出國報告（出國類別：研習）

參加亞洲生產力組織於日本舉辦之環保之水稻農耕技術與操作多國性考察團

服務機關：行政院農業委員會花蓮區農業改良場

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派赴國家：日本

出國期間：中華民國九十六年八月二十四日至八月三十一日

報告日期：中華民國九十六年十月二十二日

壹、內容摘要

近年來環境保護之議題逐漸受到重視，而農業生產又與環境因子息息相關，因此亞洲生產力組織(Asia Productivity Organism)特舉辦此考察團，希望藉由各會員國代表之分享，了解目前各會員國發展環保水稻農耕技術及操作之經驗與實例，以作爲未來稻米生產體系永續發展之方向。本次考察團主題鎖定在環保之水稻農耕技術（green technologies），注重實務上之操作與案例，專題演講分別從技術面、政策面及實務面上探討目前環保之水稻農耕技術的發展與趨勢；與會之各國代表則就各國發展之現況與案例提出報告，並針對現今面臨之問題與未來之挑戰充分交換意見，田間參訪行程包括了農業與森林研究所（Saitama Prefectural Agriculture and Forestry Research Center）、美里町水田促進會（Misato Town Paddy Farming Promotion Council）、佐久市有機農業協會（Usuda Organic Rice Association）與中央醫院（Saku City Central Hospital）、千曲市梯田保護計畫（Terraced Paddy Field Preservation Group, in Chikuma City）。本次考察團對了解亞洲各國環保水稻農耕技術及操作有充分之探討與交流，極有助益及啓發。

貳、目次

參、目的

近年來由於全球人口急速增長、經濟活動大量增加，地球的生態環境受到莫大的壓力，由於農業與環境因子息息相關，若栽培環境受到破壞，將對於農業生產及社會穩定產生極大的影響，因此亞洲生產力組織(Asia Productivity Organism)特舉辦此考察團，主要目的在於希望藉由各會員國代表之分享，了解目前各國發展環保水稻農耕技術及操作之經驗與實例，並作爲未來稻米生產體系永續發展之方向。研習方式分爲專題演溝、會員國代表報告、小組討論及田間參訪等。本次考察團主題鎖定在環保水稻農耕技術（green technologies）上，並注重實務上之操作與案例，專題演講則分別從技術面、政策面及實務面上探討目前環保之水稻農耕技術的發展與趨勢，本次考察團主要在 APO 東京總部舉行，由亞洲生產力組織主辦，並由日本農林國際合作協會「Japan Association for International Collaborations of Agriculture and Forestry (JAICAF)」協辦。

肆、行程

日期	時間	考察內容
8 月 23 日 (星期四)	08:55	搭機前往日本東京
8 月 24 日 (星期五)	09:00	前往 APO 東京總部
	09:20 – 09:35	辦理報到
	09:35 – 10:00	開幕式、團體合影
	10:00 – 10:10	考察團流程介紹
	10:25 – 11:35	專題演講：何爲對環境友善之水田管理技術與方法？ 講者：Dr. Hisashi NEMOTO, Vice Director, Saitama Prefectural Agriculture and Forestry Research Center
	11:35– 12:45	專題演講：亞太地區環保農耕技術之發展與推廣。 講者：Dr. Kong Luen Heong, Senior Scientist, Entomology Crop and Environmental Sciences Division, International Rice Research Institute (IRRI), Philippines
	13:00 – 14:15	午餐
	14:20 – 15:30	專題演講：日本政府對環境友善之農耕技術政策發展。 講者：Dr. Motoyuki Goda, Professor, Department of Environment Policy and Management, Tottori University of Environmental Studies, Japan
	15:45 – 17:45	專題演講：宮城縣登米市對環境友善之水稻栽培方法介紹。 講者：Mr. Choju Abe, Head of Miyagi Tome Agricultural Cooperative, Miyagi Prefecture, Japan
8 月 25 日 (星期六)	09:20	步行前往 APO 東京總部
	09:30 – 11:00	各會員國代表報告(3 個國家)
	11:00 – 11:15	休息
	11:15 – 12:45	各會員國代表報告(3 個國家)
	12:45 – 13:45	午餐

