional coordination for botanic gardens.

Hong Kong:
- EABGN can provide the linkage that will allow the transfer of information between botanic gardens.

Work Plan for 2006 – 2008: (based on meeting and recent contact by BGANZ)

August 2006 – April 2007:

- Continued development of the EABGN website for launch at the Global Congress in Wuhan on-going
- Nominations for the Advisory Committee and Sub-committees
- Selection of Advisory Committee and Sub-committees?

April 2007:

- EABGN Side Meeting at the Global Congress in Wuhan
- Launch of the EABGN Website
- Possible joint Capacity Building Workshop among the EABGN, the Botanic Gardens of Australia and New Zealand (BGANZ) and South East Asia Botanic Gardens (SEABG)
- Nominations and selection of next Regional Co-ordinator

May

~~Autumn~~ 2008:

- Second regional meeting of EABGN in the Republic of Korea

附錄三：

Conclusions from the 3rd Global Botanic Gardens Congress

1. Understanding and documenting plant diversity

Achievements

- Botanic gardens are making major contributions to our knowledge of plant diversity, through research in areas such as taxonomy, genetic diversity, conservation and restoration ecology.
- Technological advances are allowing botanic gardens to be more productive and data efficient and are facilitating the management and exchange of information.

Challenges

- Preliminary assessment of the conservation status remains incomplete for most taxa.
- The quality of plant-related information of botanic garden collections is often poor or incomplete.
- The integration and sharing of plant-related information between institutions is limited.
- The potential of new technologies to manage data is often not realised due to institutional constraints.

Recommendations

- Wider participation at the national level is encouraged in the preparation of the world plant list.
- To address the immediacy for conservation action for some species, a pragmatic approach should be adopted to identify and define threatened species.
- Research and information exchange on the impacts of climate change is required in order to develop models to mitigate and adapt to climate change.
- Databases should be strengthened to facilitate access to comprehensive information on plants, including location in collections and active conservation programmes.

2. Conserving plant diversity

Achievements

- Botanic gardens (BGs) have enhanced their role as repositories of plant conservation:
  - Many of the world's threatened plants requiring immediate attention are stored *ex-situ* in botanic gardens either preserved in living collections, seed or gene banks. Using the 1997 Red List as the baseline, and using data from BGCI's PlantSearch database, we know that at least 35% of threatened plants are stored *ex-situ*.
- BGs are increasingly playing a role in conservation efforts *in-situ* and in recovery and restoration work:
  - More than 400 BGs are involved in managing protected areas;
  - BGs have been involved in many plant restoration programmes and projects over the past decade.
- BGs have started to take action in view of rapid global environmental change
  - involving local communities in monitoring the impacts of climate change on plants (as in the US);
  - making increasing efforts in establishing representative seed banks (for example 96% of the UK's flora is conserved in the MSB);
  - giving more attention to 'problem' seeds, recalcitrants, dessication-prone seeds, etc. and improvements in seedbank technology;
  - realizing the impacts of alien invasive species and actively contributing to control and eradication programmes.
- In so doing, BGs are increasingly embracing a holistic way in conserving plant diversity by putting into practice the integration of *ex-situ* and *in-situ* conservation.

Challenges

- Effective conservation action by BGs is constrained by gaps in understanding of plant biology and ecosystem functioning, especially in the context of global environmental change
  - Successful plant restoration projects depend on a clear understanding of propagation/germination of species, considering also recalcitrant, dessication- sensitive species which are often overlooked in *ex-situ* collections as they are difficult to store;
  - There is limited understanding of migration patterns based on models and potential global warming scenarios, as well as the potential of increased invasiveness of alien species as a result of climate change;

- Genetic representativeness of *ex-situ* collections is often incomplete.
- Many important areas for plant conservation are believed to be outside protected area systems but most of these vulnerable areas are currently unidentified.

Recommendations

- Conservation action should give more emphasis to integrating local and science-based knowledge.
- Good scientific research, including research in horticulture and education, is essential to underpin effective biodiversity conservation.
- The role of BGs in advancing an ecosystem approach-based management style should be promoted.
- Partnerships should be strengthened and new partnerships developed to ensure integrated *in situ* and *ex situ* conservation
- While there are some excellent training programmes there is a need for greater focus on capacity building for conservation, taking into account local needs and languages

3. Using plant diversity sustainably

Achievements

- Botanic gardens around the world are focusing research efforts towards the development and sustainable utilisation of local plants. This includes research to produce improved varieties with commercial potential and developing propagation and production protocols for a wide range of useful plants.
- Botanic gardens are involved in projects, often involving their local communities, which use plant diversity in a sustainable manner, to improve human well-being. This includes work on medicinal and nutritional plants, as well as projects that aim to alleviate poverty as well as addressing social and community problems.
- Many botanic gardens are working with CITES to protect wild plants from being threatened by international trade, in a variety of ways. These include: providing comprehensive conservation models; training CITES officials on identification; and providing alternatives (e.g. hybrids) for sustainable trade.
- Among the many other contributions botanic gardens make to society, botanic gardens provide a range of health benefits and in an increasingly urbanised world, botanic gardens are playing an important role in providing green spaces in urban centres.

- Botanic gardens have begun to respond to the access and benefit-sharing requirements of the CBD by developing implementation tools such as the Principles on Access to Genetic Resources and Benefit Sharing and the International Plant Exchange Network. In addition, new innovative models to generate and share benefits derived from the use of plant genetic resources are being developed.
- The need to develop botanic gardens as models for sustainability has made good progress and technology and innovation are being used to support innovation. These models now need to be more widely applied.

