保育研究報告第39號

中華民國自然 合作
生態保育協會

墾丁國家公園瓊麻工業歷史展示區之規劃研究報告

內政部 營建署 墾丁國家公園管理處

中華民國七十七年十一月

墾丁國家公園瓊麻工業歷史展示區之規劃研究報告

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內政部營建署　墾丁國家公園管理處

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序言

恒春半島丘陵延綿，土地乾旱，其土地多種植瓊麻，以供製織。瓊麻工業近五十年來，對恒春半島發展歷史及產業、經濟、民生有極其深遠的影響。本研究計畫擬就恒春瓊麻產業歷史及其環境背景作一整體探討，其目的在於協助墾丁國家公園規劃，整頓原有的恒春麻場，建立南台灣農工業歷史演進之環境教育及現場展示解說實體博物館以增加墾丁國家公園在人文教育上之功能。

本研究計畫主要分兩部分：

一、基地規劃：

建議改變和增加現有之構造物及其配置，利用實體操作，讓遊客親身觀察了解瓊麻絲之作業情形，以提供具體教育環境。內容項目包括：遊客中心、瓊麻採織機、鐵道台車、建築設施、展示中心等。

二、史料收集：

協助墾丁處收集台灣瓊麻工業發展歷史資料及相關農工業發展史資料包括：瓊麻史、墾丁地區農工發展歷史等。

本研究計畫係委請 Dr. Bruce H. Billings 進行策劃、執行。畢林士博士為國際著名科技發展專家，曾於民國五十七年至六十一年間，擔任我國前農復會美方委員，對國內農業發展甚有貢獻。研究計畫之成果除瓊麻場之復建計畫外，並包括一附件 "Sisal in Taiwan"，為畢林博士在研究期間所收集有關台灣瓊麻場之史蹟資料。

本計畫與國內一般的古蹟修復工作有極大差異，因為本計畫尚涉及科技演進史料之收集，因此，在計畫執行期間，Dr. Billings 本着其在物理電機方面之專業科學訓練無論在資料收集、人物訪談、機具收購、建議方面，均以極嚴謹的態度，而將近代科技史之研究與國家公園之自然與人文特色結合，着實為國內相關研究，創下了新的里程碑，這亦是國家公園之重要功能之一。

本報告為保留原研究者展之精神，將英文全部文稿印出，並摘譯重要內容。而管理處業依計畫進行建築物之修復工作，並將分年進行整體基地之環境整建與細部解說規劃設計，深信必能使本計畫更臻至完善。

目錄

中文摘要

民國七十四年向內政部營建署張署長建議收購位於屏東縣恒春鎮的恒春麻場，歸併於墾丁國家公園，並將該場修復為一項紀念恒春瓊麻工業歷史的展示區。由本人提出一份修復計劃使恒春麻場將來不但成為一個遊客觀光區並可供學者研究瓊麻歷史。

三年來陸陸續續提出修建工作的各種項目並收集了不少歷史性的資料，此外，我還寄了一篇稿子供給拍攝錄影紀錄片之用，該錄影帶已大致完成，現存墾丁國家公園管理處，俟麻場修復補拍成一個完整的影片供遊客觀賞，我並累次5李建築師商談進行復建麻場情形。

我這份報告共分為二部份，第一部份包括我三年來提出的整修重建工作之項目，其中一篇已譯成中文。在這建議書中我列出應該修復及維護的建築物以及機器的項目並依舊保持各項物品的原有狀態及位置。在設計方面我詳述如何整理及修建整個的麻場。第二部份則是我收集關於台灣的瓊麻歷史。包括從開始到盛期以至今日的沒落。

在這整個的報告中我並附了一些照片供讀者可以看到麻場在還沒有整修前的一般狀況。

除了墨西哥為瓊麻的原產地，瓊麻一直到十九世紀末葉才開始傳播到其他國家，世界上最主要的瓊麻產地，坦尚尼亞，是在公元一八九三年才開始種植，而台灣則是在一九〇一年引進瓊麻。由於全世界的瓊麻工業沒落，台灣應該是首創保存恒春琼麻工業歷史展示區規劃研究麻場修復計劃這項工業歷史以供將來作參考之用。

前言

令人興奮的，內政部營建署墾丁國家公園已收購了瓊麻自動採纖機，並決定修護恒春瓊麻場設施作為恒春瓊麻工業歷史展示區。墾丁國家公園對於我們一年前的建議，採取了這麼快的行動，尤令人快慰。

修復該麻場俾使人們能瞭解瓊麻工業構成的情況，對於吸引遊客允屬當務之急。

古舊的用具在世界各地的博物館裡皆有展覽。能在原有的環境展示其用過的機械則是稀有的機會。現在台灣却有了這機會。當這計劃完成，此瓊麻史蹟中心將是世上獨一無二的。

四年以來，我們搜集了許多在台灣用過的舊式機具，能生動地示範其在台灣的發展過程。從工業技術上，我們發現部份機具創始自中國本土，有些甚至與兩千年前的沒有不同，如龍骨車即是一例；有些襲自西方，例如1887年——愛迪生發明第一盞非凡的電燈七年之後——劉銘傳採用了電光制度。

我們原計劃將這些古物放置在一座博物館裡展示。近五十年來，台灣許多舊有的器物已逐漸棄而不用，快速地失去影踪，許多已不復可尋了。

我們認為在恒春的瓊麻自動採纖機應予保存。但是，移動這架龐大的採纖機到另一博物館顯然行不通，基於上述理由，遂有恢復此瓊麻場舊觀之方案了。

為完成本報告，一套瓊麻場全景的航測圖使墾丁國家公園有所依據是有必要的。得農委會傅安明和林務局農林資源航測隊羅天平之助，我們取得了兩張最新的航照圖片，效果相當好，用立體鏡可以看到採纖機房外面軌道上的推車。這兩張圖片都已交給了墾丁國家公園管理處林益厚處長。

——畢林士

恒春瓊麻工業歷史展示區規劃研究
麻場修復計劃

我們建議採取下面四個階段來完成本計劃。

第一階段

這一階段分成兩部份。尤其必須注意的，在完成第一階段工作前，不得進行任何修建或拆除的工作。

Ⅰ基地整理

首要之務是把整個場地整理清潔。圖(1)是全場的一個略圖。在許多地方都長滿了荊棘，灌木叢，甚至樹木，難以走近那些舊廠房或農地。例如，照片(2)是火車軌道的一小部份。這條日據時代的狹軌道幾為雜草所遮蓋，應小心地將其全部從車軌上清除，顯露出原狀。

照片(3)是路軌的另一小段。

照片(4)顯示的是更好的例證。這座舊水塔從圖(1)上可以知道其位置所在——在麻場的東北角上，荊棘叢生，瓊麻植物被埋沒而看不到了。必須除去這些荊棘以顯其舊日面貌。

圖(1)上面標以建築物#1、#2（日據時代的）四周，其長滿灌木的嚴重情形，令人無法走近廢墟。照片(5)是遍長灌木及長草的建築物#3，已見不到其構造的細節了。清除這些叢草是整理工作的一部份。許多遭到毀損建築物的內部也是整理工作的一部份。在整理工作進行中，要緊的必須將任何小型手工製品或破損的物件保存起來，這些物件可做為對於當初的構造及農場運作的考據。例如照片(6)顯示建築物#3的內部，有些軌道被拆置於此。這些軌道應予保留，俾供修復之需。

照片(7)是另一破損建築物的內部，在整理階段勿觸及那半塌陷的屋頂。在決定修復它還是保留它當作古蹟之前，可從而瞭解當初建造的方式。本圖建築的右邊是樹叢，左邊是圖(1)所示採纖機所在地，外貌見照片(13)。

從照片(9)看到建築物#3一段孤立的牆。這種古老的建築方式是多麼引人入勝。凹陷的牆磚泥土充塞。經過適當的清理後，可能保持其損毀的狀況以做為古老建築方式的實例。

上面已經提過，在整理階段，保留任何發現的人工製品是非常重要的。當全部工作整理完成，我們着重地建議把凹凸的地面整平，然後鋪草皮及原生樹種。場內有充裕的水源，灌溉無慮，當然需要常修剪。能予適當維持，必將呈現一片美景。

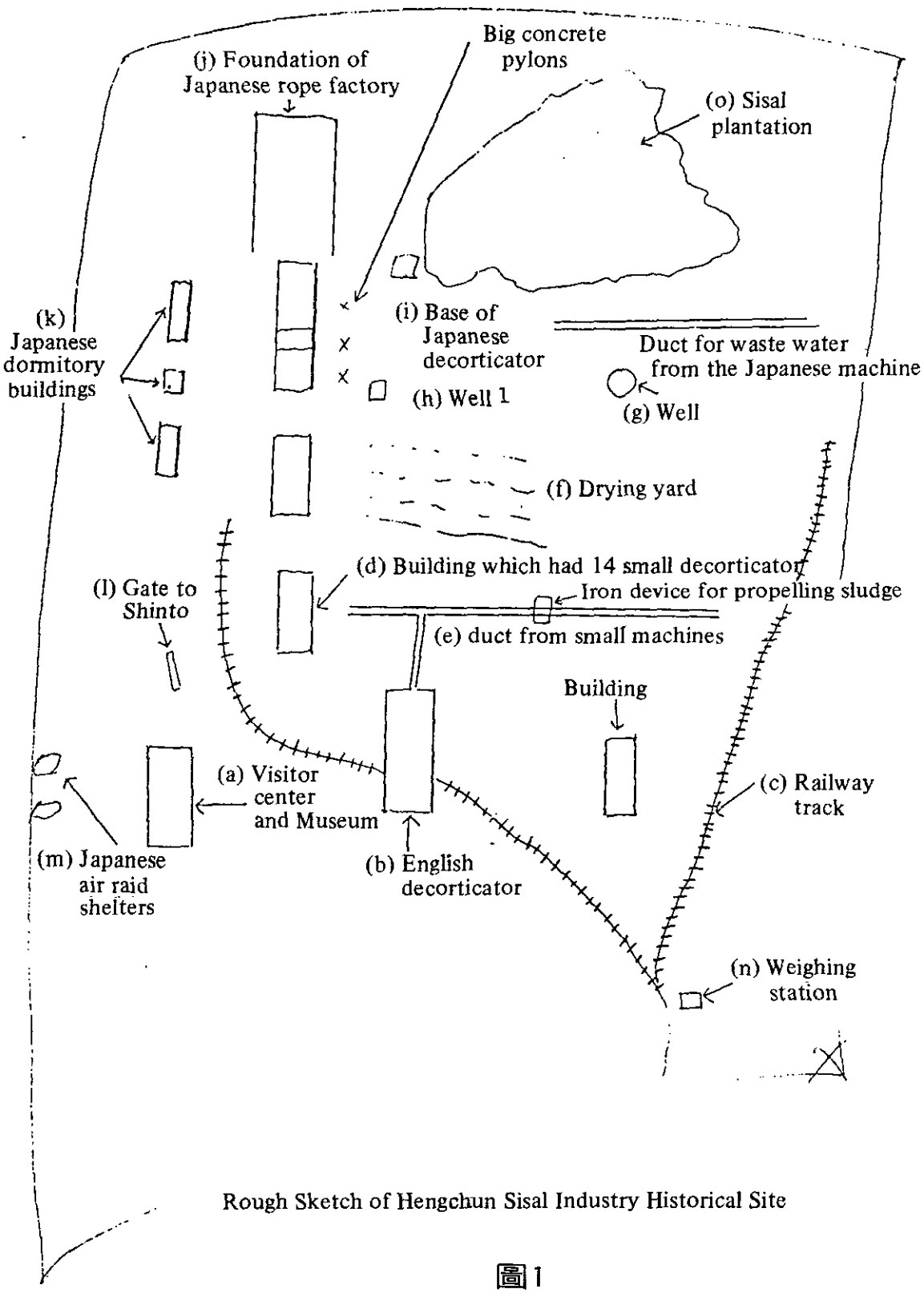
主要的採纖機必須在這階段內清理而修復，應由確知如何處理生銹機器的熟練技師和相宜的助手負擔這項工作。

Ⅱ歷史性資料的搜集

第二部份是搜集原始農場的設計資料，從許多房子構造以及設備的表面瞭解其當初的功用。

我們到處可以看到許多零散的機件，毀損的房子，和不同外形的混凝土建築物，這些顯然從台灣光復以來不曾修建或使用過。有些建築物毀壞到只賸下了地基。

照片(10)裡面的兩座建築在圖(1)略圖上的位置在採纖機及建築物#1、#2和#3之間。後面是另一建築的地基，上面的牆全部不見了，只有許多手工製品遺留在地上。這張照片是從保持良好的建築物（見圖(1)）屋頂上攝取的。



Rough Sketch of Hengchun Sisal Industry Historical Site

圖 1

照片(11)是沒有牆的廢墟其中的一座，能瞭解其興建時間及原始的用途必有助於修復工作。

照片(12)是另一張與照片(10)取自同一地點的照片。從這張照片看到的一片片白色水泥地，證明當初從乾燥場到採纖機房全是水泥地。全盤修復計劃決定之前，不得破壞它或舖上草皮。

圖(1)上的秤量站也在圖(13)內，而在那片樹叢後面亦即照片(7)那座屋頂半場狀的建築，外貌如照片(13)。如前所述，在如何處理這些建築物有所決定之前，必須先發掘出其有關歷史。

照片(14)即秤量站的外貌，內部見照片(15)。圖內秤量機如採纖機一樣，應予以清理並恢復它的工作性能。照片(16)和照片(17)可以看到一些手工製品的實例。

如圖(1)所示，接近瓊麻農場處有幾個混凝土支柱，見照片(16)，很明顯地其周圍長滿了荊棘、灌木，甚至樹叢。這些覆蓋物必須完全移去，而使瓊麻作物重現。這片農場上可能不需覆以草皮。全部整理計劃完成後，究竟保留瓊麻栽培還是將其改成草坪尚待議決。當然這一部份工作是必須查證混凝土支柱的建造年代、用途及其它有關連的機具的有關資料之搜集。

照片(17)上的物件亦需予以查證，其周圍的灌木叢予以清除。

在整理過程中，其他類似的物件可能還會被發現，自屬不待贅述，皆需予以清潔處理及勘查有關資料，以便研究這些物件是如何配合原始操作系統的。照片(18)是最後一件需清理的事物。奠基石上的金屬字體應予加塗金漆以利辨識。

第二階段

第二階段的工作是將第一階段發掘的有關資料詳加研判，決定那些建築物有修復的可能。在任何情況之下，放置採纖機的廠房是必須修復的——其窗戶應換新，架構重建。採纖機在第一階段已修復了。

