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農復會與十年來臺灣林業建設

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農復會與十年來臺灣林業建設

農復會協助臺灣林業工作之改進，開始於民國三十九年。當時各項計劃均屬小型局部的，係由植物生產組實施。迨四十年初，委員會邀請美籍森林經理專家沈格夫先生及我國造林專家康瀚先生參加工作。此兩位專家會以六個月時間，廣泛調查本省林業情況，研究林業問題，於是年七月編成「臺灣之林業情形」報告（農復會林業叢書第一號），並附林業改進意見書。此一報告會引起政府當局對於本省林業之注意，及振興本省林業之興趣。

農復會委員會有鑒於本省大部為險急之山地，表土易遭侵蝕流失，不適於農業生產，僅宜於森林作物之培植；加以省內河流淺短喘急，雨量多而不均，此等天然條件實構成水土保持不利之因子，是以林業經營之得失，不僅影響木材之生產以及森林工業之發展，且對於農業生產、河流調節、水利灌溉，關係至鉅。為此，乃於四十年十一月成立森林組，在經濟與技術雙方面協助政府，促進本省林業之發展，使本省森林資源在合理之經營下，一面達成木材之永續生產，一面發揮其保安功能，使成為農田水利之屏障。

森林組成立至今，瞬屆十年。在此十年中，曾獲得各政府機關與民間團體之熱誠鼓勵與支持，使農復會五一八個林業及水土保持計劃得以順利完成。此種成就固為森林組同仁努力之結果，然若無我政府之充分合作支持與社會人士之多方協助，此一成就勢不可能也。

（初期工作）

（民國四十年至四十四年）

臺灣原為一森林茂盛之綠島，無論淺山或高山地帶，均為闊葉樹與針葉樹原始森林覆蓋。自日本佔領本島後，即開始進行大規模採伐，在淺山地帶之闊葉樹林中，僅擇優良之樹木而伐，將品質低劣之樹種遺留於林地中，任其繁衍，以致造成今日廣大面積材積貧乏之闊葉樹林。該等林地交通屬便利，但其利用價值極低，對於本省之木材生產鮮有裨益。

對於高山地區之高價針葉樹林，日人則進行大規模剃頭式之皆伐，除中海拔（一千至二千公尺）檜木林伐木跡地上，一部分會以柳杉及杉木造林更新，但二千公

尺以上之高山樹種，如鐵杉及松樹採伐後，則任林地荒蕪，未曾從事復舊造林。以致造成今日大面積之高山草原及箭竹地，未能從事生產。此種破壞性之砍伐，在大戰期間，由於財政短拙，軍事木材需要量增加，以致進行尤為積極。

在海岸地帶，早年所建立之防風林，在大戰期間亦遭砍伐破壞。光復前後，沿海莠民復利用政府管理疏弛之時，從事盜伐。防風林既經破壞，沿海沙丘如脫韁之馬，故態復萌，隨強風向內陸進軍，大面積接近海岸之農田均遭埋沒。不僅作物受損，房舍亦遭風沙掩沒，農民不得不放棄其耕地，另謀生計。距海岸稍遠之農業地帶，亦因飛沙之沉積，生產量大減。在近海岸十至十五公里以內，凡失去防風林掩護之農田，每年減產百分之三十。

公私有林方面，在日據時期一向不為當局重視，民間造林僅為小面積供薪材之相思樹林。光復之初，一般社會人士亦認為林業生產為長期性經營，係政府之職責，不適於私人投資，故對於造林興趣極低。各層地方政府，對於林業興趣不高，對於公私有林之發展亦不重視。在民國四十年時，全省廿一縣市中僅有四縣市政府下設有林務課，縣市林務人員全省尚不足四十名。地方政府既不重視林業，林務經費自極有限，除付員工薪金等行政開支外，所剩無幾，自談不上造林事業之開展。

在保林方面，光復初期火災頻傳，火災偵察瞭望系統尚未建立，巡邏交通工具缺乏，消防器材不足，火災發生時，大面積森林資源迅速毀滅，造成嚴重損失。濫墾情形亦隨人口之增加日益嚴重，農民湧上山區，不管土地權屬，清除林地，從事短期旱作物栽培。此種坡地農墾，既不沿等高線密植作物；由於地非已有，農民更不願投資建築階段，從事定耕。陡坡上森林覆蓋既經破壞，土壤曝露，每逢豪雨，大量表土流失，地力日衰。而土砂隨急流而下，沉積於河床，使床面逐漸增高，暴雨來時，每易氾濫。土砂沉積於蓄水庫及灌溉系統，使水庫及水渠迅速為泥土充塞，終而失去其功用。

至於林業研究工作，雖然進行有年，對於林業知識頗有貢獻。惟因本省林業研究機構與行政機關互不隸屬

，彼此聯繫配合不足；加以光復初年，林業研究經費短絀，設備亦多陳舊，以至大部分研究工作，多屬學理方面之探討，而當時若干林業實際之問題，則尚未着手。

光復初期，從事本省林業工作人員，或對於地方情況不甚熟悉，或一味崇拜早年日人採用之作業方法，對於現代之林業知識與技術，頗多隔閡。如不設法提高工作人員素質，則全面之林業建設工作，勢難順利推進。

至於林業政策方面，臺灣在光復之初，因林業機構不斷變遷，人事亦常更動；加以缺乏可靠之森林資料，以致遲遲不能釐訂健全之林業政策，因而各項林業法規與措施，難免各自為政，各行其事，缺乏體系與原則，對於長期林業建設工作，頗多影響。