	13:45 – 15:15	各會員國代表報告(2 個國家)
	15:15 – 15:30	Coffee break
	15:30 – 16:30	各會員國代表報告(2 個國家)
	16:30 – 16:40	田間參訪之預備
8 月 26 日 (星期日)		自由活動
8 月 27 日 (星期一)	08:00	Leave Hotel by Chartered Bus
	10:00-12:00	前往 Kumagaya City 的 Saitama Prefectural Agriculture and Forestry Research Center 參觀
	12:00-12:30	午餐
	13:20-16:00	前往 Misato Town Paddy Farming Promotion Council 參觀與意見交流
	18:00	前往 Kokusai 21 飯店休息
8 月 28 日 (星期二)	08:30	搭巴士離開飯店
	10:00-12:00	前往 Saku City 的 Usuda Organic Rice Association 參觀
	12:20-13:20	午餐
	13:30-16:30	前往 Saku City Central Hospital 與 Saku City Compost Center 參觀
	18:00	返回飯店
8 月 29 日 (星期三)	09:00	搭巴士離開飯店
	10:00-12:00	前往 Chikuma City 的 Obasute Terraced Paddy Fields and Meigetsu-kai(Terraced Paddy Field Preservation Group)參觀
	12:30-13:30	午餐
	17:00	返回東京
8 月 30 日 (星期四)	09:15	步行前往 APO 東京總部
	09:30 – 11:00	分組討論
	11:00 – 11:15	休息
	11:15 – 12:00	分組討論
	12:00 – 13:30	午餐
	13:30 – 15:00	分組討論
	15:00 – 15:15	休息
	15:15 – 17:00	分組討論

8 月 31 日 (星期五)	09:15	步行前往 APO 東京總部
	09:20 – 10:30	分組討論
	10:30 – 10:45	休息
	10:45– 11:15	分組報告
	11:15 – 12:00	分組報告
	12:00 – 12:30	頒發結業証書及閉幕式
	12:30–	自由活動
9 月 1 日 (星期六)		返國

伍、考察內容與心得

一、考察內容：

8 月 23 日(星期四)上午乘坐中華航空班機由台灣桃園國際機場搭機前往日本東京成田機場，並由機場自行搭乘公車，再轉乘地鐵前往 Diamond Hotel 會館報到及進住。

8 月 24 日(星期五)一早於 Diamond Hotel 會館集合後，步行前往 APO 東京總部，展開考察團活動。本次考察團主要在 APO 東京總部舉行，共有中華民國、韓國、日本、柬埔寨、印度、印尼、南韓、菲律賓、泰國、越南、寮國等 11 個會員國共 21 人參加，每一會員國約有 1～4 位代表與會。首先進行簡單的開幕致詞、團體合影、各國參與人員介紹後，即開始進行專題演講。

本日有四場專題演講，分別爲：(一)何爲對環境友善之水田管理技術與方法、(二)亞太地區環保農耕技術之發展與推廣、(三)日本政府對環境友善之政策發展、(四)宮城縣登米市對環境友善之水稻栽培方法介紹等不同觀點的議題進行探討。

(一)何爲對環境友善之水田管理技術與方法：講員爲 Dr. Hisashi NEMOTO，講員主要針對降低農業生產上所使用的化學資材(chemicals)進行分享，因此多著墨於日本目前對於農作物病害所使用之生物及物理防治等。

(二) 亞太地區環保農耕技術之發展與推廣：講員爲 Dr. Kong Luen Heong 爲國際水稻研究中心(IRRI)研究員，首先，講員由政策目標開始，介紹 2000 年以後聯合國之農業重要發展目標，共有 8 項，而維持環境之永續性爲第 7 項；之後，即開始介紹目前世界各國之農業生產現況，並以中國及國際水稻研究中心爲例，由於中國目前處於高度經濟發展，對於耕作時使用化學資材的意願提高，使中國爲目前世界上氮素、農藥使用量及成長率最高之國家，而國際水稻研究中心則透過技術上之改良，目前已經幾乎不使用農藥；最後，講員分享環保之水稻農耕技術與操作之經驗及推行策略。

(三)日本政府對環境友善之農耕技術政策發展：講者爲 Dr. Motoyuki Goda，講員主要針對日本目前對對環境友善之農耕技術(environment friendly agriculture)與政策發展進行分享，在農耕技術上介紹健康土壤之建構、化學農藥及肥料之減量等，其多和台灣目前之栽培方法相似，例如水田輪作、利用鴨子防治螺類、雜草等，而在政策發展方面，則介紹日本政府對環境友善之農耕技術相關法規制訂及與發展現況。

(四)宮城縣登米市對環境友善之水稻栽培方法介紹：講者爲 Mr. Choju Abe，主要介紹日本宮城縣登米市對環境友善之水稻栽培方法，由於講員將該市之水稻栽培方法詳細介紹，可供作國內發展有機水稻之參考，晚上返回 Diamond Hotel。