混凝土築的水渠需予修復。

在此階段，農場上的所有事物皆已清晰可見，襯以綠色草地，編成一幅悅目的景色。世界各地許多歷史紀念物是以損毀狀態呈現於世人前，因其遭受破壞正是構成歷史的一部份。

我並非建議這些廢墟應保留現狀，只是指出當工作進行到上述進度時，已足以吸引遊客了，因而建議進展到此階段，能安排開放供遊客參觀。

在開放之前，需先採取下列幾項措施。首要之務，是編撰一份有關農場裡各項事物的手冊，內容包括其沿革、用途，並略及台灣瓊麻工業史。該手冊含有：

1. 用圖解說明農場佈置情況。
2. 每一建築物和手工製品的用途。
3. 恒春瓊麻工業的背景及沿革。

歐美各國許多歷史古蹟常無小徑可通達，旅客端賴手冊了解參觀項目的位置。這情形不適宜此農場。建議築設一條能通往手冊內所列的每一項目的人行小道。這條貫穿的小道宜採用簡易方式如用脚踏石舖築，俾與場內其他項目相調合，逢雨天時亦免遊客踏上泥濘地。

第三階段

這一階段初期，建議利用現在的辦公室在入口處，設一櫃台，由一位接待員照料，枱面上置放若干手冊，牆上懸掛幾張有關農場的圖片。同時必備的是供遊客用的男女廁所。

停車場可設在如圖(1)所示地點，或農作場盡頭方便遊客沿路步行到入口處。

第四階段

最後階段是根據第一、二階段獲得的有關資料，繼續對整個農場佈局展開改進、修繕或增添設

備的工作。研判某些建築物完全修復舊觀，某些移除，唯不宜早做決定。

裝運瓊麻的小推車應予修復：一部份放在有遮蓋的地方不受淋曬；一部份則整修成不畏雨水或空氣污染的散置於留有車轍的軌道上。若再添置若干與鳥來相同的手搖車推行於車軌上運送遊客來往全場，可增加引人的條件。

這一階段應將原設在入口處應擴建為接待廳，廳內除原陳列的手冊外，不兼出售紀念品如明信片，瓊麻手工藝品等，牆上應懸有大張的圖片，繪釋本場全部項目，以及成套的採纖機構造及運作的詳圖。採纖機房裡亦應懸有這類圖片。

添置錄影機全套設備應是很有助益的。播放內容包括採纖及製成繩索、草墊和其他用品的錄影帶可以增進遊客對瓊麻工業在恒春發展過程的了解。惜此項設備之添置稍後才能實行，因為我們參觀過的工廠已經關閉。

已製成的部份錄影帶可暫與墾丁國家公園管理處的主錄影帶——介紹公園特色的一配合播映。

瓊麻工業目前尚未完全從台灣消失，若干機器仍在操作中，產品有繩子和其他瓊麻製品，應予考慮把其中一台移到舊農場一角的可行性。這項遷移能使訪客對於工廠實際作業一目了然。更重要的，可能會有機構寧捨英製的採纖機而採用台灣複製品。這不僅可供參觀實際作業的機會，也能進一步見識台灣科技發展的方式。

最後建議，在接待廳設一博覽室，以展示古老的製麻產品的器具，如能找到一台最原始的手搖式瓊麻採纖機更佳。

經營管理

上述四個階段每一階段都需有專業人員及監督員督導工作進行，例如場地整理、優良草質選擇、英製自動採織機整修、辦公廳重新安排、建築物復舊、停車場地點及標誌、史料追踪，在在需要有經驗的各方面專業人員，同心協力為之。

整個工作任務繁重，必需一位極具才幹的專人負責綜理全盤計畫。

PROGRAM FOR RESTORATION OF THE HENGCHUN SISAL STATION AS A HISTORICAL MONUMENT

SUMMARY

In June 1985, I suggested to Mr. Lung-sheng Chang, Director of the Construction Planning Administration of the Ministry of Interior that the National Park acquire the Hengchun Sisal Station site as a historical monument to the sisal industry. A formal proposal was written to Director Chang and a decision was made to prepare a plan for the site and make it available for tourists and scholars to visit.

Over the next three years, I produced a series of documents. Some of these were produced under contract and some were produced informally. The majority of these are combined in the following material. Not included is a script prepared for a documentary tape on the sisal industry. The tape is now at the Kenting Park headquarters. It will be expanded to cover more views of the site as it stands today and will later have views of the restoration. Also not included is correspondence concerning the park and work which we have done with Architect Lee on reconstruction efforts.

We have presented the material in two parts.

The first part is a series of recommendations which were made at various times over the last three years. Each year we visited the park and prepared a set of recommendations. Accordingly, there is considerable redundency since each year we wished to emphasize activities had not yet been started. These recommendations included research into the use of the various artifacts in the location, a decision as to which should be repaired and how the site should be arranged for visitors.

In the second part is presented a history of the sisal industry in Taiwan from its beginning through the peak and finally to its present decline.

Included throughout the report are photographs showing the site as it originally appeared before it was restored as a national monument.

With the exception of Mexico where sisal is indigenous, the industry did not spread to other countries until the last few years of the nineteen century. Tanzania, the principal producer, did not acquire sisal plants until 1893. In Taiwan, sisal was introduced in 1901. The decline of the industry that has been seen over time in Taiwan

is being followed in other countries and it is appropriate that Taiwan take the lead in ensuring that the technical and operational details be preserved for future generations.

PROGRAM FOR RESTORATION OF THE HENGCHUN SISAL STATION AS A HISTORICAL MONUMENT

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HENGCHUN SISAL STATION AS A HISTORICAL MONUMENT

Part I

Program and Recommendations for Its Restoration

PROGRAM FOR
RESTORATION OF THE HENGCHUN SISAL STATION
AS A HISTORICAL MONUMENT

Prepared by

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May 1986

PROGRAM FOR RESTORATION OF THE HENGCHUN SISAL STATION AS A HISTORICAL MONUMENT

Dr. Bruce Billings
May 1986

INTRODUCTION

We are delighted that the Kenting National Park of the Ministry of Interior has acquired the old decorticating machine with the associated installations in the Hengchun Sisal Station. We are particularly impressed that the Park was able to respond so quickly to the proposal we made a year ago.

To prepare the site for visitors, it is of vital importance to restore it to a condition which clearly illustrates the characteristics of the sisal industry. This will require a large effort.

Throughout the world, old technology devices are displayed in the museums. Only rarely is there an opportunity to display a machine in the environment in which it was used. Such an unusual opportunity has now been available in Taiwan. When this project is completed, this sisal historical center will be unique in the world.

During the last four years, we have been collecting ancient mechanical devices which were used in Taiwan and which permit a real life demonstration of the development in Taiwan. Some of these devices which can still be found today represent technology which originated in China. Some of these items have not changed even slightly over a period of as long as two thousand years. A good example is the dragon bone car. Other devices represent technology originally brought from the West. An example is the electric lighting system acquired in 1887 by Liu Ming-chuan, seven years after Edison invented the first incondescent lamp.

We had originally planned to display these ancient devices in a museum. We are particularly concerned that although in Taiwan the use was often discontinued as recently as 50 years ago, they are disappearing with great rapidity and many can no longer be found. We felt the sisal decorticating machine in Hengchun should be preserved. However, it is too large to be moved to a museum and the associated

concrete channels and other peripheral equipment in the Hengchun area add enormously to the understanding and appreciation of the device. It was for these two reasons that we recommended preservation of the entire site.

In putting together this report, I felt it was important for the Kenting National Park to have a good high resolution aerial photograph of the sisal station. With the help of Fu An-ming of the Council of Agriculture and Mr. Lo Ten-ping of the Taiwan Forestry Bureau's Agriculture and Forestry Aerial Survey Institute, we obtained a very recent stereo pair. The resolution is reasonably good and with a magnifying glass one can see the carts on the rails outside the decorticator building. We have given both of these photographs to Mr. I-ho Lin, Director of Kenting National Park.

PROGRAM FOR SITE RESTORATION

We propose that the effort to prepare the site be carried out in four phases.

Phase I

· The first phase should be in two parts. It is important that both parts be completed before any detail planning for any construction or demolishing of structures.

I. Clean-up

Most important is the need to clean up the entire area. Figure (1) is a very rough sketch of the area with some of those items. In many cases, it is extremely difficult to get close to some of the old buildings or the sisal plantation because of the incredible growth of brambles, shrubs and even trees.

For example, Figure (2) shows a small section of the railway tracks. This old Japanese narrow gauge track has almost been completely covered with turf. This should be carefully removed from the railways so that they are completely exposed as when they were originally installed.

Figure (3) shows another section of the railway tracks.

An even better illustration is in Figure (4). This shows the old water tower whose location is sketched in Figure (1). Figure (1) also shows the location of the old sisal plantation. This has also been covered with shrubs that the sisal plant itself is completely invisible. Again, these brambles should be removed so that the plantation appears as it did years ago.

The old Japanese buildings labeled #1, 2 and 3 in Figure (1) are so surrounded by shrubs and ground cover that it is almost impossible to get into the ruins of buildings #1 and 2.

Figure (5) is a photograph of building # 3 which shows the shrubs and tall grass which obscure the building details. This ground cover should be removed as part of the clean-up activity.

This clean up process should also extend to the interior of the many broken down ruins of buildings. It is important, however, throughout this clean up activity, to preserve small artifacts or any broken object which would hold a clue as to the characteristics of the structures or the site operation. An example is Figure (6) which shows part of the interior of building #3. In the photograph are some of the rails which were apparently torn up and which should not be discarded but used in any reconstruction of the railway system.

Another building interior is shown in Figure (7).

Again, we recommend that the broken down roof not be touched at this time. This shows how the roof was originally constructed and should be kept until a decision is made as to whether building should be restored or left as an example of the decay of old structures. This building is in a grove of trees off to the right and is off to the right of the decorticator as shown in Figure (1) and also illustrated in Figure (13).

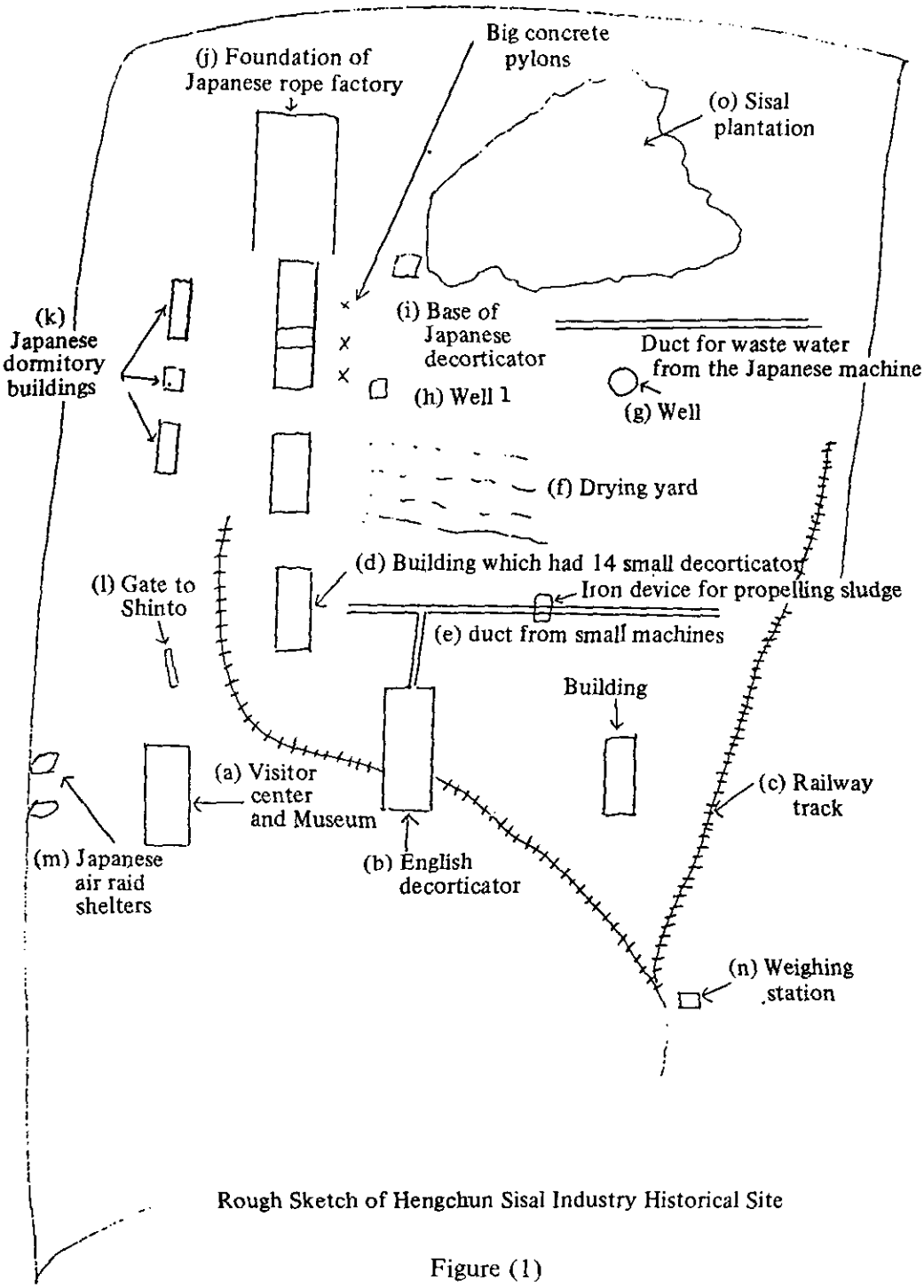
In Figure (9) is a section of the wall of building #3 which again shows the extremely interesting construction of these old buildings. Here the essential hollow brick wall is filled with mud. It may well be that after proper clean up, this building should be kept as a ruin in order to give an actual example of this old method of building construction.

As mentioned above, in all this clean-up activity, it is important to preserve any artifacts.

When the clean up task is completed, we recommend strongly that the irregularities in the ground be smoothed and the entire area be planted with high quality green grass. There is more than adequate water supply which can keep the grass properly watered and of course the grass should be regularly moved. With proper care, the area can be made extremely beautiful.

As part of the clean up job, it is mandatory that the main machine be properly cleaned and restored. This needs to be done by a skilled mechanic and also help should

be provided by an individual who knows how to treat rust and partially corroded metal systems.