農復會鑒及以上之情況，認為最迫急之工作在於：

- (一)過去曾遭破壞之林地，應迅速予以復舊造林，使荒山轉變為生產之林地，並保水土。
- (二)積極重建防風林，以安定風砂，使大面積之棄耕農田及減產之耕地，迅速恢復其原有之生產力。
- (三)以經濟與技術協助，積極發展公私有林，並激發各級政府及社會人士普遍之造林興趣。
- (四)協助林務機關加強森林火災之防止。
- (五)推動水土保持工作。勘查重要集水區之土地利用情形，並實施改進計劃。
- (六)協助林業研究工作之推進，以求早日解答實際之林業問題，而利各種作業方法之改進。
- (七)舉辦各項訓練班，以提高現地工作人員之素質，並選派人員赴美接受近代林業實習訓練。

上述之方針既經確定，農復會乃爭取美援，展開各項工作。在初期四年中，在造林方面第一年之中心工作在於積極擴張苗圃，大量育苗準備次年擴大造林之需。同時致力於本地種子之採集，及進口過去引進成功之外來林木種子，而供擴大育苗之用。

自第二年（四十二年）起，由於農復會之擴大造林計劃，以及省政府對於造林事業之重視，本省造林面積自過去（光復後至四十一年）之每年平均一萬公頃，增至每年平均四萬公頃（四十二年至四十四年）。苗圃面積亦約增加四倍。

農復會與林產管理局及各縣市政府合作之廿四個防風林重建計劃，建造海岸防風林四千公頃，耕地防風林三千八百公頃，使百分之八十曾遭破壞之防風林恢復舊觀，大部被棄及減產之海岸農田，均已恢復其生產力。

公私有林造林在民國三十七年至四十一年五年中，平均每年造林面積五千七百公頃，自四十二年至四十四

年三年中，平均每年造林二萬五千公頃，較過去幾增加四倍半。各級地方政府以及各界社會人士，對於造林興趣，顯然普遍增高。

在保林方面，在初期之四年中，為林產管理局及縣政府，共購置吉普車三十六輛，機車五十七輛，自行車五五二輛，以供保林巡邏之用。建立防火瞭望台五座，自美購進滅火唧筒二五〇個及救火工具等。訂製保林宣傳標語三萬六千張，編印宣傳書冊畫刊多種，分發各學校機關團體。並拍製電影，巡迴各地放演，以喚起國民注意森林火災，提高其造林興趣。此外並協助成立或改組一百八十三個縣鄉鎮護林協會，以協助政府推行各項保林措施。

在水土保持方面，除邀請美國水土保持專家藍敦先生來臺協助外，並與有關機關成立臺灣水土保持技術委員會，研擬有關水土保持技術及政策問題。此外並與各縣市政府及糖業公司等，合作舉辦水土保持計劃十八個，從事技術人員之訓練，勘測重要集水地區三萬五千公頃，改進山坡土地利用二千公頃。在各地推廣平台階段之建立，以示範方式，教導農民合理之耕作方法，並從事有關水土流失之觀測試驗。

在林業研究方面，與林業試驗所合作完成十六個有關研究計劃，其中重要者為柳杉收穫表之編製，重要樹種生產量之調查，防風樹種之調查及試驗，以及種子冷藏庫之建立等。為加強研究機構與行政機關之聯繫與配合，並確保致力於實用之研究與試驗，農復會更建議組織「林業研究評議委員會」，該會於四十二年經省政府採納成立。

在訓練方面，在森林組成立之初期四年中，曾舉辦六項林業及水土保持訓練班，其中三項屬造林方面，一項為森林火災防救方面，另二項為水土保持訓練班，接受訓練人員計達四七六人。此外並先後選派十五名林業人員，前往美國接受為期九至十二個月之實習訓練。

至於林業政策之擘劃工作，農復會一面與美國國際合作總署與農部商洽在臺從事全面森林資源調查，一面邀請國際聞名之林業政策權威季爾業博士來臺研究林業問題，提出報告「臺灣之林業政策及其方案」（農復會林業叢書第二號）。該報告包括本省基本林業政策之擬議與建設方案，其中若干建議業經政府採納實施。

（第二階段）

（民國四十四年至四十六年）

農復會參與本省林業建設之初期四年中，在政府與

民間團體各方面之合作下，工作推進至為順利。本省林業工作逐漸步上正軌，長期之林業建設基礎，業已奠定。

第二階段之工作可分下列數項分述之：

(一)森林資源及土地利用調查

農復會鑒於釐定本省健全之林業政策，確保森林資源之合理經營，並達成土地之適當利用，必須獲得可靠之森林面積、材積、生長量、死亡量以及土地利用情況等資料。而本省原有之森林調查係民國十九年完成者，資料已失時效，不能應用。為此農復會乃商得我國軍事當局之贊助，由空軍拍攝大比例尺航空照片，共計東西二十四條。並自美國當局獲得全臺四萬分之一小比例航空照片，由農復會主持一項全面之森林資源及土地利用調查。並由美國林務局遣派五位專家來臺協助，由林產管理局、林業試驗所、農林廳、農業試驗所及臺灣大學等，選派技術人員，參加實際工作。

該項航空調查於四十三年開始，至四十五年全部完成，總報告「臺灣之森林資源」及「臺灣之土地利用」兩種（林業叢書第三號及第五號）於四十六年印行，連同五萬分之一及二十五萬分之一森林資源及土地利用圖，一併分發各有關機關學校參考。此次調查不僅為亞洲地區首次之資源航空測量，同時亦為世界少數精確之全面森林及土地資源調查之一。