8 月 25 日(星期六)本日開始進行各會員國之報告(Country paper)，與會各國各推派 1 人開始一一進行報告，並進行廣泛討論，我國被安排於下午第一節報告。綜合各國的報告中，部份國家由於經濟及農業發展較台灣爲晚，報告中介紹之栽培方法與台灣差異頗大，參考價值較低，而泰國、菲律賓、韓國等國由於農業發展與環境和台灣相近，其中部份措施或方法，深具參考價值，而各國報告中幾乎都包含有機栽培技術、生物防治、病害綜合防治（IPM）、作物綜合管理（ICM）及面臨之難題等項目。

8 月 26 日(星期日)由於適逢週日，沒有正式行程，爲自由活動與休息時間。利用這一天與其他與會代表前往日本知名景點進行參觀，包括明智神宮、淺草寺、銀座等地。

8 月 27 日(星期一)上午搭乘巴士前往 Kumagaya City 之 Saitama Prefectural Agriculture and Forestry Research Center 聽取簡報並進行討論，本研究成立於西元 1900 年，主要研究目標爲環保農業之研究、品種改良等，如水稻育種、栽培管理與技術（environment friendly agriculture and integrated pest management）、綜合病害管理（integrated pest management）等之研發，其中於水稻育種上，近年來選育出一抗稻熱病、水稻黃萎病及具有優良米質之品種『夢之彩 Sai-no-Kagayaki』，由於其抗病性強，可以降低防治用藥量。午餐後，前往 Misato Town 之 Paddy Farming Promotion Council 參觀與意見交流，Misato Town 距離東京約 80 公里，主要生產蔬菜、水果、水稻、小麥、大麥及酪農業，本促進會成立於 2004 年，並致力於實行環保之農耕技術，主要目標爲土地『零輸出』。本地區由於擁有畜牧業，因此本促進會將牲畜產生之廄肥，經腐熟製成肥料之後，施用於農地中，待水稻、小麥及大麥收穫後，再將殘留之稻桿等農業廢棄物，經過堆積發酵處理後，製成畜牧業所需之飼料，利用此循環達到土地『零輸出』之目標，透過此種方式可使當地之天然資源得以循環。同時，當地政府也提供相關經費，一方面支持該項環保農耕技術、另一方面也可以達到保護當地農業環境之目的。會談結束後，前往 2 座畜牧場參觀農業廢棄物處理之運作。

8 月 28 日(星期二)上午搭乘巴士前往 Saku City 之 Usuda Organic Rice Association 參觀與意見交流，本協會主要栽培有機水稻，其品種爲『越光』。透過協會理事長與農友之介紹，瞭解日本有機水稻栽培，包括栽培管理方式、理念及使用機具。下午則前往 Saku City Central Hospital 與 Saku City Compost Center 參觀。Saku City Central Hospital 成立於 1944 年，由於早期 Saku City 爲農業地區且相當缺乏醫療資源，因此本醫院成立之目的即爲服務 Saku City 之農民，經過近 50 年的發展，醫院已漸漸轉型，除透過醫學協助農民外，更結合安全、健康及有機之概念，因此本醫院爲該地區最早採行有機栽培之單位，除可提供病患優質、安全之飲食來源外，後來更漸漸擴大栽培面積並加入醫療行爲（園藝治療）。本考察團首先參觀醫院之農藥檢驗設備，該設備可以協助該市或其他地區有機或一般栽培之農友，土壤與產品農藥殘留之檢驗，之後前往參觀醫院之有機田區並與院長進行意見交流。隨後驅車前往 Saku City Compost Center 參觀，本中心爲該市利用廚餘及農業廢棄物等，製作有機肥料之工廠，可提供本市有機栽培戶使用。

8 月 29 日(星期三)上午前往千曲市參觀 Obasute Terraced Paddy Fields 梯田保存計畫區。由於千曲市周圍多丘陵地，因此本區山地上之遍布許多梯田，而根據文獻記載，Obasute Terraced Paddy Fields 之梯田發跡於西元 1578 年，但由於每塊田區過小，只能以人力來作業，近年由於日本工資過高，較不符合經濟效益，因此大多數梯田農民開始放棄耕作。但本地區政府爲了保留特殊梯田景觀，於是成立了農民組織“名月會”，發展休閒農業，將農田提供給附近城市居民作爲稻作體驗環境，藉此保留住梯田之耕作，並透過邀請城市之居民實際參與插秧及收穫作業，除提供本區人力作業之勞力來源，也有助於自然景觀，農田環境保存及農業休閒體驗活動的推展，而地區農民的組織運作，也有助於社區的凝聚。下午則搭乘巴士返回東京。