Rough Sketch of Hengchun Sisal Industry Historical Site

Figure (1)

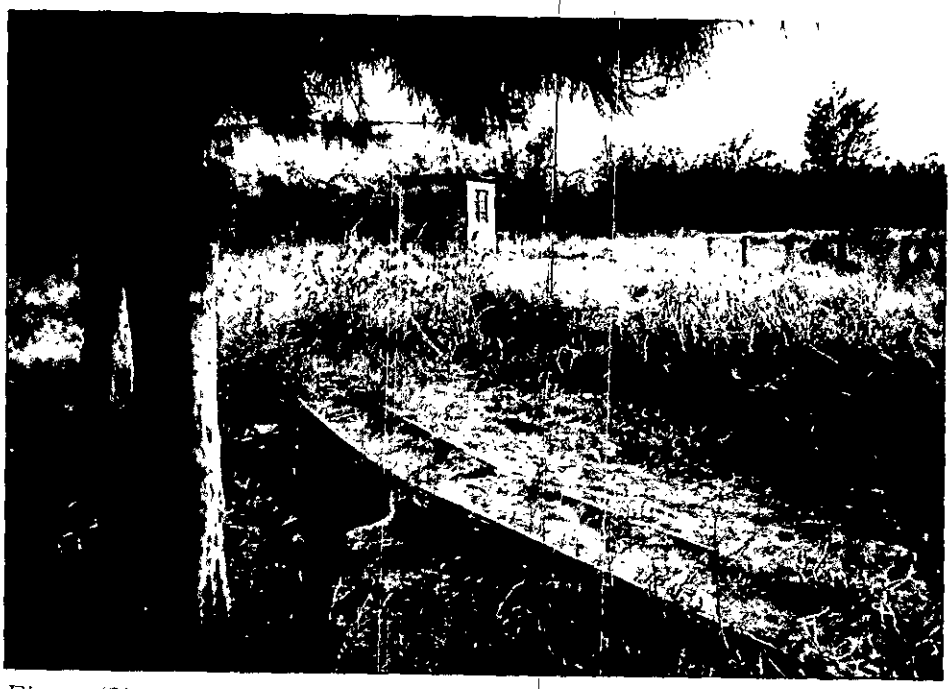


Figure (2)

Figure (3)

Figure (4)

Figure (5)

Figure (6)

Figure (7)

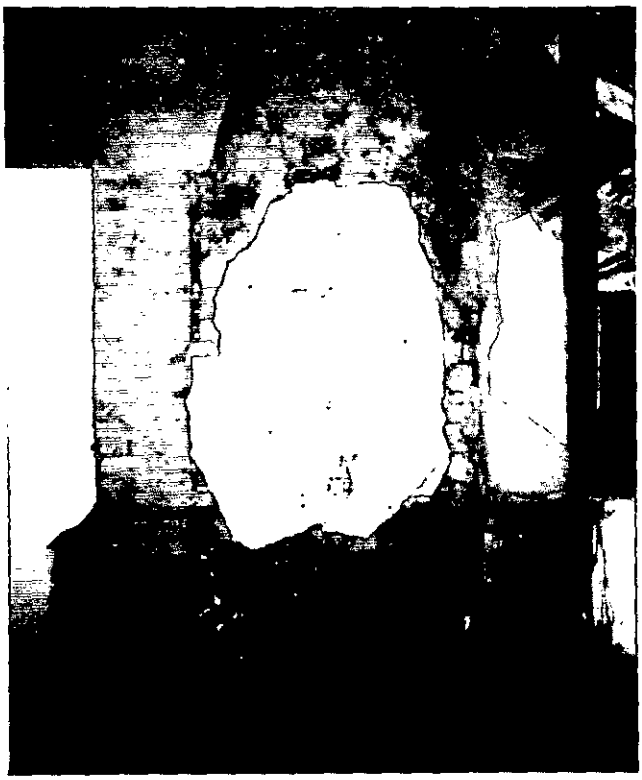


Figure (8)

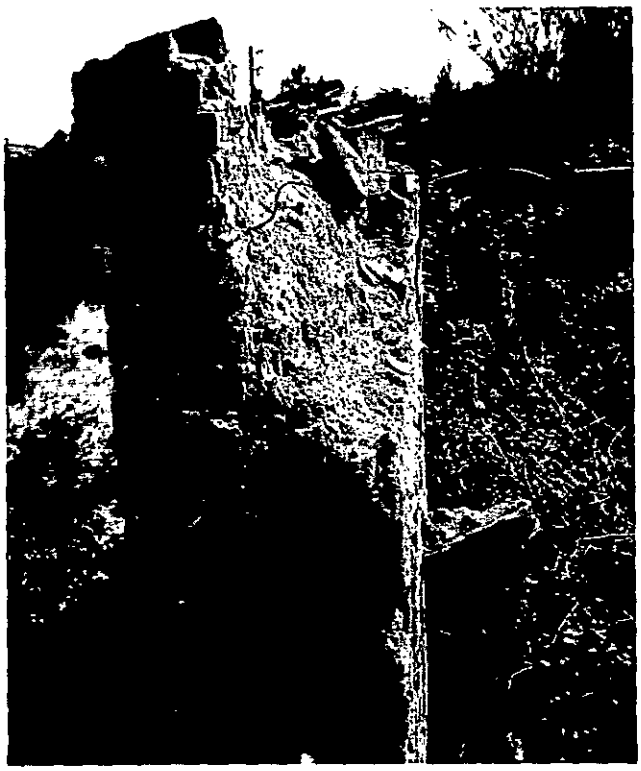


Figure (9)

II. Collection of Historical Data

A second part of this first phase is the collection of information about the original layout of the field, the purpose of the various isolated structures and peripheral equipment and of course the time at which the items were functional.

All over the area are items which apparently date back for many years and have not been used since the Taiwan Restoration. These include pieces of machinery, broken down buildings and various concrete structures. In several cases, the buildings have been demolished to the point where only foundations are left.

Figure-(10) shows the two buildings which on Figure (1) are located between the decorticator and the buildings labelled # 1, 2 and 3. This photograph was taken from the roof of the well preserved structure also sketched in Figure (1).

Behind the building in Figure (10) is the foundation of still another building. The walls of this structure have disappeared completely. Various artifcats still remain on the floor of this ruin.

Figure (11) shows one of these and it will be interesting to learn what was its purpose. It is important to know when these buildings were built and how they were used.

Figure (12) is another photograph from the same location which shows more clearly white patches of cement which must originally have covered the whole area between the drying yard and the decorticator building. This cement floor should not be broken up or covered with grass turf until a decision is made as to its possible restoration.

In Figure (12) also is the weighing station sketched in Figure (1). In this figure, one can see the grove of trees behind which is the building described in Figure (7). This building is shown in Figure (13). Again, as in the case of all the other items, its construction and history should be unearthed before any decision is made as to how it shall be treated.

Like the decorticating machine itself, this needs to be cleaned up and brought back to working condition. The exterior of this machine is shown in Figure (14) and the interior in Figure (15).

Examples of other artifacts are shown in Figures (16) and (17).

The concrete pylons in Figure (16) are located on Figure (1) and are next to the sisal plantation. This photograph shows extremely clearly the amount of brambles, shrubs and even trees which have grown up over the site. These all should

be cleared out so that the sisal plants themselves are uncovered. Grass turf should probably not be planted in the sisal plantation itself. A decision will have to be made after the entire clean up and repair process as to whether the plantation should be maintained or destroyed and covered with green grass. Also, the time at which the pylons were constructed needs to be determined and a description of their purpose and the machinery which was attached.

Figure (10)

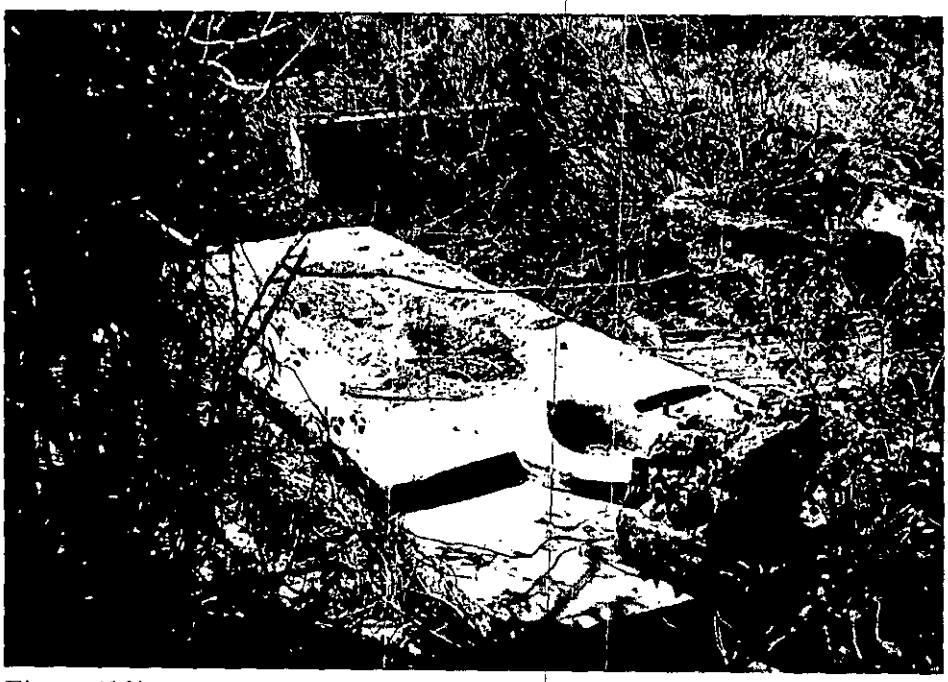


Figure (11)

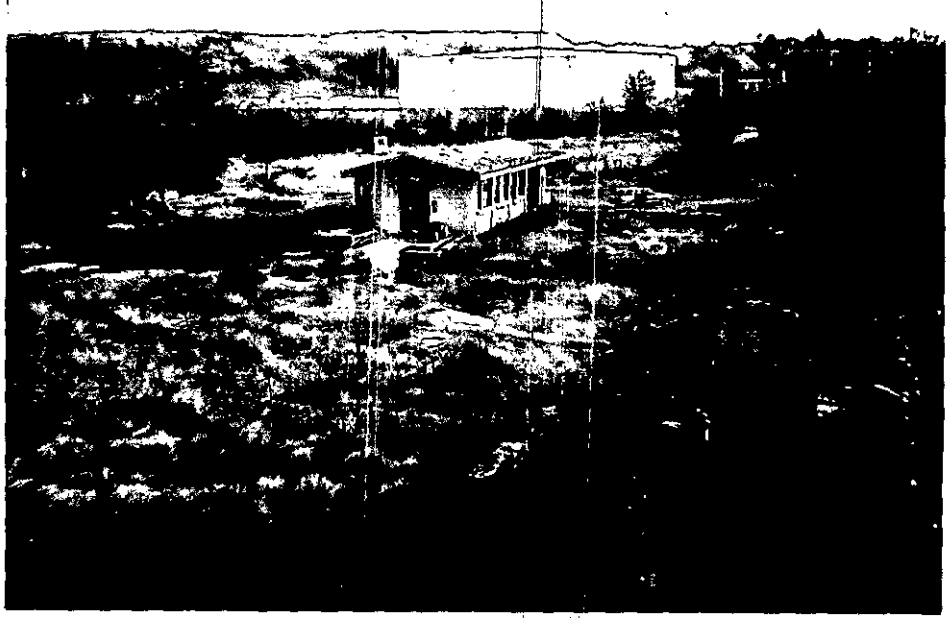


Figure (12)

Figure (13)

Figure (14)

Figure (15)

Figure (16)

The device in Figure (17) needs also to be identified and described and of course the brambles around this equipment need to be removed.

I suspect that during the clean up process other items may well be uncovered and these of course should be understood so that a decision can be made as to how they fit in to the original system.

Figure (18) is our last clean up item. We recommend that the gold paint in this dedication plaque be replaced so that the characters are easily visible.

Figure (17)

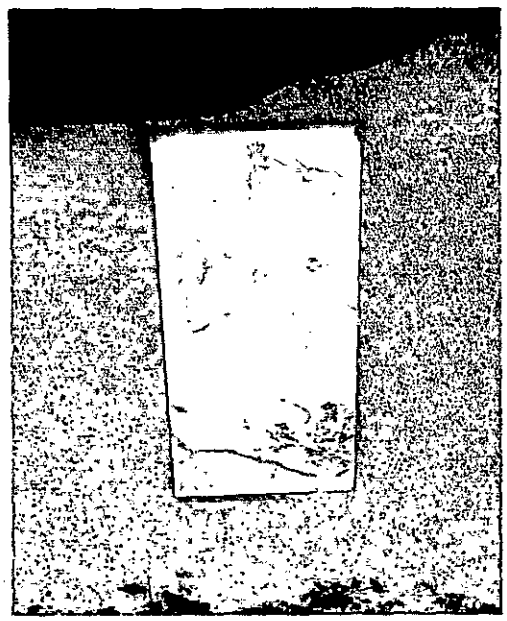


Figure (18)

Phase II

In Phase II, the information uncovered in Phase I needs to be carefully studied and a decision made as to the possible reconstruction of some of the buildings. We recommend that in any case the decorticating machine building be completely repaired. This means windows replaced and general reconstruction of the structure. The machine will have already been restored in Phase I.

We recommend also that the concrete water channels be repaired where needed.

At this point, all the items will be clearly visible, surrounded by properly mowed green sward. It should present an attractive appearance. Throughout the world, historical momuments are often presented as ruins since part of the history is the mechanism whereby they were destroyed.

I don't mean to imply that these structures should stay in the ruined state. I merely wish to point out that after completion of the items described above, the site will already be a tourist attraction. Accordingly, I recommend that after completion of the items above, arrangement be made to permit visitors to view the station.

However, before the site can be opened, several steps should be taken. Perhaps most important is a requirement for information in the form of a pamphlet or brochure to be prepared to include items in the site, the history, how they were used and a bit about sisal industry in Taiwan. The brochure or pamphlet should have:

1. A diagram showing the layout of the field.
2. The purpose of each of the various structures and artifacts.
3. Background and history of sisal industry in Hengchun.

In many old historical areas in Europe and England as well as in the United States, there are no paths or trails and visitors can wander around the area with of course the brochure to let them know where individual items are located. This may not be appropriate for Taiwan. In this case, a foot path should be laid out to lead to each of the individual items as described in the brochure. The foot path should be extremely simple in construction so that in fact it blends with the other items in the station. We propose a simple path of flat stepping stones set on a dirt trail so that in case of rain, a visitor does not have to step in mud.

Phase III

In this early stage, there needs to be a structure at the entrance to the site with a counter, an attendant, copies of the brochure, some wall posters with some of the history of the sketch of the site and of course a wash room. We recommend that the

current office building be used.

A parking area could be possibly laid out either at the area indicated in Figure (1) or in an area at the other end of the field where people would then walk along the road to the entrance by the present office building.

Phase IV

This phase covers the continued improvements, alterations and additions to the site which will result from a study of the data accumulated in Phase I and II. It may well be that some of the buildings should be completely restored to their original state with copies of their original contents made and arranged in the interior. Some of the buildings should perhaps be completely removed. These decisions should not be made prematurely.

Among the items which need to be restored are the small push carts which carry sisal. Some of these might be put under cover as protection and others could be treated in such a way that they will not be damaged by rain or the environment in general. These outdoor carts could perhaps be put on one of the spur tracks which are present here and there along the railroad. On the railroad itself, one might build carts similar to those at Wulai to hold visitors who could then be pushed on the rails through the system as an added attraction.

Part of this phase should include replacement of the original admission building with a somewhat more extensive visitors' center. In addition to the brochure mentioned above, this center could have a more extensive poster description of the items in the station. One or more of these posters should contain a set of drawings showing in detail the structure of the decorticating machine and exactly how it functions. This type of poster should also appear in each of the buildings where machinery is displayed.

