

中文摘要

隨著中草藥逐漸受到重視，近年來國際間針對藥用中草藥植物的種植，舊有的 TGAP(Taiwan Good Agricultural Practice, TGAP)就顯得稍微不足，提出更嚴謹的 GACP (Good Agricultural and Collection Practices, GACP)規範。在 GACP 規範的導入後，進行種植溯源的紀錄時，以往都需要定時定期的前往種植區，紀錄或採集植物生長的變化與環境的相關訊息，勢必將有許多的事項需要紀錄，增加了農業技術人員更多的負擔。本研究中分為兩個部分，第一部分為 GACP 導入，根據 WHO 提出的 GACP 規範，設計出一套符合室內水培種植的表單，表單的項目包含了物種品種、種苗與繁殖材料、種植、收集、人員、收穫後處理、儲存與運輸、設備，針對各個類別分別講述注意事項與表單操作流程；第二部分為 IoT (Internet of Things, IoT)系統，內容包括即時監測系統與異常通知、24 小時記錄生長指標資料、GACP 表單輸入與查詢介面，

最後，本研究比對了目前 TGAP 與 GACP 的各項差異，並展示了一份以金線蓮為範例的 GACP 表單，為驗證本研究所提出的系統架構及服務模式可行性，分別建置於鮮蔬生產線與中草藥實驗線。未來在 GACP 表單上，透過大量的測試使得表單更加地實用性與可靠性，並

透過翻譯使表單國際化；在系統上，透過自動化控制養液補給，減少人力資源的消耗，除此之外也可透過辨別葉片的變化，找出缺乏的營養素，使種植更加的便利與精準。



英文摘要

With the gradual attention to Chinese herbal medicines in recent years, for the cultivation of medicinal Chinese herbal medicine plants, the old TGAP (Taiwan Good Agricultural Practice) regulation seems inadequate. A more rigorous GACP (Good Agricultural and Collection Practices, GACP) specification is proposed to improve the problem. After the introduction of the GACP specification, in the record of planting traceability, in the past, it was necessary to regularly go to the planting area to record or collect information about changes in plant growth and the environment, which increases the working burden. This research divided into two parts. The first part is the introduction of GACP. According to the GACP specification proposed by WHO, we design an indoor hydroponic cultivation form. The items in the form include species, seedlings, propagation materials, planting, collection, personnel, post-harvest processing, storage and transportation, equipment, and the precautions and form operation procedures are described for each category. The second part is the IOT system, including real-time monitoring system and abnormal notification, 24-hour record growth index data, GACP form input, and the query interface. At last, this study compares the differences between the current TGAP and GACP, and shows a GACP form that takes the clematis as an example. In order to verify the diversity of the system architecture and service models proposed by this research, a fresh vegetable production line and a Chinese herbal medicine experiment line were established and inserted respectively. In the future, a large number of test forms will be

more practical and reliable on the GACP form. And the form will be internationalized through translation. On the other hand, the system through automatic control of nutrient replenishment can reduce the consumption of human resources. In addition, it can also identify the lack of nutrients by identifying the changes of the leaves, which makes planting more convenient and precise.