8 月 30 日(星期四)與會之代表針對各國之報告（country paper）所提供之方法與案例

及田間觀摩中所得到之收穫，進行分享與意見交流，並針對三項議題 1.環保之水稻農耕技術與操作成功案例。2.政府政策在環保之水稻農耕技術與操作之角色。3. 環保之水稻農耕技術與操作未來發展與面臨之挑戰撰寫綜合之結論。

8 月 31 日(星期五)與會代表經過一天的討論之後，針對三項議題提出個別之結論。

1.使用環保之水稻農耕技術與操作成功案例：

(1)利用農業廢棄物，如稻桿、廄肥、穀殼等製作堆肥再次回歸於自然中。

(2)利用栽培技術、人力、鴨子、螺類等方法進行雜草防治，減少化學藥劑的使用。

(3)利用性費洛蒙、光源誘殺、阻隔、綜合作物管理等方式進行病蟲害控制。

(4)建立相關農業組織協助推動環保之水稻農耕技術。

2.政府政策在環保之水稻農耕技術與操作之角色：

(1)應增加農業上之研究經費，育成優良品種增加水稻產量。

(2)制訂相關政策獎勵操作環保水稻農耕技術之農友或農業組織。

(3)協助開發銷售市場或是能與一般栽培產品有所區隔。

3.環保之水稻農耕技術與操作面臨之挑戰：

(1)產量上無法提高。

(2)全球人口的增加，採行環保水稻農耕技術無法提供足夠之糧食。

(3)由於成本之因素在市場上無法與一般栽培競爭。

(4)部分國家田區面積小，成本無法下降且農友年紀大缺乏活力。

9 月 1 日(星期六)離開 Diamond Hotel 會館，搭車至東京成田機場，搭乘華航班機，返程。

二、考察心得：

（一）了解未來國際農業發展之目標

由於我國非聯合國之成員，近幾年來參與國際水稻會議機會較爲缺乏，因此對於未來國際農業發展方向較無所悉，而本次專題演講邀請來自國際水稻研究中心（IRRI）之研究人員，其對未來國際農業發展相當的了解，因此透過其之專題演講，可以使我國明白世界農業之發展趨勢，從而調整我國農業科技研發之目標。

（二）各國農業資訊之交流

本考察團由於擁有 11 個國家 20 人參加，透過各國 country paper 的報告，可以聽到

不同國家之農業現況，包含農業相關基本資料、科技發展現況等，部分國家如韓國與泰國，甚至將操作方法與策略巨細彌遺的寫出，對於了解各國農業發展有相當大的幫助，同時，也可以從中評估其在台灣之利用性，作爲未來我國稻米產業科技研發之方向。

（三）日本對於守時、守法觀念之重視

在本次考察過過程中，發現日本國人對於守時之觀念相當的重視，當第一天到日本且欲搭公車前往飯店，發現日本公車相當準時，到達與出發的時間都如公車牌上所示，雖然路程中有碰到塞車，但是公車也都能準時抵達，可見日本人對於路程時間的拿捏相當的準確，同時乘坐日本地鐵也是相同，時間完全不延誤，一律按照時間到達與出發。

另一方面，日本人也相當的守法，因此雖然路上車輛很多，但是卻不會超速、闖紅燈或是越線，在公共場合需要購票時，都能夠依序排隊並且有條不紊，由此可見，日本國家會強盛，守時與守法觀念之重視，有相當重要的影響。

（四）文化遺產之保護周全

在日本考察的過程當中，可見日本神社、佛像或是幕府時代的建築物，且常常出現在現代高樓大廈之附近，甚至在寸土寸金的東京市內也可見到小型的神社矗立在路旁，而在參觀日本明治神宮時，更見到日本國小學生穿著傳統服飾進行舞蹈比賽，且有一新人按著古禮進行婚禮，而 Obasute Terraced Paddy Fields and Meigetsu-kai 的地方政府，除了提供經費外，更協助成立名月會，透過政府與民間的力量保存其自古流傳下來的特殊梯田景觀，由此可見日本對於文化遺產之保護相當重視，反觀台灣在文化遺產上保存上則相對較差，許多傳統技藝或是建築，常隨著社會變遷而消失，因此日本保存文化遺產之方法值得我國學習。