It also could have facilities for showing video tapes of the sisal operations from its background to the development of the industry in Hengchun. These probably should be made in the near future since already one of the plants we used to visit has now been closed down. These tapes could show the actual manufacture of ropes and mattresses and other items using sisal as well as complete operation of a sisal decorticating plant.

A part of these tapes can be blended with the master tape shown in the Kenting National Park headquarters building which describes all the features of the park.

The center might also have a few items for sale such as postcards, descriptive

material of the operation or even sisal products.

At this point and time, the sisal industry has not completely disappeared and a few existing machines are still functioning. Sisal rope is being manufactured as well as various other items which use this fiber. I would like to have us consider the possibility of moving one of these existing operations to one corner of the field near the old sisal plantation. With some inducement, such a move would permit the visitor to see the actual operation of a plant. A most interesting possibility would be an organization which is using the predecessor to the decorticating machine brought from England. This would add not only an opportunity to see the actual operation but also an opportunity to gain an insight into the way the technology developed in Taiwan.

Eventually, it might be desirable to add a small museum to the center in order to display some of the old equipment used in manufacture of sisal products or if possible, one of the very primitive hand operated sisal decorticating machines.

PROJECT SUPERVISION

Each of these four phases will require the direction of appropriate professionals and supervisors. The clean-up, selection of high quality grass for ground cover, the clean-up and repair of the English decorticating machine, the rearrangements of the office building as admission, ultimate restoration of buildings, location and design of parking facilities and finally tracking down of history all require people with background and experience.

The total task is large and there needs to be a full time highly competent individual to manage and oversee this whole program.

REPORT ON THE PROJECT FOR THE RESTORATION OF THE HENGCHUN SISAL STATION AS A HISTORICAL MONUMENT

By

Dr. Bruce H. Billings

June 1987

It is now exactly two years since I proposed to Mr. Lung-sheng Chang, Director-general, Construction Planning Administration of the Ministry of Interior that his National Park Department acquire Hengchun sisal station site as a historical monument to the sisal industry. His administration moved rapidly and it is only a year ago that we started our present program to help collecting information and prepare the site for viewing.

We have now completed one year of effort on this program. Everybody involved with the project has worked hard and I believe that as developments continue, this "Sisal Historical Monument" will become a big attraction both for residents in Taiwan as well as for overseas visitors. We are of course delighted that many of our original recommendations are in the course of being carried out. Architect Lee has been retained to do some restoration and repair work on the site. We met with him and Mr. Lin I-ho (林益厚處長), director of the Kenting National Park to review the plan for transforming the old office to a visitor's center with a room for display of some sisal products and some associated equipment such as a small decorticating machine. The room will also have a TV set for presentation of a documentary on the sisal industry. Mr. Lee will also draw up plans for the repair of the building which houses the English decorticating machine. He also prepares designs for the complete restoration of one of the two Japanese dormitories. The other will be partially restored so that the old method of construction can be seen. Finally, he requested approval to plan for the rebuilding of the little Japanese temple which stood behind the Torii gate.

To do the camera work for the documentary, the Park has retained the Tay Shan Company (泰山傳播公司). We met several times with this group. First was in the Hengchun area where we spent the day going over as many as possible of the sites,

the equipment and the artifacts to be considered. In particular, we spent time observing the operation of the last working large decorticating machine in Taiwan. Originally, the island had ten operating machines. Coverage of this last machine in operation is important since it allows visitors to understand the functioning of the machine preserved in the Park. We also went over in detail the attached English version of the script with Susan Ko of Tay Shan Company and gave her a tape of Mozert's "Eine Kleine Nachtmusik" as suitable background music for this documentary. I prepared this script in the special format which is used by TV camera crews. The original will cover more material than will be needed for the Park visitors and a specially edited version will be put together. The entire coverage will be extremely important as a record of the sisal industry since in a few years it will probably disappear completely.

A very important part of this project is the collection and presentation of information about the ruins and the long since vanished equipment associated with the sisal industry in Taiwan. This information should also include details of the history of the operation from Japanese times through to the present. Attached is our report which covers our collection to date and also shows how the Park activities have changed the sisal monument. There is an enormous amount of material still to be collected. The final printed document should then be available in the visitor's center.

RECOMMENDATIONS

In our first report, we made a series of recommendations. First and most important was the clean up of the area. This was done and resulted in several startling discoveries. Perhaps most unusual was the uncovering of these Japanese air raid shelters. Unfortunately, the removal of the brambles was not permanent and they are rapidly growing back as shown in the attached report.

Recommendation No. 1:

As a first recommendation, I would like to propose again that the Park consider the possibility of cleaning up these rapidly growing weeds and prepare the field for green sward. In Taiwan, this is the type of grass cover used in a golf course. When such a field is prepared by professionals who treat it with chemicals to prevent the growth of brambles and weeds, maintenance of such a prepared area is not expensive since it can be periodically mowed with a power mower and again periodically treated to prevent growth of weeds. First cost of

such a procedure is relatively expensive but maintenance would be a lot less expensive then having to periodically clean up brambles and weed growth.

Recommendation No. 2:

As a second recommendation, I would like to propose that trees be planted at the edge of the field to hide the large oil tanks. Again, fast growing and reasonably foliaged trees can be provided. They often can be transplanted at a point where they are already partly grown and in mere seedlings.

One of the interesting features of the old sisal industry was the narrow gauge railroad which had two branches - one which went directly across the Mao-pi-tou pennisula to the coast and the other which went in a more northernly direction towards the sea and then actually along the coast itself. The part of the railroad outside the park as well as some of the tracks in the park have been torn up. It has been suggested that the tracks inside the historical monument be restored and cars be built to carry visitors around the area. However, the area of the monument as it is considered today is small. A railway car for visitors would be more interesting if the tracks could in fact be extended over more of the Mao-pi-tou pennisula so that visitors could see more of this area. Such a long range project could of course include repair of some of the old bridges which in Japanese times supported these railroad tracks.

Recommendation No. 3:

I would like to propose that the Park consider first restoration and use of the line in the Park for visitors but that as a second part of this activity look at the possibility of extending the line over some of its original location.

As shown in the sisal video tape, the plant is still being decorticated by small hand fed machine. It would be extremely interesting for visitors to the site to be able to see this operation in the area. Along the road are a series of sisal plantations and many plants are actually present in the area close to the ruins.

Recommendation No. 4:

I propose that a mechanism be found where a farmer who already owns

a small plantation and who does his own harvesting could be permitted to harvest the plants on the Park property. The harvest dates could be advertised in the paper and on TV so that special tour groups could be arranged to view the site at those times.

A prime reason for the existence of the monument is the need to preserve the English decorticating machine and as an example of historically interesting technology. Normally old technical devices are preserved in museums. This machine with its associated concrete water channels is not only rather large for a museum but also become more interesting when displayed in its original surroundings. An exciting proposal has been made to include in this part of the park a museum with other examples of Taiwan's technical heritage. Each year, an increasingly large number of individuals visit the Hengchun area. A museum with items such as straw bag looms, Dragon Bone pumps, palaquins, ancient telegraphs and other materials from Taiwan's past will make a valuable addition to the historical area.

Recommendation No. 5:

I recommend that the concept be exploited in detail both with respect to the variety of devices that could be acquired or borrowed and displayed, then the building space which would be needed and the details of presentation and of course the cost of construction and the site location. This will be a fairly complex undertaking and will require a team of individuals to make sure the product meets appropriate standards.

From various people in the Hengchun area we have learned what was the purpose of most of the ruins and we have learned what was housed in some of the buildings whose foundations can be seen throughout the area. At the present time, we don't have, however, any photographs or sketches which actually show what things were like at the peak of the operation when all the buildings were still standing and old machinery still running. At this point, there are actually many people in the area who either worked with the machinery or were involved in maintenance of other activities associated with the site. These people could help in putting together a presentation which would show things 50 years ago.

Recommendation No. 6:

I propose that as a first technique, we use the approach used by police in getting a sketch of the face of a wanted criminal. An artist could be hired to interrogate people in the area to sketch buildings as he talks until individuals agree that the sketch corresponds with their memory. From this data, a picture can be put together showing the site - how it actually appeared. The data could also be used for construction of a model.

The English decorticating machine was acquired in 1965 by the Sino-American Joint Commission on Rural Reconstruction (JCRR) with funds provided by the U.S. Agency for International Development (US AID). It was dedicated in 1966 and a marble plaque was installed at the site of the building. The characters on the plaque was inscribed and painted with gold paint. This paint has now partially disappeared and the plaque is therefore difficult to read.

Recommendation No. 7:

This is a simple task but important. I recommend strongly that the plaque be restored so that visitors will see the name and the date of the dedication.

We anticipate that some time this year the new historical monument will be ready for visitors. A lot of effort has gone into the preparation of this historical monument and it is an important component in the list of items which make Taiwan unique.

Recommendation No. 8:

I propose that at the time of opening, there be a special dedication ceremony to which top officials can be invited along with newspaper, TV and magazine reporters. Authors such as Joe Nerbonne who wrote the Taiwan Guide for tourists and of course organizations such as the Tourist Bureau should be invited. It will be especially good if the ceremony coincide with a visit by Premier Yu's science advisory committee headed by Fred Seitz. I would also recommend that another marble plaque be prepared and signed by Director-general Lung-sheng Chang and placed on the wall or on a new gate which might be constructed at the entrance to the site.

ADDITIONAL RECOMMENDATIONS FOR HENGCHUN SISAL HISTORICAL MONUMENT

By

Dr. Bruce H. Billings

January 1988

1. We were startled to see how rapidly the brambles and weeds had begun to cover the whole site. The railway tracks had again almost disappeared and the sisal plantation had become over grown. It is very expensive to clean up the area.

I would like to suggest again that an expert on golf course preparation be asked to look at the possibility and make an estimate of the cost of covering the entire area with green sward. The initial cost of course will be high but maintenance is almost trivial and can be done with a power mower plus some detail work. The only problem might be water but from looking at the stream and the nearby lake, I don't believe this will be serious.

2. On the site next to the concrete support for the Japanese decorticating machine is a small sisal plantation. I would like to propose that this be properly maintained so that tourist can see this cactus with its properly vigorous appearance. Perhaps also once a year, a local individual could be hired to run one of the small decorticating machinesusing leaves from the site. This could be advertised as a special day for tourist to visit the installation.

3. In going over Architect Lee's plans I believe that first priority should be restoration and preparation of the office building as a visitor's center and the building housing the British decorticating machine.

Although restoration of the Japanese buildings is a second priority, I would like to recommend strongly that means be found as soon as possible to protect the existing ruined structures. We were stunned to see how much additional damage was done by the typhoon last fall. In Figure (1) is a picture taken about a year ago of one of the buildings after the site was cleaned up and Figure (2) we took in December 1987 shows complete destruction of the roof and then part of the walls.

Figure (1)
(November 1986)

Figure (2)
(December 1987)

4. We recommended previously that it should be possible to estimate the latest time at which the concrete layers were placed over one area in the site. A good sized tree has grown through the concrete and as I proposed earlier, an expert should be able to determine the age of this tree and thus the latest time at which the concrete was laid. This tree has been pretty much demolished by the typhoon and it would be advisable to make the measurement soon. The Forest Service or the Council of Agriculture can certainly identify an individual who could get the answer.

5. I would like to propose that a strong effort be made to learn what the area was like during the course of its history. It is conceivable that some people might have photographs taken before the war which could show the actual shape and distribution of the buildings.

There is another approach which I recommend strongly. There are individuals living in the area who knew both the historical monument site and the one in Manchow. There are many people in Taiwan who can sketch and paint. I have seen them in street corners in Taiwan sketching people or items. If you brought such a painter to the site and had him sit on the roof of the warehouse building with a few folks who knew the area, he could sketch and the local people could comment and in effect direct his drawing to give a picture of the site as it used to be. An enlarged copy of this sketch would make the ruins more interesting and represent another step towards showing the history of the sisal development in Taiwan.

6. We were very pleased with the video tape. Of course there are still a variety of additions that could make the presentation even better. As an example, when the site is restored, scenes of the area will need to be added.

I would like to propose also that there be more views of the site as it stands at present and that the views which are already in the tape be put together. Right now they are scattered through the tape as isolated shots and it is not clear that these are from the historical monument.

Finally and most important is that the tape needs to indicate more strongly that its purpose is to give a record of the dying industry and to show clearly that the record is part of the historical monument being put together by the National Kenting Park to preserve a record of the industry for future generations.

HENGCHUN SISAL STATION AS A HISTORICAL MONUMENT

Part II

Sisal Development in Taiwan

SISAL IN TAIWAN

By
Dr. Bruce H. Billings
May 1987

PREFACE

This document covers a brief sketch of the sisal industry in Taiwan. The cultivation of the sisal plant and the manufacture of rope were the principal products in Hengchun, Pingtung Hsien. At one time, it had brought prosperity to the area. Today, it has almost completely disappeared.

The large machines used for decorticating sisal leaf are now idle and slowly rusting away. In order that scholars and visitors of future generation can learn about details of this industry, the National Kenting Park has preserved one area as a historical monument with the large British decorticator and the ruins of the original Japanese sisal installations.

In this pamphlet, we have tried to provide background information for all those who are interested.

We owe special thanks to many individuals and organizations who have helped us collecting this material. They include of course those in the Kenting National Park and also the Council of Agriculture and the Provincial Department of Agriculture and Forestry. We also owe thanks to Mr. Chi Ching-yuan, former director of the Fiber Research Center who spent many hours with us and has given us copies of his documents.

SISAL IN TAIWAN

By

Dr. Bruce H. Billings

May 1987

This is the story of the Taiwan sisal industry.

The cactus plant, AGAVE RIGIDA VAR SISALANA, produces a fiber which under the name of sisal hemp has been used for many years to make the ropes and hawsers used in ships. As shown in the photograph, Figure (1), this plant produces a cluster of leaves which at the time of harvesting reaches a length of four feet. The fiber is contained inside the leaves which are covered by a heavy layer of pulpy material. The strength of the fiber is sufficient to withstand the force required to scrape off the pulpy material. The scraping process is called decortication and over the years has been carried out by a variety of devices.

Figure (1)

In Taiwan, the sisal industry was centered in the area of Hengchun which is shown in the map of Taiwan in Figure (2).