Challenges

- A huge number of plant species are used for their medicinal properties (50-70,000). However, there is a great lack of information, for example on the extent of trade in medicinal plants and baseline population data for plants that are being exploited.
- While collecting plants form the wild is often the only option available, information on what constitutes a sustainable level of harvesting is often not available.
- The role of CITES in protecting wild plants, whilst not discouraging trade or damaging livelihoods, is not always well understood.
- Local plant resources are insufficiently used by urban planners in the development of green spaces in cities – botanic gardens have an important role to play in addressing this gap.
- Policy and decision makers at many levels are not aware of the work of botanic gardens in the conservation and sustainable use of plant resources.

Recommendations

- Many wild plants are under threat due to unsustainable harvesting techniques. Bringing these plants into cultivation is not always the answer - although it often has an important role to play). Botanic gardens should also focus on supporting sustainable harvesting initiatives – using the guidelines recently developed – and especially working with local communities.
- Botanic gardens should ensure that conservation efforts include intraspecific diversity and crop wild relatives as these provide important resources for developing new varieties.
- Botanic gardens and BGCI should work with CITES to support the new livelihood initiatives within CITES, providing botanical information and expertise.

- Botanic gardens need to constantly renew their relevance to society. They can contribute to global as well as local benefits, but cannot flourish without the support of their local community.
- In line with the access and benefit sharing provisions of the CBD, botanic gardens should continue to seek more opportunities for collaboration and innovative ways to generate and share benefits and build local capacity for conservation and sustainable use of plant resources.
- Botanic gardens should inform policy and decision makers about the importance and relevance of their work in conservation and sustainable use, so that new national and international laws create and enabling environment for their work.
- There is a need to mainstream sustainability into botanic garden operations. Sustainability should be built into new designs, structure and garden landscapes, rather than being retrospectively applied. Protocols for sustainability need to be developed and shared to guide botanic gardens.

4. Promoting education and awareness about plant diversity

Achievements

A global survey carried out by BGCI revealed that 91% of botanic gardens include education in their mission. This is very encouraging. Sessions have demonstrated that botanic gardens carry out a wide range of education and interpretation programmes and that they are increasing their efforts in environmental education and education for sustainability.

Education provision complements many other botanic garden activities. For example, involving communities in conserving medicinal plants and eradicating invasive species.

Botanic gardens reach a wide range of audiences from school children through to the general public, local communities and tourists with traditional and innovative programmes, including signage, exhibits, events, classes and field trips. Botanic gardens are increasingly becoming extended classrooms for schools and life-long learning.

Collectively, botanic gardens make a significant contribution to implementing Target 14 of the Global Strategy for Plant Conservation incorporating the importance of plant diversity and the need for its conservation into communication, educational and public awareness programmes.

Challenges

Our world is facing major environmental challenges such as climate change, poverty, environmental degradation, lack of sustainability of food systems and rapid urbanisation At the moment, relatively few botanic gardens are developing communication and education programmes to tackle these issues. Botanic gardens need to stimulate reflection and discussion about these topics with their visitors.

Evaluation is essential for ensuring botanic gardens reach appropriate audiences with relevant messages. There appears to be a lack of qualitative evaluation and research on communication, education and public awareness provision being carried out in botanic gardens. This has implications for the quality and type of programmes offered and their success. To address this, botanic gardens need to find new ideas and methodologies for interpreting messages, i.e. thinking outside the box and creating a new paradigm.

Through communication, education and public awareness provision, botanic gardens reach large numbers of specific audiences, e.g. university students, school children and families. However there appears to be a gap with reaching target audiences such as decision makers, business leaders, people with disabilities and those audiences not currently visiting the botanic garden.

Many gardens report a lack of investment for communication and education provision, whether in terms of finance, resources, staff or capacity building. This may reflect a link with the lack of contact with decision makers and potential funders.

There has been a decline in the teaching of plant science in schools in many regions of the world. Botanic gardens need to address this through their programmes, networking with other scientific and education institutions and influencing policy.

Gardens currently do not make the most of using their unique opportunity to provide ecotourism experiences for their visitors. They can begin by committing themselves to sustainability, using these principles to guide their work and communicating them to their visitors.

Recommendations

In addition to incorporating Target 14 within their education, communication and public

awareness programmes, botanic gardens need to address some of the key contemporary environmental and social issues, including climate change, poverty alleviation, food security, alien invasives and urbanization. In addressing these issues there must be an emphasis on attitude and behavioural change with the aim of achieving sustainable development.

Botanic gardens must attract or provide more investment for their education programmes. This may be through targeting policy makers, business leaders and the media, engaging in partnerships and networks, offering capacity building, employing appropriately qualified educators and reaching new audiences, such as ecotourists.

Botanic gardens should carry out research and evaluation to determine audiences, tailor programmes to their requirements and ascertain that these requirements are being met. Botanic gardens need to utilise new technology such as that offered by the internet, and incorporate environmental thinking in their programme development, for example systems theory can be used to illustrate connectivity and biological complexity.

Botanic gardens should address the perceived reduction in plant science education through their education provision, networking with other scientific and education institutions and influencing policy.

There are a wide range of training needs at several levels, but with limited trainers available. A key need is to maximise training by:

- Identifying key training needs
- Developing standardized multi-lingual training materials
- Recognising local issues, needs and resource availability
- Appropriate certification based on simple but rigorous assessment.

Botanic gardens have an increasingly important role to play in communication, education and public awareness. Research needs to be undertaken to determine their impact and verify their importance in creating a sustainable global society.

Botanic gardens need to ensure that they are fun, exciting, provocative, innovative and relevant places for people to visit and engage with the messages being communicated.