（五）對於有機農業之用心

在本次考察過程中，最令我印象深刻的就是日本農民對於有機農業之用心。在日本有機農業不單單只是由人的角度出發，乃是由一個生態的觀點出發，因此除了生產、栽培與收穫外，更多了一項對於生態環境維護的用心，以 Usuda Organic Rice Association 生產有機水稻爲例，其除了重視水稻產量外，更重視保護水田生態系的理念，其保留田埂上之雜草作爲害蟲天敵之棲地，而在田間處處可見蜘蛛等天敵與水生動物，生物多樣性相當的豐富，在收穫時，更會保留一塊田區作爲田間鳥類之食物來源，對於生態環境之平衡有相當大的助益；此外，日本有機水稻之栽培已能夠從水稻育苗開始即採行有機方法處理，相較於我國仍未能克服有機育苗上之困難，值得我國借鏡。

（六）犧牲奉獻之精神

台灣目前人口之分佈以大多集中在都市地區，農業鄉村人口少且多剩下老人或是小孩，日本也和台灣類似，人口分佈相當不平均，東京都人口約有一千萬以上，而周圍山地鄉鎮人口則相當稀少且較缺乏醫療資源，而 Saku City Central Hospital 在創立之初，就是爲了能夠服務偏遠地區的農民，因此，有些醫生秉持著理想放棄了都市的高薪來到這裡服務，其犧牲奉獻之精神值得我們學習。

陸、建議事項

1. 透過本次考察團各國代表之報告，可以充分瞭解目前各國在環保之水稻農耕技術與操作之發展現況。同時，透過彼此的討論與意見交換，可以互相發掘並解決問題。

2. 透過田間觀摩的學習，發現日本在有機水稻的發展相當完備，相當值得我國借鏡，尤其在栽培技術與生產理念上。因爲目前國內有機水稻在育苗上仍使用化學藥劑，同時，對於有機之觀念上仍嫌不足。因此在未來的推廣過程中，可以透過產銷班會等分享本次考察經驗，進而提昇有機水稻之栽培技術與觀念。

3. 我國這次有 2 位代表與會，部分國家則有 4 人參加，在與各國代表交流互動中，不僅達到稻作資訊之交流，同時也將我國各項資訊在此場合介紹給各國，是相當成功的國民外交。因此爲提昇我國外交之能見度，並突破目前之外交困境，建議將來如有機會應儘量派員參加。

柒、誌謝

本次赴日參與研討會承蒙亞洲生產力組織（APO）提供旅費特此誌謝。

捌、附錄

一、本次考察團照片

全體合照

農友介紹新育成之水稻品種『夢之彩』

與 Misato Town 之 Paddy Farming Promotion Council 進行意見交流

Usuda Organic Rice Association 之農友操作除草機

Saku City Central Hospital

千曲市水稻梯田

與 Meigetsu-kai(Terraced Paddy Field Preservation Group)合照

分組討論

二、我國國家報告(Country Paper)：

題目：The development of rice good agricultural practice and rice organic cultivation in Taiwan

作者：余宣穎 （Hsuan-Ying Yu）

I.Introduction

Taiwan locates on subtropical zone, with plenty sunshine and rain. Agricultural production often suffers many damages of diseases and insects. How to manage the diseases and insects during the production process becomes an important and serious challenge. On the other hand, the construction of a friendly, ecological, safety and sustainable agricultural environment and the providence of safe and high quality food for consumers have been highly concerned in Taiwan for recent years. In order to develop the green technologies fitted to the above ideals. The Taiwan Government promoted rice organic cultivation since 1993. Now, the cultivated area of organic rice had been increased from 2 hectares in 1993 to 1500 hectares and 28 unions in 2006.

At the same time, as economic developed, what consumers wanted is not only to ensure that their basic energy requirements were met, but also eat better through access to a wider variety of food with respect to either safety or high quality. On this purpose, the Taiwan Government began to promote rice good agricultural practice (GAP) in 2004. Under the government positive extension and promotion, there are 460 hectares followed TGAP in 2006.

Now more and more farmers accept the rice good agricultural practice and rice organic cultivation, and want to join it. In this report, I will introduce “the development of rice good agricultural practice and organic cultivation in Taiwan”.

II.Brief History and Current Status of rice in Taiwan

Taiwan is a small island in the south-eastern Pacific. Total area is 36,000 square kilometers, and from north to south is about 400 kilometers. 75% of it is mountain and hills, others are plains and basins, but the plains and basins need to provide for live at the same time. So the arable land of agriculture is only 830,000 hectares. Of these, paddy field about 423,000 hectares is the largest portion of land use.