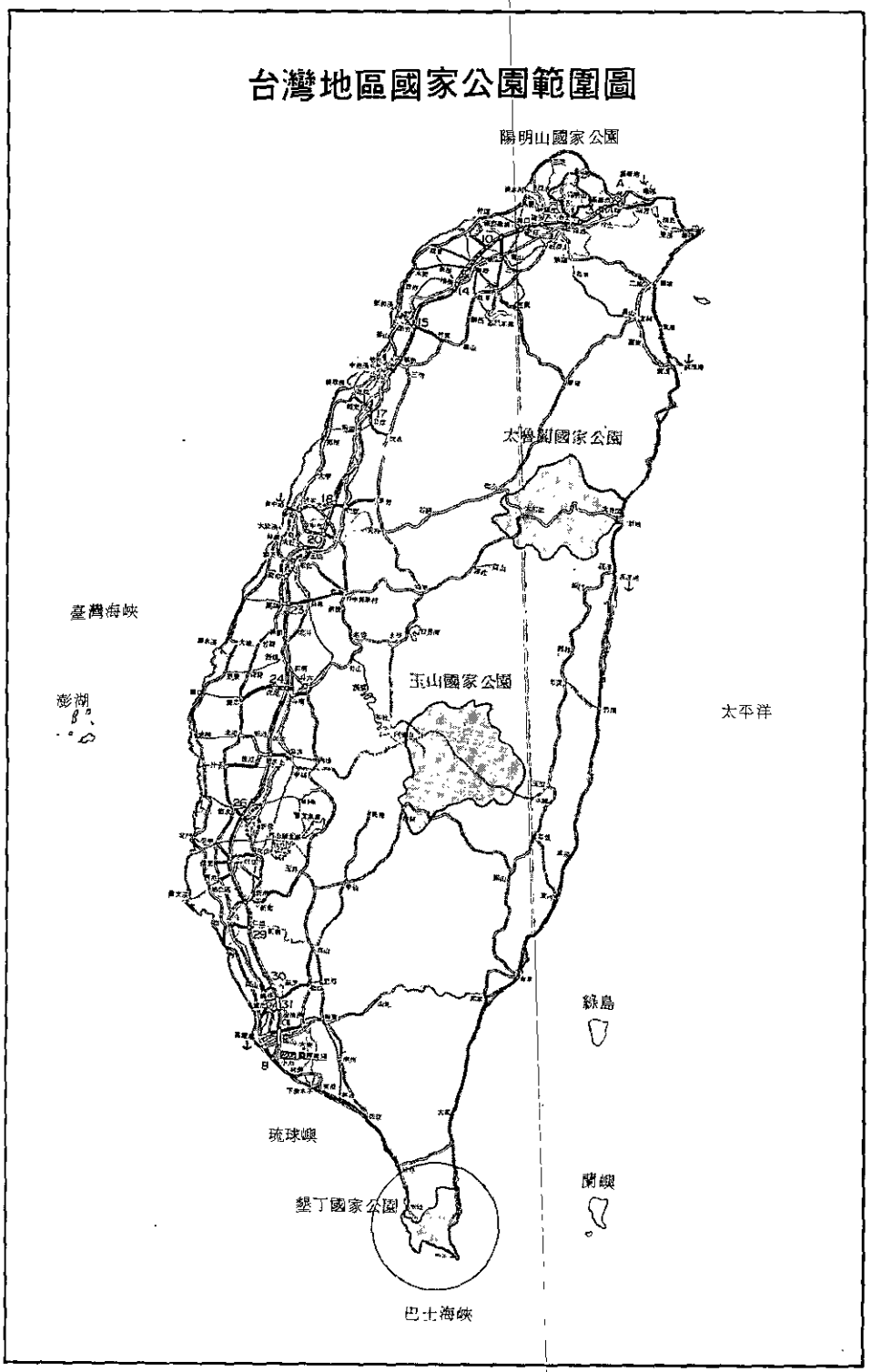


Figure (2)

The soil and climate in this area are particularly suited for growing this cactus. In 1967, to carry out decortication some farmers simply placed the leaves on the road where ox cards and military vehicles effectively crushed and thus made pulp to be removed readily easy.

Although the trade in the fiber was a small part of Taiwan's export, it represented a very large part of the business of the people in Hengchun. People often said that sisal had brought wealth to the area. Now the demand for sisal has dropped tremendously and the production in Hengchun is only a fraction of what it was as recently as in 1964.

In Table (I) we have the production for 1967, 1969 and 1981 as well as the planted area. This table[1] shows the dramatic drop in modern times and also the effective increase in yield per hectare.

Sisal Production Per Year in Taiwan

Unit: Hectares/metric tons

	1967	2969	1981	1985	1986
Planted area	10,280 ha.	8,806 ha.	2,605 ha.	2,485 ha.	2,556 ha.
Fiber Yield	10,377 MT	9,964 MT	3,078 MT	2,057 MT	2,977 MT
				827kg/ha.	1,164kg/ha.

Table (I)

(1) Taiwan Nung Ye Nien Bau

The first production of sisal in Taiwan was during the Japanese Period which lasted from 1895 until after World War II in 1945.

There are a few documents in Chinese and Japanese which describe the beginning of the sisal industry in Taiwan. The following translation[2] sketches some of this early history.

"Sisal originated in Central America. It is a tropical crop. It also has been grown in Hainan Island, Canton, Can-chi, Yun-nan, Fukien and Taiwan in China.

Sisal production dated back in 1901 when Mr. Devitson American Consul, imported it. It was first tried out in Taipei Agricultural Experiment Station. Next year several

seedlings were transplanted to Hengchun Tropical Nursery. The experimental results in Hengchun turned out to be very good. In 1908, a study was conducted by the Tropical Fiber Crop Nursery under the Crop Production Bureau in Pingtung City (屏東市高樹庄，時稱阿緱廳武洛庄設殖產局附屬熱帶纖維植物苗圃) to study this crop as well as its economic value.

Back in 1910, a number of people were sent to Mexico and America to study the cultivation method as well as the method of decorticating sisal with its machinery. The result in 1913 was the purchase of the Prieto decorticating machine. The following year fiber was decorticated from sisal. By 1918, the fiber station of Taiwan Fiber Corporation also imported the same type of decorticating machine for mass production of sisal fiber."

(2)台灣省文獻委員會卷四經濟志農業生產 P 112, 1963。

Through the years, the economics of sisal have changed. Synthetic fiber of comparable strength and sea water resistance were invented. Beginning in the early 1800's, world production climbed to reach its maximum in mid 1900's. Thereafter it dropped steadily.

During the war years, Japanese production of sisal in Taiwan dropped from 1,990,772 kg. in 1942 to a low of 21,0020 kg. in 1944. After Taiwan Retrocession, production built up again to a peak in 1964 of 11,519,995 kg.[3] as shown in the following tables (II) and (III) from the Taiwan Agricultural Research Institute (TARI).

It is interesting that all these documents, both Chinese and Japanese, give credit to Davidson for bringing in the sisal plant. Davidson himself however in his book, "The Island of Formosa" published in 1903 says in a footnote on page 533:

> "The first real Sisal Hemp plants (Agave rigida var. Sisalana) to be seen in North Formosa, so far as the writer has been able to ascertain, were introduced by Mr. A. E. Hodgins during the present year."

(3) Sisal Material, compiled by Special Crops Department, Taiwan Provincial Department of Agriculture and Forestry (PDAF), October 10, 1964

⑲ 瓊麻 (Sisal)

年次及縣市別	栽培面積	收穫面積	收穫量	一公頃平均收穫量	價值	一百公斤平均價值
	公頃	公頃	公斤	公斤	元	元
民國 26.	1,052.50	–	584,091	–	231,031	39.55
27.	1,388.21	–	792,776	–	360,021	45.41
28.	2,345.32	1,173.58	1,251,450	10,664	820,134	65.53
29.	2,708.20	1,155.64	983,998	8,515	7 5,005	80.79
30.	2,933.10	1,578.06	2,311,684	14,649	1,036,668	59.12
31.	2,973.02	1,966.28	1,990,772	1,012	1,434,980	72.08
32.	2,919.24	2,370.36	653,385	276	488,951	74.83
33.	489.80	122:62	21,000	171	24,465	116.50
34.	331.71	331.71	30,078	91	35,041	116.50
35.	536.30	334.78	52,899	158	2,482,980	4.694
臺北縣	—	—	—	—	—	—
新竹縣	—	—	—	—	—	—
臺中縣	—	—	—	—	—	—
臺南縣	—	—	—	—	—	—
高雄縣	530.78	331.71	48,561	146	2,428,050	5,000
臺東縣	5.38	2.93	4,254	1,452	53,810	1,265
花蓮縣	—	—	—	—	—	—
澎湖縣	—	—	—	—	—	—
臺北市	—	—	—	—	—	—
基隆市	—	—	—	—	—	—
新竹市	—	—	—	—	—	—
臺中市	—	—	—	—	—	—
彰化市	0.14	0.14	84	600	1,120	1,333
臺南市	—	—	—	—	—	—
嘉義市	—	—	—	—	—	—
高屏市	—	—	—	—	—	—
屏東市	—	—	—	—	—	—

Table II

⑲瓊　　麻
Sisal

年次及縣市別 Year, Prefecture & City			種植面積 Planted Area	收穫面積 Harvested Area	收穫量 Production	一公頃平均收穫量 Yield per ha	價值 Value	一百公斤平均價值 Value per 100 kg
			公頃 ha	公頃 ha	公斤 Kg	公斤 Kg	元 $	元 $
民國	44	1955	5 123.40	2 447.72	1 076 908	440	5 389 389	500.45
	45	1956	5 483.34	2 756.50	1 236 801	449	4 955 844	400.70
	46	1957	7 574.39	5 750.30	6 904 420	1 201	27 692 066	401.08
	47	1958	7 310.92	5 736.91	6 837 245	1 192	23 661 415	346.07
	48	1959	7 028.30	6 087.80	6 591 565	1 083	26 004 658	394.51
	49	1960	7 359.20	6 266.70	7 836 175	1 250	46 291 985	590.75
	50	1961	8 421.68	7 013.68	8 724 191	1 244	49 190 494	563.84
	51	1962	8 666.20	7 413.18	7 713 056	1 040	44 872 287	581.77
	52	1963	9 735.70	8 093.90	10 047 260	1 241	58 417 920	581.43
	53	1964	10 183.13	8 704.00	11 519 995	1 324	68 246 759	592.42
臺北縣 Taipei Prefecture			—	—	—	—	—	—
宜蘭縣 Yilan Prefecture			—	—	—	—	—	—
桃園縣 Taoyuan Prefecture			—	—	—	—	—	—
新竹縣 Sinchu Prefecture			—	—	—	—	—	—
苗栗縣 Miaoli Prefecture			—	—	—	—	—	—
臺中縣 Taichung Prefecture			—	—	—	—	—	—
彰化縣 Changhwa Prefecture			—	—	—	—	—	—
南投縣 Nantou Prefecture			—	—	—	—	—	—
雲林縣 Yunlin Prefecture			—	—	—	—	—	—
嘉義縣 Chiayi Prefecture			—	—	—	—	—	—
臺南縣 Tainan Prefecture			—	—	—	—	—	—
高雄縣 Kaohsiung Prefecture			—	—	—	—	—	—
屏東縣 Pingtung Prefecture			9,095.00	7,753.00	10,535,015	1,359	62,156,589	590.00
臺東縣 Taitung Prefecture			922.33	858.00	901,450	1,051	5,588,990	620.00
花蓮縣 Hwalien Prefecture			165.80	93.00	83,530	898	501,180	600.00
澎湖縣 Penghu Prefecture			—	—	—	—	—	—
臺北市 Taipei City			—	—	—	—	—	—
基隆市 Keelung City			—	—	—	—	—	—
臺中市 Taichung City			—	—	—	—	—	—
臺南市 Tainan City			—	—	—	—	—	—
高雄市 Kaohsiung City			—	—	—	—	—	—
陽明山管理局 Yangmingshan Administration			—	—	—	—	—	—

Table III

I felt it was important now to prepare a record of this industry since economic forecasters tell us it will probably disappear completely by 1997.

The sisal plant was indigenous in Yucatan, Mexico and in the early 1800's because of its strength and resistance to sea water, was already used in the manufacturing of rope for ships. Decortication was originally done by hand operated machines. As the market expanded, the Mexican government offered a prize for the invention of a device which would be automatic, cut down the expenses, and speed up the process of decortication. The prize by 1861 resulted in a steam driven decorticator, and already by 1866 in Mexico there were at least 600 decorticators of which 400 were steam driven. On the second of October 1884, the government offered another prize for improvement of the machine and this resulted in the invention by Mr. Prieto of the machine which bears his name. This machine had a chain drive which carried the leaves horizontally through the machine.

Over the years, the sisal cactus was taken from Mexico to many other countries - first in 1819 to Flrida then in 1893 to German, East Africa and finally in 1901 to Taiwan. German East Africa rapidly passed Mexico and by 1957 Brazil also passed Mexico in terms of production of sisal fiber. In 1958, world production was 686,000 tons of which the Tanganyika (formerly German East Africa) share was 200,000 tons, Brazil 120,300 tons and Mexico 121,300 tons. During the period of production in German East Africa machines were built in German factories and eventually were copied and improved by the British.

At the present time, for much of the information on the details of the Japanese sisal operation, we have had to rely on oral history. Several people in the Hengchun area worked in the Japanese operation and have been able from their own recollections to tell us some of the details in the factories and their remains.

During the hey day of Japanese sisal production, most of the output went to the Japanese navy to make ropes and hawsers. Two types of machines were used. The first is a small device which could be taken into fields where it was operated mostly by farmers. This type of machine was also used after Retrocession. This is described in the section which covers current operations in Taiwan.

There were two large machines. One of our sources, Mr. Chi-chun Fan (范記春) started work at the age of 18 in one of the large sisal operations which is south of Hengchun town next to a small stream and Chia Tze Chiao (加志橋). According to Fan in 1944 the large machine in this field was burned and Mr. Fan was transferred

to the second operation in Manchou. This area was originally identical with the site near Hengchun. This second large decorticating machine was operated by steam.

In Figure (3) and (4) are the smoke stack and support for the machine which in 1987 still stood in this site. Both machines were mounted on an elevated platform which was placed on top of these supports.

Figure (3)

Figure (4)

Across the field as shown in Figure (5) were the extensive ruins of the Japanese buildup which we were told were warehouses. During our first visit in December 1986 the field grew melons. In this May 1987 photograph, the field has become a rice paddy. In Figures (6) and (7) are closer views of these ruins.

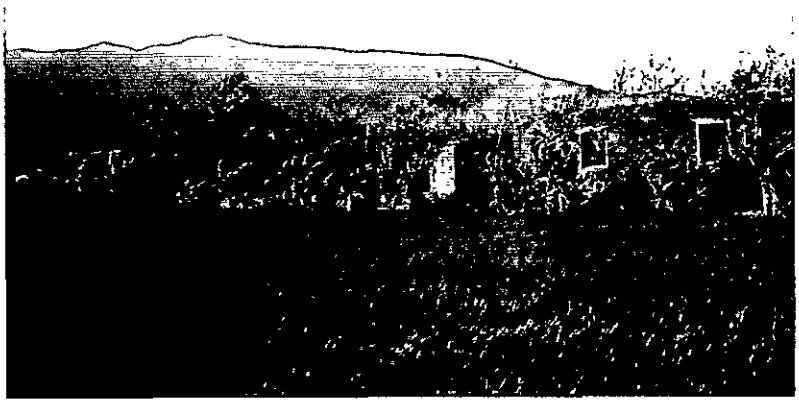


Figure (5)

Figure (6)

Figure (7)

The sludge from the decorticating leaves dropped to the first floor and was swept on a water channel. The fiber continued on through the machine and into the area where the fiber processing took place. Mr. Fan felt that these machines were larger than devices now preserved by the National Park. The records, however, show that these two Japanese devices required 40 H.P. whereas the British machine used 109 H.P. Mr. Fan believes that the Japanese machines were from Mexico and this may indeed be possible since in his description of machinery he mentioned that the fiber leaves were carried horizontally through the operation on chains which went by the first drum in which a large wheel withbars was spun at 400 turns per minute to remove the leaf pulp. The fiber with the attached half leaf was moved by the chain to the second drum where the remaining pulp was removed. The pulp was dropped to the first floor.