該項全面調查完畢後，復應臺灣大學之請，亦採用攝影測量方法，從事該校試驗林精密之調查，作為編定森林施業案之基礎。此外又陸續完成橫貫公路森林及土地資源調查，及石門水庫集水區土地利用調查等工作。

本計劃之完成不僅獲得各項珍貴之資料，並使我國三十五位農林技術人員獲得航空調查之基本訓練。省政府為採用此項新技術以發展本省經濟建設起見，乃自農復會接受技術人員及全部航空照片及儀器，在農林廳下成立農林航空調查隊，從事各國有林事業區之精密調查，供作編訂森林施業案之資料。此外並利用航空照片從事各種農林調查與計劃工作。

(二)林業政策與方案

農復會鑒於健全之林業政策，為林業發展之基礎，為近代國家經營林業所必需確立者。今森林資源及土地利用資料既經獲得，為集思廣益起見，於四十五年再邀請季爾業博士偕同美國林務局二位經驗宏富之林業專家來臺，根據最新獲得之各項資料，研究本省林業經營方針、法規、組織、財務、作業方法及林業問題等，復與

我國各有關機關舉行多次會議商討，提出一項報告，名為「臺灣林業建設方案」，由農復會出版（林業叢書第四號）。該報告中就林業政策與法規，及森林經營計劃兩項，提出詳盡之建議。

臺灣省政府隨即邀請本會森林組三位同仁，及其他林業機構學校之專家及教授，組成「林務專案小組」，針對美籍專家提出之建議書，再加研討，先後經過二十餘次會議，最後提出「臺灣之林業政策與建設方案」，送呈省府核議，於四十七年三月十一日正式通過，公佈實施，於四十七年十月七日復經行政院核准備查，是為我國首次經政府明文公佈之林業政策與方案。

該項林業政策強調臺灣林業應依永續經營之原則，為全體國民謀取永恆之福利；不僅須發揮森林之生產功能，並應注重森林之保安效用。此外並就森林經理，造林、保林、利用、研究、公私有林、木材工業及森林遊樂之發展、林業管理及人事、以及土地利用等，釐定長期之經營方針與方案，作為今後林業建設之依據。此項林業政策與方案在我國林業發展史上，將為一重要之里程碑。

(三)森林經理

在「林務專案小組」討論林業建設方案時，與會代表推請農復會森林組會同林務局根據新訂林業政策，編著全省森林經營計劃綱要，作為今後國有林經營之準繩。

該綱要在林務局陶局長玉田、農復會前森林組組長沈格夫先生、技正楊志偉先生與著者共同磋商下，經過半年餘之努力，於四十八年九月出版「臺灣森林經營綱要」（農復會林業叢書第六號）。

該綱要係根據最近之航測資料，提出本省林地及各林型經理原則，作為編訂各林區及各事業區經理計劃之參考。其中包括全面經理目標、各林型經理方法、伐採計劃、造林計劃、保安林之經理及二十年林道發展計劃等。

根據該項綱要，本省將於未來四十年中，將全部衰老之針葉樹原生林及質劣之天然闊葉樹林，予以順序伐採更新，逐漸改變為生長迅速材質優良之人工林。

(四)林務機構改組

林務專案小組在完成林業政策草案之後，曾就本省林務機構之組織，加以廣泛檢討，認為：一、林場作業範圍與山林管理所轄區重疊、權責難以劃分，各種作業易於脫節，成為保續作業一大阻礙。二、根據新訂林業

政策，政府經營之伐木作業將逐漸移轉民營（政府僅標售立木）。一面可簡化林務機構業務，使林務人員專注於森林經理，一面可使伐木經營企業化，並發展本省民營工業。而政府伐木機構（林場）之繼續存在，將妨礙此一政策之實施。三、林產局之下，設有山林所，所下轄有分所；分所之下又劃分為工作站，在一貫之林業中央集權制度下，現場工作單位（工作站）事事均須層層向上請示；級層愈多，工作效率愈低，影響作業甚大。四、林場業務既以伐木為主，故一向被視為「生產」機構，山林管理所工作則以造林為中心，故常被視為「非生產機構」，因此林場員工可領「生產獎金」等額外收入，而山林所員工則無此優待。在同一機構服務而待遇懸殊，有違同工同酬之原則。五、林產管理局名稱有強調林產收入之嫌，有違新訂之林業政策林地多角利用之原則(Multiple Use of Forest Land)，應予正名。

農復會過去曾主張伐木與森林經理應分由兩個機構負責，以利雙方業務之推進，今政府既採納眾議，決定伐木逐漸移轉民營，在過渡階段，自不宜另設伐木機構，徒增此一政策實施之困難。

根據以上之檢討，林務專案小組各專家咸認為當時之林務機構實不能配合新訂林業政策之執行，乃擬定林產管理局改組草案，建議林產管理局更名為林務局，撤消林場及山林所，全省劃分十二個林區。國有林分別由十二個林區管理處負全責實施其所轄各事業區之保護作業經營。林區管理處下設工作站，直接向管理處負責現場作業。此外並建議分權制，提高管理處之職權，使能負責，俾增加工作效率。