In Taiwan, the natural environment is quite different between the north and the south. In the south, there is a clear dry season in winter, but in the north there is not. There are usually many typhoons in July and August, and usually cause large damage for humans and crops, so the cultivation was changed for this weather. Rice is the largest crop in Taiwan, at present. The total cultivated area of rice is about 260,000 hectares (2006). There are two crops of rice in a year. The first crop is from January to July, and the second crop is from July to December.

Rice has been cultivated six hundred years in Taiwan. In early stages, immigrants brought Indica type rice seeds from Mainland China to Taiwan. In 1895, Japonica type rice were introduced by Japanese. During this period, Japanese banish Indica type rice from cultivated varieties by policy, so most of rice varieties in Taiwan are Japonica type now (about 90%). After 1945, Taiwan was restored to R.O.C. and continued to breed new rice varieties with disease-resistance, high yield and good quality. Till 2006, the rice quality and yield have great enhanced compared to the past, and the average rice grain yield of a year reach 6,000 kg/ha and total rice yield reaches approximate 1.4 million tons.

Because of the new rice varieties released, rice quality and yield have been great increased in recent years. But Taiwan's rice industry still faces some challenges, the most important one is how to appropriately use chemicals, such as chemical fertilizers and pesticides. In order to sustain the yield stability, the farmers usually rely highly on pesticides and chemical fertilizers. The unnecessary inputs not only would kill pests, weeds or provide nutrient, but also is harmful to the agro-ecosystem. The government began to promote "Taiwan Good Agricultural Practices (TGAP), traceability system and organic cultivation to solve this problem.

III.The Development of Rice Good Agricultural Practice in Taiwan

1. The purposes:

In the past, Taiwan's farmers usually cultivated rice based on their experiences or learned from their parents, or friends, so the yield and quality were not stable. In 1960s, pesticides and chemical fertilizers were introduced, and the standard practice was established by agricultural researchers. The average yield per year in 1945 was only 2,000 kg/ ha, and it was increased to 6,000 kg/ ha in 2006, the yield of rice was obviously increased.

The major target of farmers was to get high yield in early stage, so the farmers applied heavy fertilizers in the farm to get high yield and income. Simultaneously, too many fertilizers cause heavy diseases and insects damage, so that they would increase the application of fertilizers and pesticides, and would influence agro-ecosystem, food safety and quality of rice. Recently, consumers emphasize highly the food quality, safety and eating favor. Rice quality and safety has becoming the prior requirement of rice production and agricultural policy. In order to establish a standard protocol for farmers to follow to appropriately use fertilizers and pesticides, the rice TGAP were set up.

2. Establishment and Content of GAP in Taiwan:

Taiwan Government began to establish the rice GAP and traceability system in 2004.

Firstly, the researchers collected information from Japan and European Union. After referring to the agricultural situation in Taiwan, the Traceability system and Good Agricultural Practice was established in 2005. The GAP in Taiwan is also called TGAP (T means Taiwan and Traceability).

Rice TGAP contains 8 sections, including vow, product pathway graph, risk managing table, inspective table, calendar of cultivation, calendar of preventing diseases and insects, the standard of fertilizers, and the record of traceability.

(1) Vow: the first of TGAP is a vow. Taiwan Government wants to tell farmers that it is a duty when you follow the TGAP.

(2) Product process graph: this graph standardize the product process from field to market.

(3) Risk manage table: this table contains all risks and solved methods from seed to market.

(4) Inspective system: this table combines the risk control table to check all operated process.

(5) Calendar of cultivation: this calendar shows that what you will do in each cultivated process.

(6) Calendar of preventing diseases and insects: what time the diseases and insects will raise and how to solve.

(7) The standard operated method of fertilizers: the using quantity and time of fertilizers in cultivated process.

(8) The traceability: To help the practicers that record the operated time and method in cultivation.

3. Recently status and the development of the future:

Under the government positive extension and promotion, there are 460 hectares followed TGAP, and most of them locate in eastern Taiwan. In the future, the major target of this policy will broaden the area and will promote more farmers to do.

IV.The development of rice organic cultivation in Taiwan

1. The beginning and state of play

Rice organic cultivation began in Taiwan since 1993 to improve the situation that too many pesticides and chemical fertilizers were applied into the field, and would affect the environment and agro-ecosystem.

After ten years, the organic rice techniques and experiences have been accumulated

included fertilizer usage, diseases and insects management. More and more farmers could accept this organic concept and tried to cultivate organically, so the cultivated area of organic rice had been increased from 2 hectares in 1993 to 1500 hectares in 2006.