The chain then carried the fiber to the other end of the machine to be carried to the drying yard. In the literature, the descriptions of the Mexican machine mentioned that the leaf was transported through the device by chain whereas in the British version and its copies in Taiwan the leaves are carried through the machine by rope.

At the time of Retrocession, both of the large Japanese decorticators had been destroyed and the remaining machines were small portable devices as described in the following translation of a 1956 document[4].

"There are two kinds of sisal farms - large sisal farmers and regular farmers. Besides owning and managing their own sisal farms, the large farmers owned and operated their own decorticating machines. Their sisal after decorticated, graded and were sold directly to the factories. These farmers made good profits. Also because they owned and ran their sisal farms well, there was never any shortage of sisal leaves. The regulars farmers sold their leaves to the decorticating people or split the fibers with them. Very often the large sisal farmers would buy from regular farmers. In other words, the regular sisal farmers had to go through a third party to sell their products to the factories. However, there were only a few number of large sisal farmers and most of the regular farmers went through the decorticating machinery people. Their operations and equipments are described in the following.

(1) Equipment

Themachine was very simple - usually a Japanese made machine with 2.5 h.p. engine (NT$4,000–5,000). A drawing and sketch of the machine is in Figure (1).

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(4)台灣之瓊麻，台灣研究叢刊NO.41,PP.128-49,April 1956.

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(2) Number of existing decorticating machines

District	Hengchun	Men-chou	Tsu-cheng	Fengshan & others	Total
No. of decorticators	180	30	20	20	250

Notes: 1. The number of decorticating machines includes those owned by the large sisal farmers.

2. The number is based on the survey made by Special Crops Department of PDAF in 1954.

(3) Location of decorticating machines

District	Remote Area	Flat Land	Convenient Area
Distribution percentage	60% sisal farmers	70% 70%	72% 72%
	40% decorticating business	30% 30%	28% 28%

Note: This is based on the survey by Special Crops Department of PDAF in 1954.

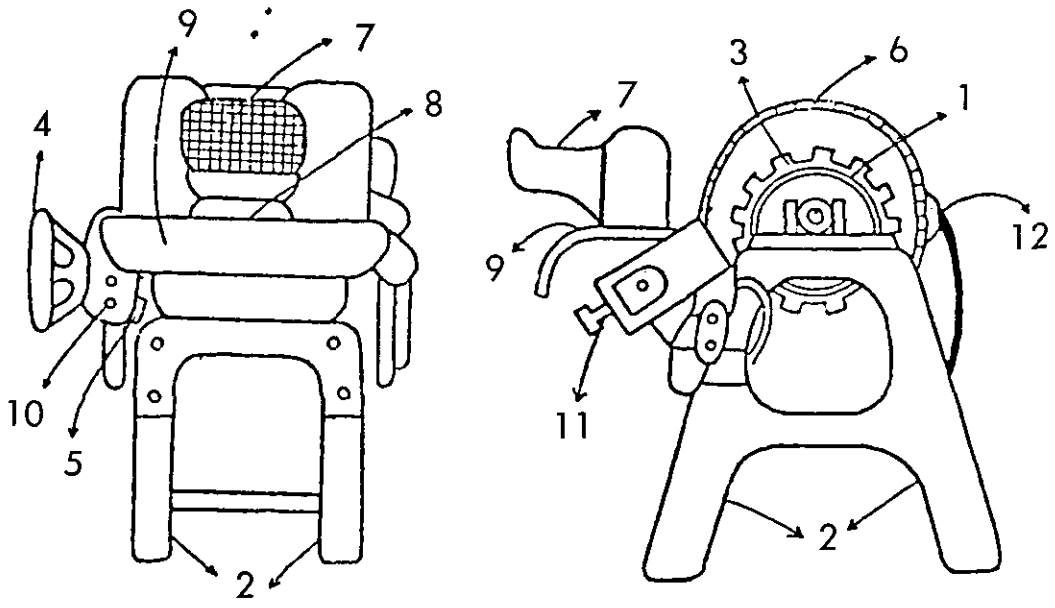
(4) Decorticating cost

	Quantity	Unit Price NT$	Amount
6,000 kg leaves	10 days labor	5	50
Ox-cart (transportation)	2 carts	30	60
Decorticating	8 days labor	5	0
Miscellaneous work	4 days labor	4	16
Technician	1 day	20	20
Fuel			20
Packaging			4.5
Rope for packaging			4
Supervisor	1 day		6
Machinery depreciation			20
Total			233.5

Notes: 1. 2 decorticators can process 200 kg./day; cost for decorticating is $1.2 per kg.

2. Statistics are based on survey by PDAF in Aug. 1952.

池田式剝皮機



（正面圖）　　（側面圖）

1.迴轉筒 2.配架 3.製機板 4.把手 5.把手固定螺 6.迴轉筒安全裝置
7.送葉作業安全裝置 8.挿葉口 9.送葉臺 11.調節螺 11.螺絲裝置 12.軸

Small machines of this type are still used in Taiwan. They are run with gasoline engines and on a sunny day are carried by farmers into these private sisal fields. The leaves are cut and carried to the decorticator which is usually set up under an awning. We discovered this operation by accident when we noticed the awning in the middle of a large sisal area along the coast. In Fig. (8) is a photograph showing how the leaves are fed by hand into the machine. The operation of the decorticator is the same as for large machines. A wheel with ridges rotates at high speed inside a cylindrical cover. The leaves are pushed into the machine to the point where the ridges scrape off the pulp and leave only the fiber. The operation can be dangerous since if the person holding the leaf moves her hand in too far she can lose some fingers. Fingerless people can be noticed in the Heng Chun area. In Fig. (9) is the pile of leaves ready to be fed into the small machine and some of the sisal plants which have been harvested. The next photograph Fig. (10) shows the belt drive which runs the cooling fan as well as the machine. The view from this site is in Fig. (11).

Figure (8)

Figure (9)

Figure (10)

Figure (11)

Further down the coast towards Mau Pi Tou we found a farmhouse beside the road which was at the edge of a plantation with a small machine operating. The machine and the field belonged to a farmer. It also was belt driven and had a cooling fan for the operaters as shown in Fig. (12). Like the previous small machine operation tne cut cactus plants were used as a drying yard which can be seen in Fig. (13). Fig. (14) shows the farmhouse and the area used for packaging the dried sisal fiber.

One big advantage of these field operations is the waste leaf pulp which in the plantation becomes an important fertilizer.

Figure (12)

Figure (13)

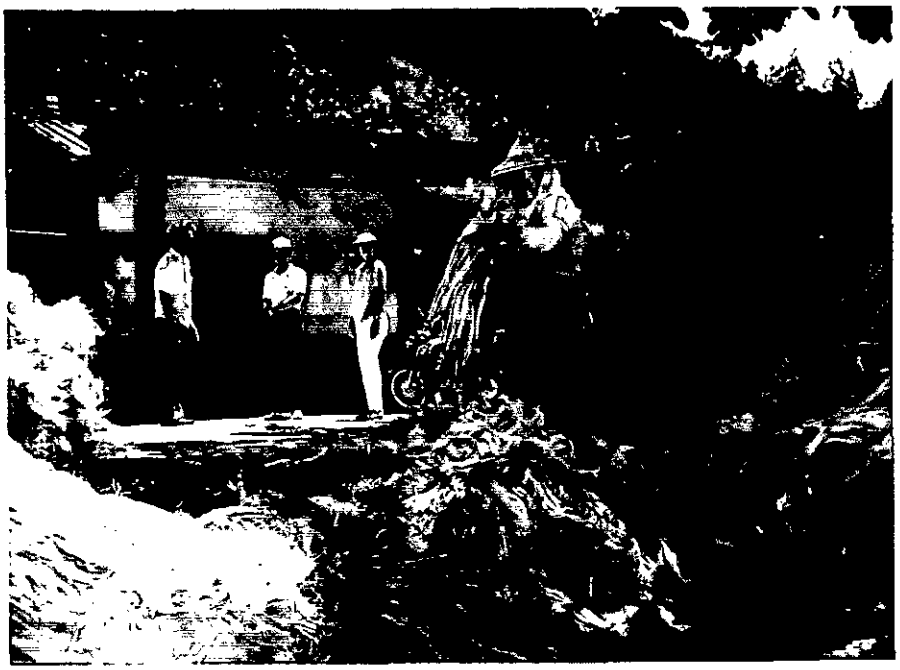


Figure (14)

On March 24, 1964, the Plant Industry Division of the Joint Commission on Rural Reconstruction (JCRR) proposed what became a drastic change in the post Retrocession technology of extracting fiber from the sisal plant. This proposal, TC-3654[5], in the JCRR Archives pointed out that during the period from 1958 to 1963 the export value of sisal and sisal products increased enormously as shown above in Table (III).

Japan was buying large amount of sisal; very little was acquired from Taiwan. To quote from the proposal:

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(5) Joint Commission on Rural Reconstruction (JCRR) Proposal TC-3654. Subject: Establishment of a Pilot Sisal Decortication Plant in Hengchun, dated March 24, 1964.

SUBJECT: Establishment of a Pilot Sisal Decortication Plant in Hengchun – For the Improvement of Sisal Quality in: Promotion of Sisal Export.

The Plan

Among the several kinds of fiber crops grown in Taiwan, sisal is a very important item and ranks only second to jute as far as its planted acreage and economic value are concerned. In 1962, the sisal acreage amounted to 8,666 ha., producing 7,713,056

kg. of fiber. Based on the average price of sisal fiber at NT$10/kg., sisal produced in Taiwan in 1962 may be valued at NT$77,130,000, or an equivalent of US$ 1,928,000.

In the past six years, the export of sisal and sisal products have gained increasing importance year after year. In 1958, the total value of sisal export was only US$ 133,462, whereas it rose to US$614,893 in 1959 US$561,784 in 1960, US$383,272 in 1961, US$691,984 in 1962 and US$1,487,164 in 1963, respectively. The following table shows the amounts of sisal fiber, rope and rug exported from Taiwan during the period of 1958–1963:

Taiwan's Export of Sisal & Sisal Products during 1958–1963

Year	Sisal fiber	Value	Sisal rope	Value	Sisal rug	Value	Total value
		US$		US$		US$	US$
1958	831 MT	133,462	–	–	–	–	133,462
1959	3,439 MT	562,727	197 MT 431 rolls	52,166	–	–	614,893
1960	2,195 MT 10 bales	433,025.6	431 MT 1,086 rolls 1,000 catties	128,758	–	–	561,783.6
1961	250 MT	52,007.5	3,773 MT 3,420 rolls 10 bales	332,264.59	–	–	384,271.59
1962	701 MT	148,194	1,743 MT	543,789	3,515 sq.ft. 1,240 pcs 1,000 kg.	2,465.78	691,983.78
1963*	–	611,531	–	871,079.34	–	4,553.68	1,487,164.02

Source of data: Bank of Taiwan

Detailed figures of 1963 export not yet published;
export value supplied by the Bank of Taiwan.

Although the current trend of sisal export has increased significantly over the past years, future prospect for expanding the export of sisal and sisal products from Taiwan is still promising. Japan alone imports some 20,000 MT of sisal fiber yearly from Africa, Australia, the Philippines, Indonesia, England and Taiwan. Among Japan's total sisal import, Taiwan's supply varied from 250 MT to 3,400 MT being only about 1.25 to 17% of its total import. Because of the short distance between Japan and Taiwan, sisal and sisal products from Taiwan are certainly welcome by the Japanese

market. The reasons why Japan imports only so small a percentage of sisal from Taiwan are that: 1) too much admixture in the sisal fiber has resulted in the great percentage of loss in the manufacturing process; 2) the color of Taiwan fiber is not as white as that of ofrican origin.

From the information supplied by the Tokyo Branch of the Central Trust of China, the following statement (translated from several Chinese letters) may be quoted for reference:

"1. Taiwan produced sisal is not as white as those from other countries. It contains admixture thus causing higher loss in manufacturing.

2. It seems to us that the decorticating facilities in Taiwan are inferior; so the fiber contains too much leaf residues .... For the sake of expanding Taiwan's sisal export, the decortication method should be re-examined and improved."

In order to break through the bottleneck affecting seriously the sisal quality, two factors should be considered. Firstly, an automatic decorticator may serve to minimize the leaf tissue otherwise attached to the fiber; and, secondly, a washing device to wash the fiber right after decortication may whiten the fiber and improve its quality. To achieve these two purposes, the automatic "Corona" type sisal decorticator seems to offer the only answer. This type of automatic decorticator can process the leaves into cleaner fiber with the least amount of leaf tissue left on it. The fiber is then washed and carried out by the conveyor belt ready for drying. According to Mr. H. S. Chang, Senior Specialist of this Division, this type of automatic decorticator has been widely used in East Africa where sisal is the main agricultural product of those countries and where over one-third of the world's sisal is supplied. The adoption of this decorticator may improve the quality of sisal produced in Taiwan, and thus the expansion of export sales can be expected. However, before the introduction of the said decorticator, several problems have to be solved. Firstly, the sisal farmer in Taiwan is accustomed to have a dealer bring a decorticator to his farm to decorticate sisal leaves into fiber. He may not wish to send his sisal leaves to the decorticating plant for automatic decortication, is against the usual practice for processing, particularly when the plant is just set up. Secondly, the machine requires considerable amount of water for its washing operation, while in the Hengchun area where about 90% of the Island's sisal is grown, some places have no underground water source for this purpose. Thirdly, the operation and maintenance of the machine require both technical and managerial personnel for timely feeding of sisal leaves into the machine,

drying of fiber, collecting of processing charges, as well as many other kinds of business. The selection of a crew of experienced personnel to operate the machine is another problem to be solved before the machine plant is set up.

In view of all the factors as mentioned above, a series of meetings has been held among PDAF, JCRR, PSB and other concerned organizations. The conclusions reached at these meetings may briefed as follows:

1. It was unanimously agreed that a pilot plant be erected in the Hengchun area and one set of the smallest type of automatic decorticator with washing device be introduced for trial use and demostrate purpose. The establishment of the pilot plant may lead the local growers, dealers or the related government organizations to set up similar plants.

At that time, the bulk of the world production was in East Africa where most of the decorticating was done by automatic machines which produced completely clean fiber and could handle a much large quantity of leaves per hour. It was also proposed that the plant would be put up in the Hengchun sisal farm of the Taiwan Agricultural and Engineering Enterprises Ltd. which was the location of one of the two Japanese machines. Five bids were tendered. It was planned to select companies in U.S.A., West Germany, Holland and England. A rough description of the desired machine which was sent to bidders is shown as follows:

Description

One complete set of automatic sisal decorticator with motors.