此項改組計劃終由省府採納，於四十九年二月付諸實施。

(五)造林與保林

在此階段中，農復會推行之造林工作，未曾稍怠。除每年仍保持全省造林面積三萬五千公頃以上，公私有造林二萬五千公頃以上外，同時繼續致力於防風林之建造，使第一期經建計劃原訂之十二萬公頃，達到十五萬五千四百八十七公頃，超出達百分之三十。為求造林木品質之改進，更大量引進國外優良樹種，其中最重要者為美國之濕地松、沖繩之琉球松、及數種來自澳洲之桉樹。此等樹種在臺生長至佳，極適合於本省低海拔質劣之潤葉樹伐採後造林更新之用。

在保林方面，由森林組與林試所及林務局合作，製成森林火災危險度測定儀一種，以加強火災防止工作。

並繼續採購各式車輛，作為巡邏之用，添購各式省產之救火工具，以加強救火工作，並購置動力噴霧器，以撲滅森林蟲害。此外，陸續與林務局合作，推動愛林防火宣傳工作。

(六)水土保持

在四十四至四十六三年中，農復會水土保持工作逐漸展開。為在現地從事長期推廣水土保持工作起見，農復會在四十四年協助農林廳在臺中縣清水鎮成立第一個水土保持工作站，四十五年在高雄及新竹兩縣成立兩個工作站，四十六年又在臺中市、臺中、苗栗及臺北縣成立四個工作站。此種工作站不僅從事水土保持示範，並以經費、工具、技術指導等方式，積極協助農民建築階段、排水溝、種草、植樹及改進農作方式等。工作人員所需交通工具則由農復會購置小型卡車，以供應用。

農復會並協助臺糖公司從事蔗園寬壟階段之建築，協助高雄縣從事山坡鳳梨地之水土保持示範工作，協助建設廳改進大貝湖集水區土地利用，協助水利局推行阿公店集水區保護工作，協助臺東縣在綠島推廣水土保持工作。此外並與臺灣大學及農業試驗所合作收集茶園土壤沖蝕資料，並設置鳳梨園水土流失觀測區，俾利水土保持規劃工作。

(七)林業研究與訓練

農復會繼續協助林業研究工作，至四十六年底，共完成研究試驗計劃二十五個，合作研究報告多已付印，分發各有關機構及學校參考。

林業及水土保持訓練方面，在省內接受訓練者，至四十六年底，達五百八十六名，派赴美國及日本受訓者，達二十三人。

(第三階段)

(四十七年至四十九年)

(一)木材外銷

根據新訂林業政策，本省天然針潤葉樹林，亟待漸次採伐，改植優良樹種。而本省木材消費量有限，為求林班標售順利，私人伐木事業得以發展，並為國家爭取外匯計，開拓海外木材市場，至屬必要。

四十六年底，此間獲悉韓國政府將以美援款項招標大批潤葉樹枕木，林務局一面籌組專案小組，一面由農復會森林組前組長沈格夫氏攜帶枕木樹材二十四種，前往韓國，向美共同安全總署及韓國有關機關說明本省高海拔溫帶潤葉樹材優良性質，以及防腐工廠設備情形。沈氏來臺服務前，曾以 ICA 林業顧問名義在韓服務，

極獲韓美雙方人士之信賴，故此項鋪路工作，對於我國嗣後得標簽約，極有裨助。

首批枕木五十七萬六千零九十一根簽約後，林務局在各有關方面支持與合作下，傾全力加工製作。在原木生產上，進行至為順利。惟有少數樹種，在防腐處理上，尙待研究改進。

農復會鑒於此批大量潤葉樹材出口，尙屬創舉，對於未來外銷，關係至大，故以「只許成功，不能失敗」之心情，不斷協助林務局解決各項困難。為改進本省防腐技術與設備，俾能順利完成此項巨大任務計，特邀請聯合國駐菲顧問，木材防腐權威亨特先生（George M. Hunt）來臺三月，實地考察本省兩大防腐廠，及枕木生產業務，並提出具體改進建議，卒使該批枕木出口順利完成。

自該批枕木順利完成合約後，又陸續出口枕木四批，計三六七、〇〇〇根，價值一、一四〇、四八三美元。

銷韓枕木出口後，本省自一九二六年，始終為木材輸入國（自該年起始有記載），自四十七年起，一變而為木材輸出國，對於政府外匯收入裨助甚大。

農復會為進一步促進木材外銷起見，本（四十九）年度特與林務局、林試所、木材工業同業公會合作，製作本省可供輸出之優良樹種三十五種木材樣本七千塊，並將每一樹種三種標準切面，拍攝彩色底片，製成色彩圖版，附加英文木材性質說明。將來分發至海外各地，預料對於今後開拓省材國外市場必有裨助也。

（二）木材利用工業

農復會曾於四十五年從事一項木材利用工業調查，該項調查顯示，本省大部分木材利用工業，因原料供應不足，以致生產量僅及生產能力之一半，此種情形極待改進。數年以來，農復會為協助各種木材工業獲取其所需之原料，不遺餘力。為保紙廠未來所需木材充分供應計，曾大量推廣松樹造林，預計五年以後，本省全部所需造紙用材，將可以省材充分供應。

農復會有鑒於竹材養成需時很短，週轉迅速，其覆蓋遠較山坡旱作地為佳；且近年竹材生產量相距造紙工業需求量甚遠，故正洽美援，大量推廣竹材造林，業已多次現地調查，選定造林地，預計自本年度開始四年內，植造竹林八千公頃。

為瞭解近年來木材工業之困難，原料供應情況，生產量、原料需求量及生產技術等，農復會現正與七個有關機關，合作一項全面林產物利用工業調查。此項調查資料，不僅可作發展本省木材工業之基礎，對於今後原料木材供應計劃，以及長期造林計劃之編訂，將為極重要