In Taiwan, Organic rice farmers in same area will group together as a union. There were 28 unions in 2006, union members meet very often to discuss the technique of organic cultivation and the marketing of their goods. Now, 50% cultivated area and 9 unions locate in eastern Taiwan, because the east region have better, natural and no pollution environment compared to the west.

The cultivation of organic system includes the selection of locality, rice variety, fertilizers application, weed and pest control, etc. Manure is suggested as the best method to enhance soil fertility.

A special organic cultivated case in Taiwan is using ducks. Ducks are useful in weed control and increasing soil fertility. Because of their restless and omnivorous nature, they eat both weeds and injurious worms. The excreta of ducks can also serve as fertilizer of the rice. As the result, ecological environment in rural will get improved.

2. The development in the future

The organic rice in Taiwan has been great developed during last ten years, but we know that it must been done better in order to develope organic rice well in the future. In the future, there are four targets to strive. The first is “enhance the quality of organic rice”, the second is “practice the traceability and TGAP”, the third is “promote the management of production and marketing”, and the last is “development the marketing of organic product”.

(1) Enhance the quality of organic rice

Organic rice could balance ecological environment and agriculture, and fulfill the consumers need that lead to buy the high quality organic rice. So it is important that the farmers need to improve the cultivated technique and diseases and insects management in order to provide the high quality organic rice.

(2) Practice TGAP and traceability

Traceability is the identification card of organic rice, and TGAP is the standard process of organic rice cultivation. By follow them, the farmers could provide safety and high quality organic rice. At the same time, the consumers could trace production by internet, and relieved. This policy is promoted just now, and we want to encourage more farmers to do.

(3) Enhance the management of production and marketing

The organic rice does not use any chemical input, so it is very important to prevent the

pollution on the process of production. The methods that include practice TGAP and traceability certainly, manage input from operator, make separate zones to prevent the pollution from no-organic farm, the machines need to clean certainly before harvesting, and use independent machines to husk rice etc..

(4) Development of the product

A good product will create uncounted value in marketing, and separate from others. So how to development the good product will become an important job in the future.

V. The challenges of rice good agricultural practice and rice organic cultivation.

1. The challenges in rice good agricultural practice

GAP and traceability system in Taiwan is a new policy for farmers and never practice it in the past. And the agricultural researchers and farmers have two major problems when they practice.

(1) The identification fee is too high

Now there are four organizations to identify organic rice. A case of identification, the union need to pay about NT.10,000 per hectare. In Taiwan, the cultivated area of most farmers is usually below 1 hectare, so it is almost to grow organic rice and be identified alone, the charge will become a heavy burden. So the spirit of farmer is willing, but the flesh is weak.

(2) The age of farmers is too old

As the economy developed most of the young people who was born in the country but worked in the urban, so farmers are usually old. According to the statistics, about 50% farmers are older than 55 and a lot of them do not have good education in the past. They sometimes can not write, or difficult to read and usually say “the weight of a pen is heavier than a hoe” when promote the GAP.

2. The challenges in rice organic cultivation

The history of rice organic cultivation has only ten years more in Taiwan. More and more farmers accept the organic agriculture and want to join. And in this developing period, some problems were happened simultaneously.

(1) The cultivated environment is not adaptable

Taiwan locates on subtropical zone, the temperature is very suitable for disease and insect development. So it is very difficult to solve them in organic cultivation.

(2)The chemical pollution cause from neighbor field

The cultivated area of most farmers is small and close in Taiwan. If you grow organically alone, and neighbor field does not, you will face the chemical pollution from neighbor field. Although the farmer will establish a separated zone, but the effect is not good enough.

(3) The confidence of consumers in organic product is not enough

In Taiwan, there are three tags to identify organic product. But consumers could not identify them clearly, and some businesses sell fake product to deceive consumers. So the faiths of consumers for organic product sometimes are not very strong.

Although there are many challenges in rice good agricultural practice and rice organic cultivation, the Taiwan Government has been worked out some methods to solve. The methods including encourage the young people going back to country, chancing the optimum environment to develop organic rice, enhance the using technology of pesticides, punish fake products and simply the tags to identify clearly for consumers etc..

VI.Case study I

The second organic rice production and marketing union in Fu-li Township is one of the first unions that practices TGAP and traceability in Taiwan. This union was established on July, 1997, and only has 12 farmers with 18 hectares farm. This union increase to 100 farmers and 170 hectares in 2006, which become the largest organic rice production and marketing union in Taiwan.