Capacity: 8-ton leaves per hour.

Length of leaves to be decorticated: 30cm to 140cm (or greater range).

With two beater drums all covered, stainless steel beater knives, reversible wearing plates, pulleys, Manila ropes for leaf and fiber transport and manufacturer's standard equipment.

Equipped with:

1. Feeding conveyor, 2-speed, with leaf adjuster for aligning butt ends of leaves. 1 set
2. Washing device, with water pump, complete pipe system, spray jets and valves for washing the fiber during decortication and for washing away the waste. 1 set
3. Hydraulic rope tensioning device, with 4 cylinders and fully automatic pressure device. 1 set

4. Complete sets of electric driving motors for driving beater drums, feeding conveyor, fiber transport and washing pump with necessary transmission, motor starters and safety control.

Complete with one set of tools for operation, maintenance and repair use.

Optional:

One lot of main spare parts for 2 years as recommended by the manufacturer. The price of the spare parts should be quoted separately.

Total Estimated Cost US$31,570.00

Remarks:

a. Power supply for all motors is 220V, 60 cycles, 3 phase, AC.

b. One detailed layout must be furnished with the bid.

The final bid was won by Shirtliff Brothers, Ltd. in England. It was described by JCRR as the "small machine" and was installed in the Chia Tze Chiao (加志橋) field.

According to Kirby[6], in 1963 there were three important machines in the market – the Corona, the Robey and the Stork machines. All of them had two drums with beater knives. The Shirtliff Brothers in addition to the Corona machine, made a fiber baling press and a kenaf harvester. In response to our inquiries in England, we have learned that they went out of business in the 1970's.

According to Cyril Jarman[7] the Corona was originally made by the Ottensener Eisenwerke of Hamburg. The history of this particular model probably started in Germany since prior to 1918 the African production area was part of German-East Africa where the sisal plant was introduced in 1893. By 1913 20,000 tons of fiber were exported from this region.

The fiber with the British machine was owned by the Agricultural Engineering Enterprises. The machine itself was handed over by JCRR and US AID to the Provincial Department of Agriculture and Forestry. It was operated by the Agricultural Engineering Enterprises and handled sisal both from the government plantation and from private farmers for a fee. It was finally closed down in 1980.

(6) Vegetable Fibers, R. H. Kirby, Leonard Hill Brooks, Interscience Publishing, Inc. NY 1963.

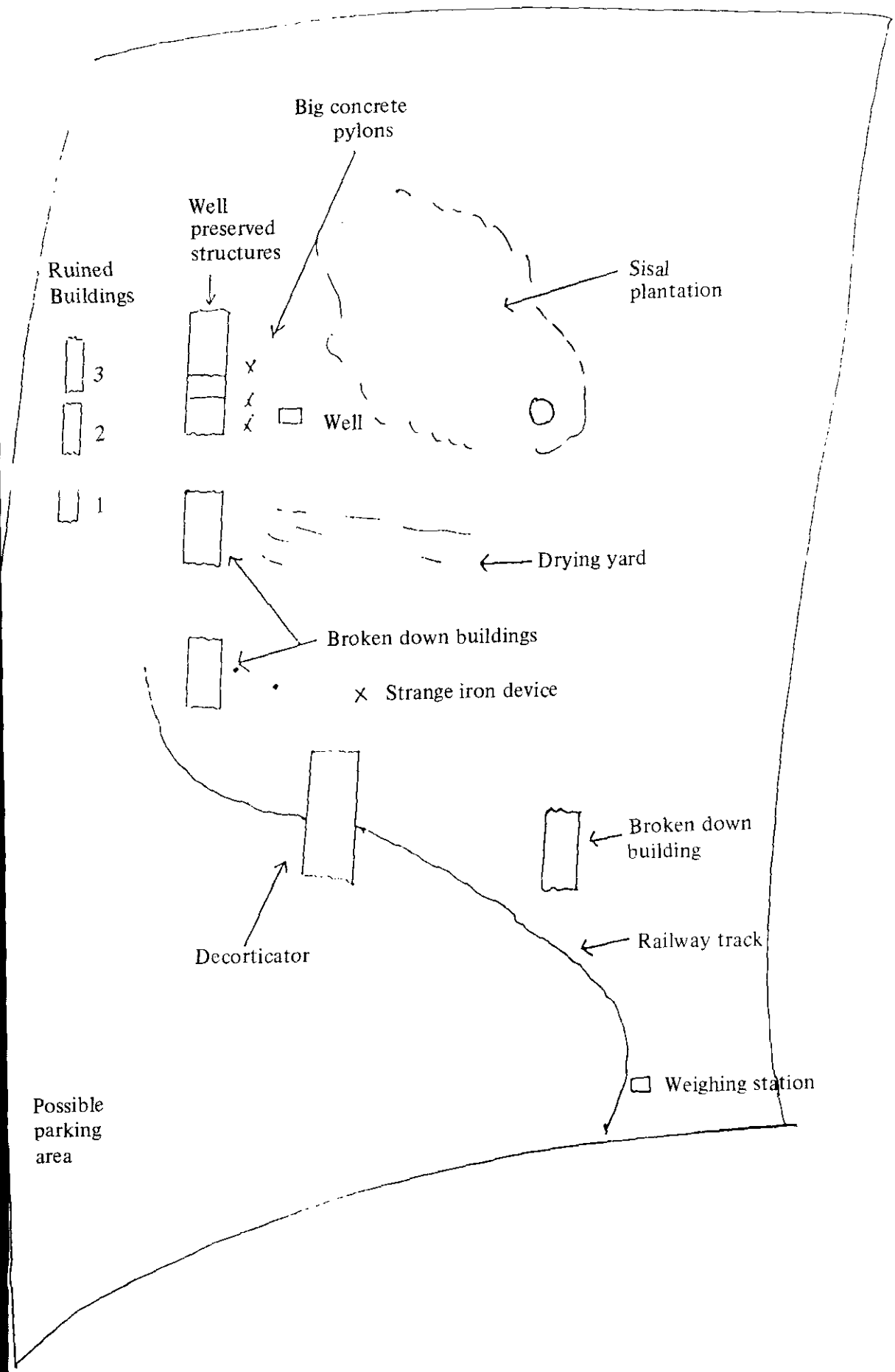
(7) Cyril Jarman, private communication.

Because of the importance of the sisal industry in the Hengchun area and because the industry is rapidly disappearing, it was felt that the Chia Tze Chiao (加志橋) field with its associated ruins and artifacts of sisal industry should be preserved so that future gererations would be able to see these remains of Taiwan's industrial history. Accordingly, in May 1984, I recommended that the land and its associated equipment be acquired as a historical monument by the National Park Service. This was done in 1986.

In Figure (15) is a sketch of the area showing its various artifacts. The total acreage of the site and its associated experiment station is 14,416 hectares. The station itself occupies three lots – 10.4040 hectares under the land No. Hengchun Lungshui Shiutuan No. 527.1 (恆春鎮龍泉水段土地地號), 2.5169 ha. under the land No. 527.2 and 1.4906 ha. under the land No. 527.3.

At the time of acquisition, the area was extensively overgrown and difficult to explore. As a first step in preparing the site, the field was cleaned up of brambles and shrubs. As a result of this operation, many items which people had forgotton were uncovered. Perhaps most startling was the discovery of the three Japanese air raid shelters which were probably constructed during World War II when part of this area was bombed. A photograph of one shelter is shown in Figure (16).

Figure (16)


Big concrete pylons
Well preserved structures
Ruined Buildings
3
2
1
Sisal plantation
Well
Drying yard
Broken down buildings
Strange iron device
Broken down building
Decorticator
Railway track
Weighing station
Possible parking area

It is interesting to see the contrast between the pre and post clean up period. Figure (17) is a photograph of the old Japanese water tower taken before the actual acquisition of the area. Figure (18) shows pylons which supported part of the drive shafts for running the large associated rope factory. In Figure (19) is the tower and pylons after the removal of the brambles.

In this area the large Japanese machine was supported on the second floor of a building by a heavy concrete structure as shown in Figure (20). Mext to the stand is a sisal plantation which previously was completely hidden by brambles.

Since a large amount of water is used in the machine, a concrete channel was constructed to carry the sludge and waste water to the small stream at the edge of the field. This channel has not been used since Japanese times and is quite ruined as shown in Figure (21).

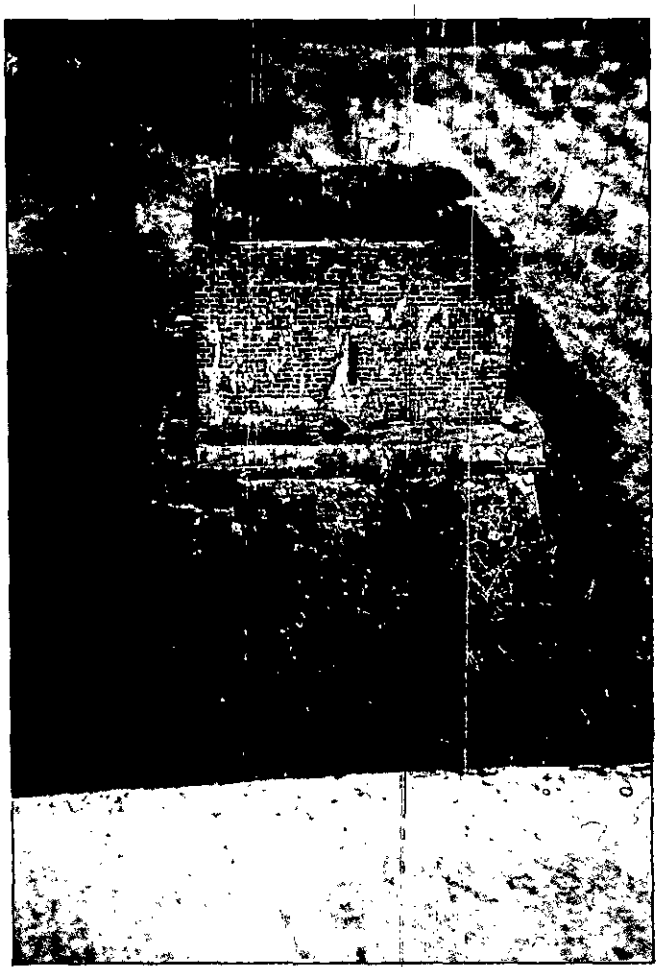


Figure (17)

Figure (18)

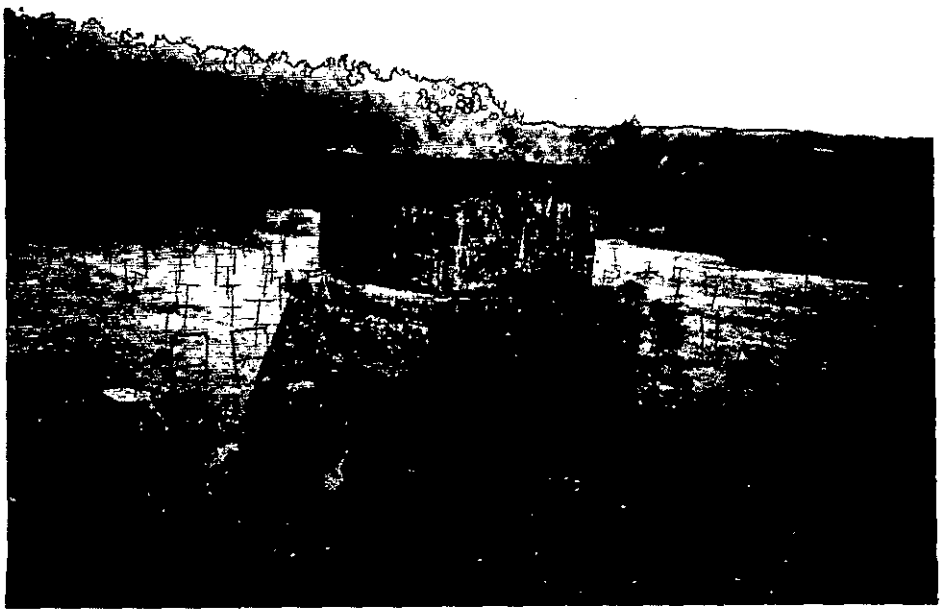


Figure (19)

Figure (20)

Figure (21)

Next to the support structure was a large diesel engine which was positioned on the ground. Close to the machine was the rope factory which with the exception of its foundation has also completely disappeared. Much of this foundation was originally covered with overgrowth and was not visible before the clean up operation.

With the destruction of the large automatic decorticating machines, an attempt was made to fill the same function by typing together a series of 14 small machines which were run by a single belt from an approximately 40 h.p. diesel engine. These were placed in a building with a single concrete water channel underneath the machines. Only the foundation of this building remains today and is shown in Figure (22) just beyond the first ruined building.

In some ways, the most important item in the Kenting National Park Sisal area is the British machine itself. This is in the building shown in Figure (23) along with the track and some of the carts which carried sisal leaves into the machine.

In Figure (24) is another view of the building with the oil storage tank in the background. Trees should be planted to conceal the tank.

Figure (22)

Figure (23)

Figure (24)

Sisal was delivered to the building by railway tracks which brought the sisal leaves from plantations. Before clean up most of these tracks were completely covered by weeds and dirt as shown in Figure (25).

The sisal went first to the weighing scale shown in Figure (26) and then along the tracks in Figure (27) and finally into the building housing the large machine. The original Japanese inbound tracks are shown in Figure (28).

Figure (25)

Figure (26)

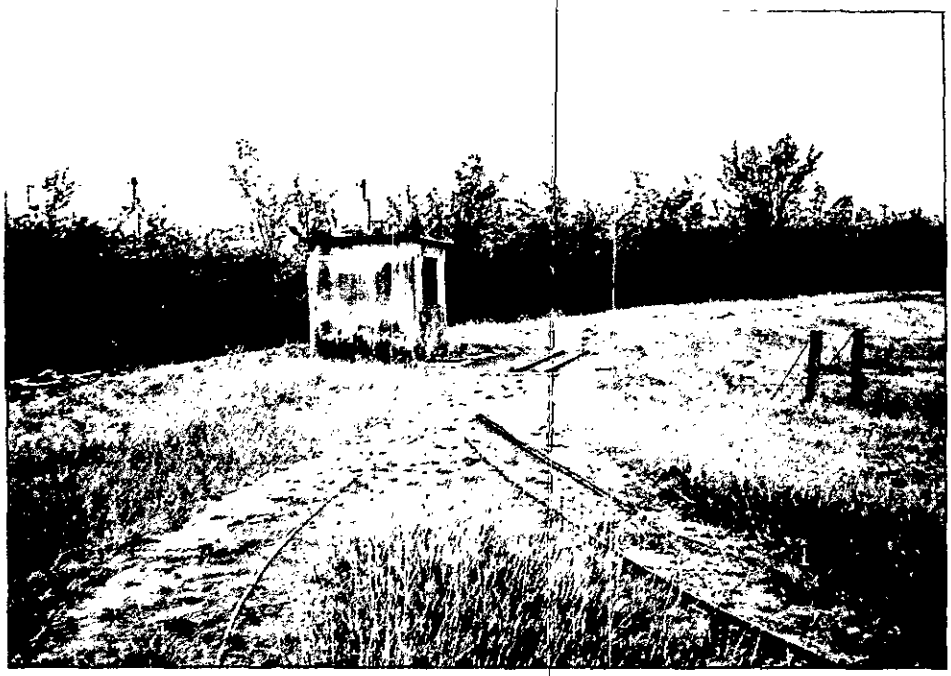


Figure (27)

Figure (28)

Mounted on the building and shown in Figure (29) is a marble plaque commemorating the dedication of the machine in 1966.