之參考資料，此項調查預定在本年十月完成，中英文調查報告將於年底出版。

（三）航空測量

自從農復會採用攝影測量從事森林資源調查後，政府逐漸放寬航空照片之應用。此種新穎之調查方法不但迅速，費用低廉，且精確度甚高，應用極廣，實為近代國家建設所必需。

航空照片不但可利用於森林及土地資源調查，同時可作大地測量及多種農林漁牧及工程建設之勘測。農復會有鑒於此，近年來極力提倡航空照片之多角利用，使此種「近代建設工具」，充分發揮其效用，以利各方面業務之發展。

在農林航測隊成立後短短三年中，工作開展甚速，除已完成國有林六個事業區森林經理計劃調查，及大雪山山區一萬分之一地形圖及精細之森林調查外，並與農復會合作完成全省防風林調查及八七水災農田災害調查，此外復與中國航測學會合作完成達見水壩等高線圖、海浦新生地形圖、細道邦礦區圖及高雄市市區圖等。

農復會為該隊陸續自國外採購所需之各種儀器，並協助該隊從事多項航測研究、發展與訓練計劃。四十八年並撥款在臺大校園興建一座航測館，一方面可作該隊永久性辦公廳之用，一面可作未來國際航測訓練中心。目前已有一位菲律賓大學副教授及二位菲律賓林務局技術人員正在該隊指導下，接受為期三個月之森林航測訓練。預計不久未來將可發展為一亞洲區國際航測訓練中心。

（四）造林

本省既有廣大面積之荒廢林地，有待造林，在未來二十年內，植樹工作將始終為本省林業建設重心之一。

截至四十九會計年度底止，在農復會二百六十九個復舊造林計劃下，共計造林十八萬公頃，育苗八億二千萬株。目前若干縣市政府管轄下之公私有林地造林，已接近完成之階段。

農復會補助之苗圃至四十九年度止，面積已擴張至一百八十五公頃，每年可生產苗木一億一千萬株，可供造林二萬五千餘公頃。

在最近之三年中，農復會繼續自國外大量採購優良林木種子，其中引進成功者，除美國濕地松已栽植三千九百萬株外，桃花心木在本省中南部生育極佳，各方爭相種植，三年以來已造林一百萬株。凡委託各縣政府培育之各種樹苗，均無價分配予農民栽植。

防風林之栽植，始終為農復會中心工作之一。至四十八年度底止，建造海岸防風林五千一百公頃，耕地防

風林四千一百公里。爲充分瞭解本省防風林之分佈情形及生育狀況起見，農復會於四十八年與航測隊及林務局完成一項全省防風林航空調查。該項調查資料將供作今後建造防風林之參考；何處尚需增造防風林？優先次序如何？已建之防風林現狀如何？今後如何經營始能獲取最大之保安與經濟利益，諸此規劃工作，將因是項調查之完成，而獲得健全之保證。

農復會自四十一年開始，協助金門造林，自四十四年起協助馬祖造林。數年以來，金門每年植樹三百萬株，馬祖每年植樹一百萬株。過去當地居民認爲植樹不可能成功之光禿海島，今已綠樹成蔭。所植樹木，不但供給當地薪材，美化環境，且予屹立于最前線之基地以天然掩護。

(五)森林火災之防止

農復會在防止森林火災方面，曾多方協助林務局加強其工作。近三年來，購置揸負式輕便幫浦一千架，救火工具三千三百件，並自美採購揸負式高壓機動幫浦十架，耐高壓水管五千五百呎，及龍頭、滅火器等。

爲加強火災通訊工作，復採購輕便無線電話六架，最近即可在現地試用，並舉辦訓練班，教以運用方法。

爲發展山區水源，以供救火應用起見，農復會正協助林務局在火災危險林區，建造容量一千加侖水池四十個。

農復會並自國防部洽購本省地形圖六十套，加印林班圖，分發各林務及警察現地機構，以利尋獲火災發生地點，並計劃撲救工作。森林組現已編著「臺灣森林火災消防技術與組織」一書，於九月即可分發各有關機構參考。該書說明各種情況下救火之步驟與方法，並提出本省消防組織之擬議，對於今後改進消防技術與組織，將有裨益。

農復會將於本年十月舉辦一項全省性巡迴救火講習班，一面放演美國林務局所拍救火訓練之電影，一面講解救火技術與消防組織。

此外農復會並爲林務局採購視聽教育器材，以加強林業宣傳。並合作舉辦各項林業教育計劃。

(六)水土保持

至本年六月底止，農復會已協助成立二十二個水土保持工作站，分佈於每一縣(及臺中市)及每一重要水庫集水區(全省共五個)。經數年來之教育、示範、推廣及經濟與技術之協助，農民對於水土保持已有相當普遍之認識與興趣。惟水土保持工作站尙非正式政府機構，爲使此項工作在長期計劃下全面推動起見，農復會於四十八年向省政府建議，在農林廳下設一水土保持局，現省府已同意以山地農牧局名義，從事山區水土保持工作。

在農復會舉辦之水土保持工作訓練班接受實習訓練

人員，先後已達四〇四人，受訓完畢後，大部分均在各地參加實際工作。爲長期舉辦是項訓練計，農復會已在草屯建立訓練中心一座。在美援技術援助項下，選派赴美接受進一步水土保持訓練者前後已有九人，此批人員將爲推進我國水土保持工作之先鋒隊。