In earlier stage, only one farmer who is the leader of union want to try when the organic rice cultivation was still only on the research and demonstrative stage, and there are no tags to identify organic product and no traceability or TGAP. At present, technologies consist of rice variety, manure application, weed and pest control were matured and released to farmers. More and more farmers accepted the organic agriculture and join them.

From 1999, before the TGAP and Traceability begun in Taiwan, the leader and members of union had recorded the practice process and times, included plowing, growing, green manure application, organic preventing, harvest, and the changes of agro-ecosystem etc. It is very useful for the next crop that could adjust his cultivation, so the union could accept them firstly when the TGAP and Traceability was promoted.

In order to help the farmers who are older to finish the TGAP and traceability, they employ a young man to write and type, and it is a major method to solve the problem that farmers are older to practice some recoding works. Now in the union, different methods were used to practice TGAP and Traceability:

(1) The older farmers recorded data on the book himself and type them in the computer by an employer.

(2) The young farmers recorded data on the book and type them in the computer himself.

(3) A few farmers have PDA and the records were keyed in the computer directly.

After typing the record in the computer, they will get traceability numbers that will print on the product package, and consumers could understand the cultivation process. A field has only one number, so the consumers could see the traceability through internet.

TGAP and Traceability are the managed system of quality for this union. By the record, the members of the union can understand the weather in different crop that how to influence the cultivation. For example, the rice blast usually raises near Tomb Sweeping Day (5, April) in Taiwan, but the real time will change by climate. So this union will change the kinds of manure with climate by TGAP and Traceability.

VII.Case study II

In Sun-Shin Township of Yi-Land country, there is a union that practices a special green technology to cultivate rice. This union is the first organic rice production and marketing union in Sun-Shin Township. And the special green technology is using ducks in rice cultivation.

The Yi-Land country in North Taiwan has a special famous product that is smoked and corned duck meet. The food was made by duck, so some farmers raise ducks and cultivates rice for a long time. The agricultural researcher tried to combine both when the organic rice was developed,

The distance of each rice plant is 30cm in this cultivation method, it is suitable for duck walking. The duck was bred to rice cultivation specially. And the farmers will put the ducks in the field after transplanting 20~30 days. In the field, ducks are useful in weed control and increasing soil fertility. Because of their restless and omnivorous nature, they eat both weeds and injurious worms. The excreta of ducks can also serve as fertilizer for the rice plants. This agricultural practice is very friendly for agro-ecosystem, and the rural ecological environment in will be improved. After transplanting 50~60 days, ducks were be taken away from field and grown in another field until sold to the market. So the farmers will get income from duck selling and rice harvesting. Although the yield is lower than normal culture, but the pure income is higher. Now the union has 15 farmers with 20 hectares farm.

Conclusion

In recent years, environment reservation is an important subject in the world. So how to

remain a natural, productive, sustainable agricultural environment is a goal of the government and farmers. So if we cultivated with green technologies, we could maintain the environment with better conditions for the future.

The green technologies, rice good agricultural practice (TGAP) are on the development stage in Taiwan, and have some problems on practicing. And organic rice industry has been a natural and environment-friendly cultivation method in Taiwan. For the healthy and natural environment and future, we will take more effort to find better ways such as more green technologies to keep and maintain the agriculture development better in a safe and natural ways. In this study mission, I think that could get the answer of our problems by learning with participants and it will be introduced to our officers and farmers to promote the green technologies.

三、我國國家報告摘要：

The development of rice good agricultural practice and rice organic cultivation in Taiwan

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Abstract

To maintain the agro-ecosystem, consumers' healthy, and provide safety and high quality food, the Taiwan Government promoted rice organic cultivation and rice good agricultural practice (TGAP).

Rice organic cultivation began in 1993. After more than ten years, the rice cultivation techniques and experiences have been accumulated, so the cultivated area of organic rice had been increased from 2 hectares in 1993 to 1500 hectares in 2006. In the future, rice organic cultivation will face new challenges including:(1) Enhance the quality of organic rice, (2) Practice TGAP and traceability, (3) Enhance the management of production and marketing, (4) Development of the product.

The GAP in Taiwan is also called TGAP (T means Taiwan and traceability), and has been established in 2004. Rice TGAP protocol contains 8 sections, including vow, product pathway graph, risk managing table, inspective table, calendar of cultivation, calendar of preventing diseases and insects, the standard of fertilizers, and the record of traceability.

Under the government positive extension and promotion, there are 460 hectares farms followed TGAP. In the future, the major target of this policy will broaden the cultivation area and promote more farmers to do.

(Key words: rice, good agricultural practice, organic cultivation, green technologies, Taiwan)

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