Throughout the historical site are many ruins and artifacts. Most conspicuous are two Japanese dormitories. One will be completely restored. The other will be preserved in a way to show the details of their interesting construction. Figure (30) and (31) show one of these buildings. The other is in Figure (32).

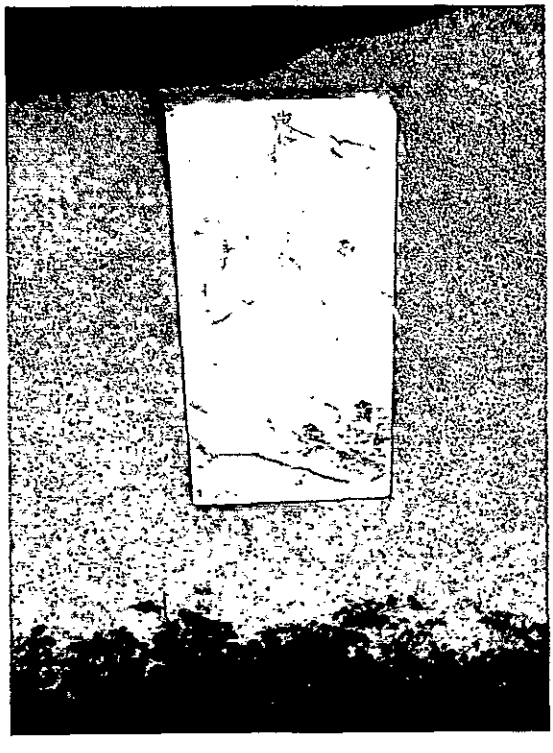


Figure (29)

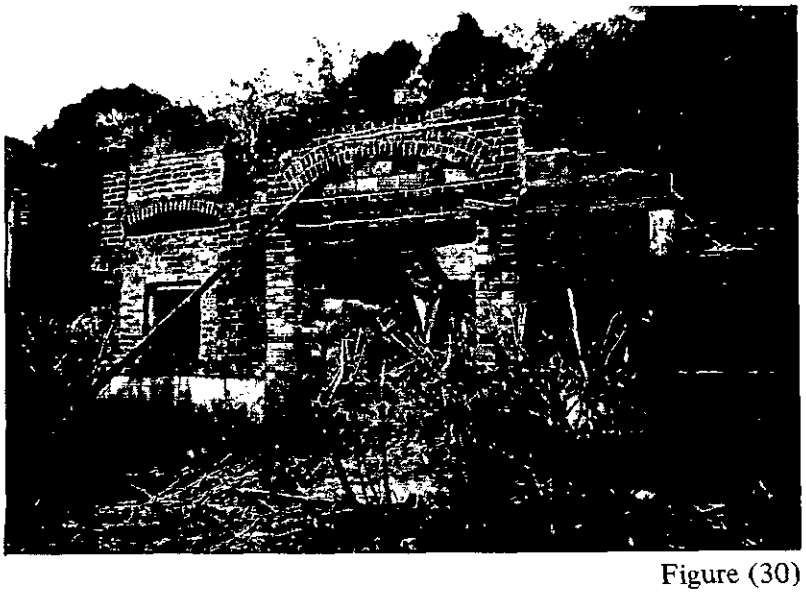


Figure (30)

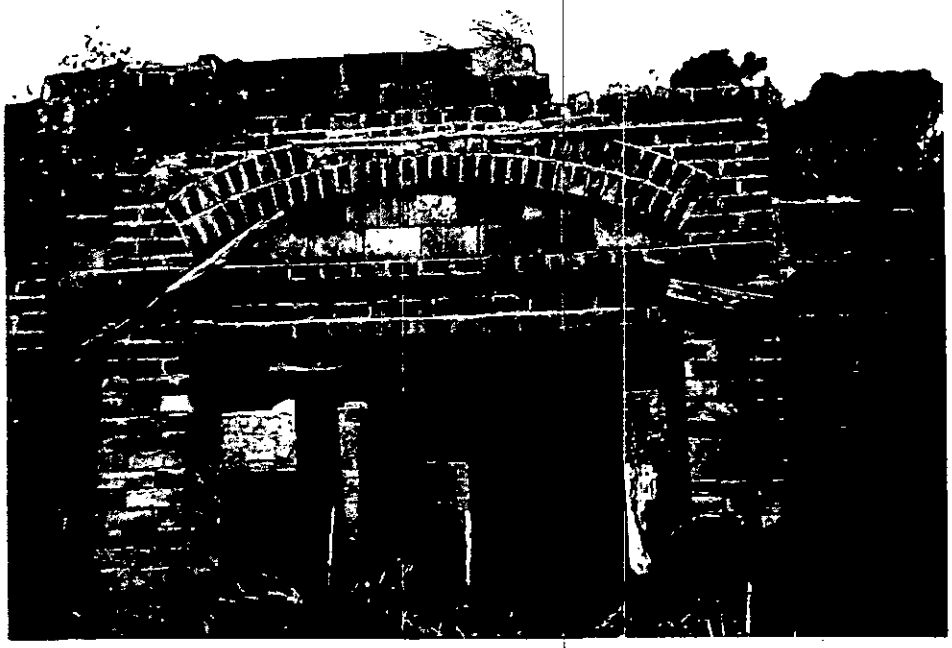


Figure (31)

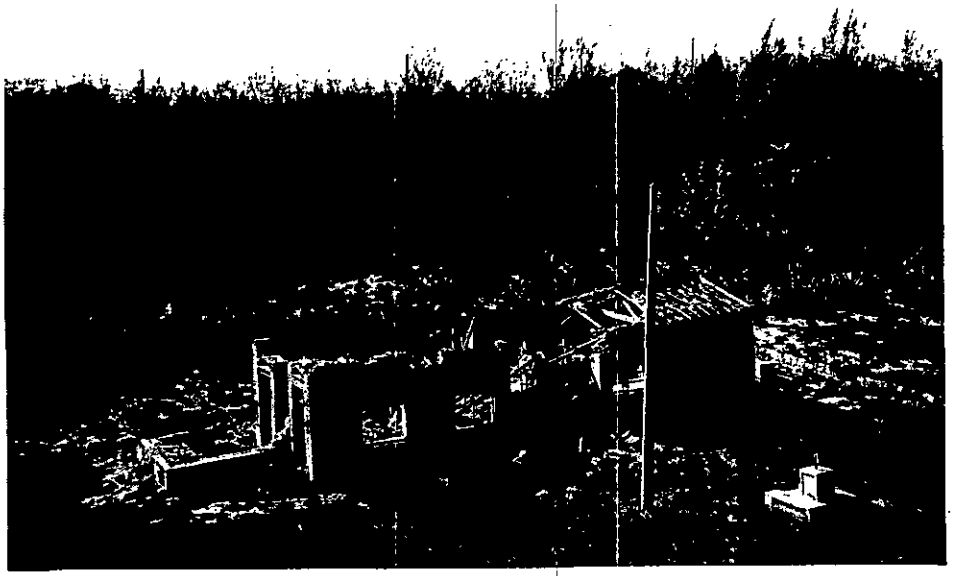


Figure (32)

Many of the items in the field have still not been identified. One concrete foundation shown in Figure (33) is interesting because of the presence of this tree. The age of the tree can be easily determined and will give a clue as to when the cement was laid down.

In the JCRR proposal, it mentioned that the operation of the imported machine might encourage local growers or government organization to set up similar operations. No more machines were purchased in England. Instead as described by Lai Ming-li (see the following translation)[8], a number of copies of the machine were made.

Figure (33)

(8) Study on Improving quality of sisal fiber as raw material for making ropes in Taiwan, Ming-li Lai, Director and Specialist. Tainan Cotton and Fiber Experiment Station, Vol. 94, China Agricultural Association, pp. 26.

"Because of the decrease in sisal fiber price, farmers suffered great losses. To improve fiber quality, JCRR imported an automatic sisal fiber decorticator from England and subsidized PDAF to set up a sisal fiber automatic docorticator demonstration center. The machine was Type 2B Corona, manufactured by Shirtliff Bros. Ltd.

The machine arrived at Hengchun Sisal Farm is February 1966. The installation was completed in May. After testing, the demonstration center went into operation. Because of the good quality of fiber from the machine, a few sisal processing plants during the years of 1967 and 1968 put an order to the Chunghsin Machinery and Kaohsiung Machinery Co. to copy the decorticators some medium and others large size. The copied machines were installed in Haishan Li, Hengchun Hsiang and Tze-chen Hsiang. The details are in Table IV."

表 1. ：瓊麻自動採纖機設置地區

Table 1: Distribution of sisal automatical decorticators in Taiwan

型式 Type	馬力(H.P.) Horse power	重量(公噸) Net weight (M. T.)	採纖量(公噸／8小時) Fertility of dry fiber (M.T./8 hrs.)	設置地點 Locality	臺數 Number of decorti-cators
英國製「可羅娜」2B型 Automatical decorficator of Corona	109.5	16	2.53	恒春麻場 Ma-ta, Henchung	1
本省仿製中型自動採纖機 Medium type automatical decorticator	50	5	1.44	恒春鎮山海里 San-hai, Henchung	2
本省仿製中型自動採纖機 Medium type automatical decorticator	50	5	1.44	恒春鎮山海里 San-hai, Henchung	1
本省仿製中型自動採纖機 Medium type automatical decorticator	50	5	1.60	恒春鎮南灣里 Nan-wan, Henchung	1
本省仿製中型自動採纖機 Medium type automatical decorticator	50	5	1.60	恒春鎮東門外 Tung-men, Henchung	1
本省仿製大型自動採纖機 Large type automatical decorticator	109.5	16	2.52	車城鄉 Checheng	1
合計 Total			12.59		7

Over a period of time, more machines were added and some were moved. The recent locations are in Table V.

Hsiangchiaowan	1
Sanhai	2
Kuanshan	1
Fengkang	1
Wanshali	1
Haiko	1
Tungmen	1

Table V

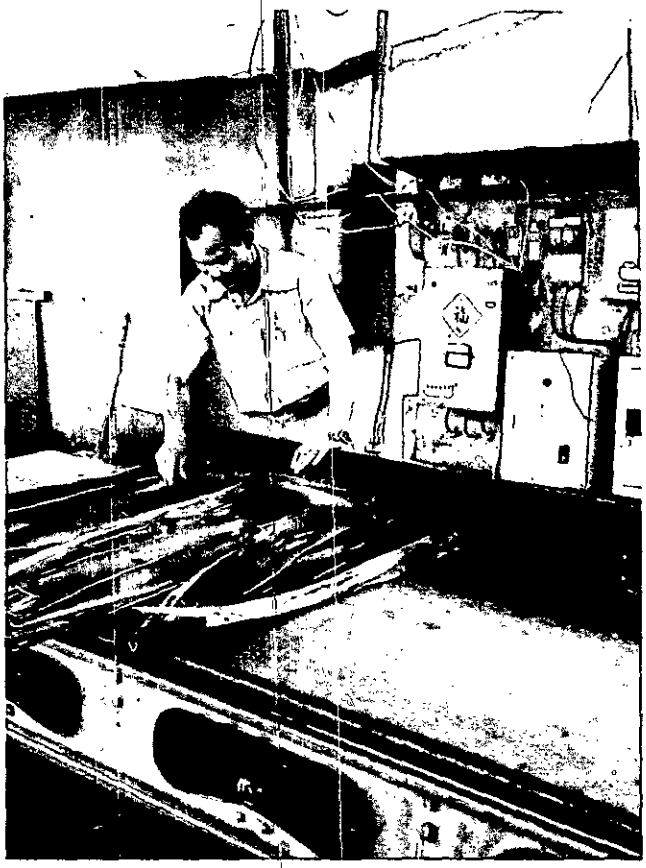
At least five of these machines were still running in 1983.

Figure (36) and (37) show the operation of one of the machines in Kuanshan. This was partly owned by a former mayor of Hengchun.

Figure (38) shows the building which houses another machine still operating in 1983.

Figure (36)

Figure (37)



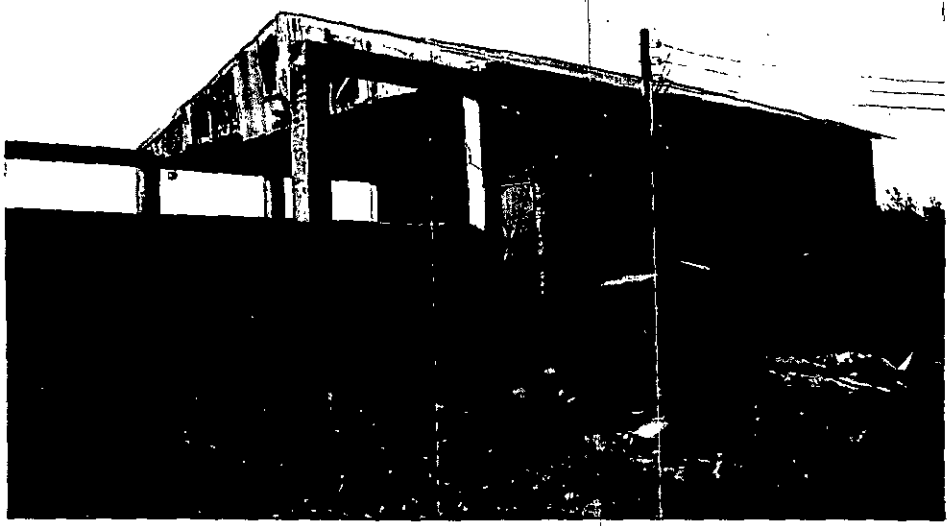


Figure (38)

Over the years as the industry has declined, most of the large decorticators as well as many of the smaller units have closed down. Of the large machines, only one was still functioning in 1983.

At the present time, seven of these copies are still in existence at the listed sites and can be visited.

Most of the operation of the machines were discontinued because of competition and the problem of marketing. In 1987, one of the last two machines was closed by the government because of pollution.

Eventually, all of these large decorticators will probably disappear.

A documentary video tape showing the harvesting, the processing and the details of the industry has been prepared and can be viewed at the Kenting Park's historical sisal monument with its carefully preserved British decorticating machine.

Because of synthetic fiber, the sisal industry in every country will probably eventually disappear and the record preserved in Taiwan may have importance for students throughout the world.