爲保護橫貫公路起見，農復會近年來與公路局等合作，在沿線實施邊坡安定工作，以控制表層沖蝕。此種工作將可推行至其他山區公路。去年八七水災以後，農復會成立擴大治水計劃，在中南部荒溪構築各種工程，以攔阻砂石，減輕洪害。

(七)林業研究與訓練

農復會與林試所，臺大、省立農學院及林務局合作，共舉辦林業試驗研究計劃三十九個(包括採購儀器及圖書等)。其成果對於改善森林作業方法定有極大裨助。

在訓練方面，先後舉辦訓練班十一個，人數達九百八十人，派赴美國及日本接受訓練人數則達卅七人。

展 望

農復會今後林業工作之重心，在以經濟與技術援助方式，傾力協助林務局有效執行新訂林業政策及建設方案。

在森林經理方面，將注重於改進森林施業案(經理計劃)，務使各國有林事業區之道路發展計劃，採伐計劃與造林計劃，彼此密切配合。此外並將致力推動各種作業，依照施業案正確執行。

在造林方面，將加強高山造林、危險河川上游集水區造林、及工業原料林造林，此外並繼續輸入外來優良林木種子。

在保林方面，將再加強防止森林火災。工作之重心，將在改進消防技術與組織，並加強防火教育與宣傳。

在森林利用方面，將促成政府伐木及早轉移民營，以增加政府收入，簡化林務局業務，使伐木在企業化經營下，木材生產成本得以降低；推行木材標準規格，推廣闊葉樹材之利用，並協助民營木材工業之發展。

在木材產銷方面，將加強需求量之調查，使木材達到適量之生產，不虞匱乏，不患滯銷。此外並致力於開拓國外市場，協助木材輸出。

在水土保持方面，將繼續改進土地利用方式，以更多經濟與技術協助，擴大推廣水土保持工作，保護重要集水區域。並協助政府以安全方式開發山地資源。

在林業研究方面，仍將繼續協助實用之基本研究與試驗。在訓練方面，將針對當前最迫切需要改進之工作，推行在職訓練，並派技術人員前往國外實習。

在航測發展方面，農復會將繼續協助農林航測隊，在設備、技術及人員素質上，力求改進。爲國家建設從事更大貢獻，並促成亞洲國際航測訓練中心之實現。

JCRR 10-YEAR FORESTRY WORK IN TAIWAN

by *Hsing-chi Yuan*

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More than two thirds of the area of Taiwan is better suited for forestry than for any other land use. The forests on this mountainous island not only provide timber for the population but also play an important role in regulation of water, protection of critical mountain soil and safeguard agricultural lands, and reservoirs of irrigation systems and hydroelectric plants. In view of these facts, JCRR has actively engaged in a forestry development program since 1951 when it established its Forestry Division.

Reforestation

Before the conclusion of world war II, huge areas of accessible hardwood forest were depleted by repeated removal of desirable species, leaving cull trees and inferior species in the forest. In the higher altitudes, grass and weed trees took over the site after large-scale clearcutting of valuable virgin timber. Reforestation, both natural and artificial, was inadequate.

During and shortly after the war, formerly established windbreaks were heavily cut. Sand dunes moved inland, causing serious damage on the coastal cropland. Many such lands were abandoned. Because the significance of this situation was not understood by the public, there was little interest in tree planting, and consequently expenditures for forestry by local governments were very small or lacking altogether.

As the first step toward an expanded planting program, existing nurseries were enlarged and new ones established with JCRR assistance. In 1952 planting stock production was tripled. Additional expansion in the following years further increased the capacity, and by 1960 the JCRR cooperative nurseries in operation reached a total area of 185 hectares, capable of producing 110 million seedlings every year. The annual planting

of community and private forests has increased to 25,000 hectares (average 1953-59) from the 5,700 hectares in previous years (average 1945-52). The total annual planting by all agencies has been raised from 10,000 hectares (average 1945-52) to 38,000 hectares (average 1953-60). Under 269 JCRR reforestation projects, a total of 180,000 hectares of idle land or poorly stocked hardwood forest has been planted, and the number of trees planted totals 820 million. In addition, 5,100 hectares of seacoast windbreak and 4,300 km. of farm shelterbelt have been established. As a consequence, the greater part of the formerly abandoned or deteriorated cropland has recovered its normal productivity.

In addition to greatly increasing the collecting of local tree seed, JCRR during the past seven years has undertaken large-scale importation of seed of exotic tree species previously proven to be well adapted to Taiwan. The successfully introduced species are slash pines from USA, mahogany and narra from the Philippines, several eucalypts from Australia, and Luchu pine from Okinawa. These species are of high economic value, they are well suited for low altitude mountain slopes, and they have become the favorite trees for planting by Chinese farmers.

In its future work JCRR will emphasize the reforestation of old cutover land at high elevations, the planting of bare slopes in the headwater areas of critical rivers, and the planting tree species that yield particular types of product for industrial use.

Forest Protection

Because of high humidity and the large percentage of evergreen hardwoods, forest fire is less likely to occur in Taiwan than in most western countries, but fire is difficult to control because of the extremely steep topography.

The average number of fires is only 40 per year per million acres, and the average area burned is 21 hectares. Practically all forest fires are man-caused. Nearly one half of the forest fires are caused by land clearing, and one quarter by smokers.

Owing to the lack of adequate transportation facilities and fire fighting tools and equipment, serious damage was caused by forest fires in early years after restoration. To improve this situation, JCRR has purchased in the past 10 years 93 motor vehicles and 652 bicycles for patrol use and the transportation of fire fighters and fire-fighting equipment; 250 Indian fire pumps, 1,000 locally made backpack pumps, 3,300 various fire fighting tools, 10 backpack high-power pumps, 5,500 feet of forestry hose and other equipment. To provide water for fire suppression, 40 small ponds have been constructed in areas of high fire hazard. Six portable two-way radiophones have been purchased to strengthen fire-fighting communication. In addition, 60 sets of large-scale topographic maps, with overlays showing working circle and compartment boundaries, have been procured from the Ministry of National Defense for locating fires and planning suppression.

The JCRR forest fire specialist in cooperation with meteorologists of the Forest Research Institute has helped in making a fire danger meter which has been used in several forest districts on a trial basis. He has also improved the compilation of fire statistics by using hand-sorting cards contributed by the Bank of Taiwan. Recently, he has prepared a fire control manual which deals with techniques of fire suppression as well as fire fighting organization.

A short training course was given to the fire wardens in 1954, and the second training class will be conducted in October of 1960, in which fire fighting training movie films produced by the US Forest Service are to be shown after lectures and field practice.

During the past ten years JCRR also helped the Forestry Bureau in strengthening fire education work by procuring audio-visual equipment, distribution of posters, pamphlets

and various educational material, and by conducting educational campaigns.

Fire is a major destructive agency to the forest resources in Taiwan as in other countries. It calls for constant efforts in improving fire control works as well as in public education for fire prevention. It is the policy of JCRR to continue to render technical and essential financial assistance to the forestry agencies in order to reduce the damage caused by fires.

Forest Inventory

Indispensable to a sound national forest policy and forestry program is an accurate inventory of forest resources, the rate of growth and drain, and the use conditions of forest lands. The first survey of forest resources in Taiwan was completed in 1930, and has become obsolete.

With support of the military authorities, aerial photography of Taiwan was obtained for inventory use in 1954. An island-wide aerial survey of forest resources and land use was then organized by the Forestry Division of JCRR, with technical assistance of the US Forest Service. A group of 35 Chinese technicians selected from various forestry and agriculture agencies and schools was trained in photogrammetric survey methods by a team of experts from the US. After two years of strenuous work, involving the measurement of 545 forest and land use sample plots throughout Taiwan, the survey was completed. The results were presented in two reports entitled "Forest Resources of Taiwan" and "Land Use Conditions in Taiwan", (JCRR Forestry Series No. 3 and No. 5). In addition, an atlas of land use and forest type maps in 103 sheets was prepared on a scale of 1:50,000 for detailed planning, and two sets of wall maps on a scale of 1:250,000 for overall planning.

The JCRR Survey Team then completed intensive surveys and maps of the Taiwan University Forest, the Tashushan Logging District, the E-W Cross-island Highway area, and the watershed of the Shihmen dam reservoir.

In order to take advantage of the survey

team's valuable technical training, the PDAF took over the team from JCRR, together with the photogrammetric equipment and photographs. The team has since been made a permanent unit of PDAF, entitled the "Agriculture and Forestry Aerial Survey Team". It has been doing continuous inventory work for the national forest working circles as well other types of aerial surveys. The JCRR has continued to extend moral support, technical assistance, and limited financial aid particularly in the procurement of more survey equipment which is not easily obtainable. In cooperation with the National Taiwan University and Chinese Society of Photogrammetry, JCRR has also aided in the construction of a suitable building on the University campus for the Aerial Survey Team as well as for the prospective Asian photogrammetry training center.

Interest aroused by the use of photogrammetry has resulted in the formation of the Chinese Society of Photogrammetry with more than 150 members. Personnel from the survey project were instrumental in starting the society.

Forest Policy

Following completion of the forest inventory, JCRR secured the services of 3 well-experienced American foresters from the US Forest Service to review the inventory data, study forestry problems, and then formulate a basic forest policy and a forestry program for Taiwan. Their recommendations were embodied in a report entitled "A Forestry Program for Taiwan" (JCRR Forestry Series No 4).

To review the recommendations of American consultants, the Provincial Government organized a Forestry Committee consisting of specialists from JCRR, the Provincial forestry agencies, and professors from forestry schools. In March, 1958, the Government promulgated the forest policy and forestry program submitted by the Committee. This is the first forest policy in written form published by the government, and is an important milestone in the history

of forestry development of the Republic of China.

JCRR will continue to help the Forestry Bureau carry out the approved forest policies in an efficient way.

Forest Management

The approved forestry program called for the preparation of a practical forest management guide. To this end, the staff of the Forestry Division, in cooperation with the Director of the Taiwan Forestry Bureau, prepared a "Forest Management Guide for Taiwan" (JCRR Forestry Series No 6) which was published in September, 1959.

This Guide sets forth the main features of long range management of the forest resources of the island. It serves primarily as a policy guide for present and future forest managers in setting up detailed management plans for individual forest districts and working circles. The Guide is designed to cover a period of 40 years, but is to be revised at 10 year intervals in order to serve its intended long range purpose.

Efforts are to be made in improvement of forest management plans to ensure that the road development plan, cutting plan, and reforestation plan for each national forest working circle are tied together. Field operations are to be carried out strictly in accordance with the improved management plans.

Reorganization of Forestry Agency

At the meeting of the Forest Policy Committee, the following drawbacks in the organization of the Taiwan Forest Administration were discussed:

1. The territories of TFA forest districts and logging stations overlapped each other. Consequently their jurisdiction and responsibilities could not be well defined, and forestry operations failed to keep pace with one another. This situation would handicap the sustained yield management practice.
2. According to the approved forest po-

licy, the government logging was to be gradually turned over to private enterprise. The government logging stations would hinder the carrying out of this policy.

3. Poor work efficiency resulted from too many levels in between the headquarters of TFA and working stations in the field.
4. Logging stations were considered to be "revenue producing", whereas the forest districts were known as "non-revenue producing". In consequence, the employees of logging stations were entitled to "production bonus" and other "production welfare" benefits, while those of the districts had no such rights.
5. The "Forest Product Administration"* had misled the public to stress only the forest productive function. In conformity with the principle of multiple use of forest land as urged by the new forest policy, the name of the forestry agency should be revised.

In previous years, JCRR had been in favor of setting up a logging agency under PDAF to separate logging from forest management in order that the forestry agency could do more effectively the technical forest management and silviculture, and that logging also could be conducted more efficiently as a separate business. Inasmuch as the government had approved the turning over logging operations to private enterprise, the formerly "logging agency" would not be necessary in the transitional stage.

The TFA reorganization plan submitted by the Committee was finally put into effect by the Provincial Government in February 1960. The national forest in Taiwan is now under the sustained management of 12 newly established Forest Districts. The working stations are responsible to the Districts for field operation. More authority has been delegated to the field organizations for better efficiency.

Timber Export

As urged in the forest management guide, large areas of natural conifer and hardwood forests are to be cut over within a period of 40 years and planted with fast-growing species of high economic value. To carry out this program smoothly, develop private logging operations and local wood-using industries, and earn foreign exchange, a search for international markets for Taiwan's surplus timber is imperative.

As soon as JCRR was informed that the Korean Government was to purchase large quantity of untreated and treated hardwood cross-ties on open bid, Mr. Zehngraft, former Chief of the Forestry Division took to Korea samples of 24 species of Taiwan hardwoods. His "preparatory" work helped toward the later awarding of a contract to the Taiwan Forestry Bureau for the production of the required cross-ties.

After the contract was signed, JCRR invited Mr. George M. Hunt, the world known authority in wood preservation, to inspect the treating plants in Taiwan and make recommendations for improvement. His works also contributed to successful fulfillment of the contract.

This batch of cross-ties was valued at US\$2,238,403. or 75% of the total timber export in the previous 3 years (1955-1957). Since then, Taiwan, a timber import country for more than 30 years, has become a timber export country.

JCRR is now preparing wood samples of 35 native species, and a pamphlet containing illustrations of three standard sections of wood together with descriptions of the woods, in natural color, for each of these species. This advertising material is designed to help sales of Taiwan's timber in the foreign market.

Development of Wood Industries

A survey of wood-using industries in Taiwan was conducted by JCRR in 1956. This survey revealed that production by the

*"Forest Administration" as directly translated from Chinese.

existing wood industries had not quite reached 50% of their capacity due largely to insufficient supplies of raw material.

In view of this fact, JCRR has undertaken to find out what prevented the wood using plants from getting plenty of logs and waste wood in Taiwan where forests are the most widespread and abundant natural resource. There is no real shortage. The apparent shortage is the result, chiefly, of too much and too complicated government control of timber cutting and selling, and of the big profit demanded from the timber. This must be changed before the wood-using industries in Taiwan can be really successful.

In the meantime, JCRR has actively promoted and partly subsidized the cooperative planting of millions of pine trees which will be ready for thinning 5 to 8 years later for the paper industry. Recently, plans have been made for planting some 8,000 hectares of land with bamboo in the coming four years in order to provide the raw material required by certain types of paper and fiber companies.

An intensive wood-using industry survey is now being conducted by JCRR in cooperation with 7 concerned agencies. The information to be obtained from this survey will be used as basis to formulate (1) industry development plan, (2) long-term wood supply plan, and (3) reforestation plan.

Soil Conservation

The demands of a rapidly increasing population for more food have encouraged farmers of Taiwan to extend their cultivation from the level lands up into steep foothill areas. The result has been to increase the flooding of valleys, the siltation of canals and reservoirs, and the severe erosion of the steep fields themselves.

It is imperative, therefore, to teach farmers how slope lands should be managed to achieve maximum production with minimum soil loss.

With technical and financial assistance, a total of 22 Soil Conservation Field Offices have been established since 1956. They are

located in each of the 16 Hsiens, in five important reservoir watersheds, and in Taichung city. The setting up of these field stations has taken place just as personnel could be trained.

Technical personnel at these stations demonstrate to farmers the application of correct soil conservation practices. Following the demonstrations the same personnel give technical assistance and lend tools and equipment to farmers who are willing to apply the recommended soil conservation treatment to their own lands.

These soil conservation field stations, however, have no legal status. A recommendation was made by JCRR in 1959 to establish a provincial soil conservation organization. The Provincial Government has decided that, instead of this, a much larger and more comprehensive organization should be established to include the development of marginal and mountain land resources as well as soil conservation on the lands that are already under cultivation.

The marginal land survey conducted under the sponsorship of JCRR has been completed. The information will be used to a great advantage in the future land use planning work.

JCRR has also demonstrated an effective and economical method of controlling erosion on the steep slopes of the E-W Highway. This method can be applied elsewhere by the governmental agencies concerned without further assistance from JCRR.

In the Wild Creek Rehabilitation Program, a total of 133 projects have completed with JCRR assistance for the repair of the damages caused by the flood of Aug 7, 1959.

Research And Training

Forestry research in Taiwan has been in progress for a long time and has contributed to the solution of certain problems and knowledge of forestry. However, since most former forestry research was of an academic nature due to shortages of funds and laboratory equipment, there is still a definite lack

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