CIP IN CHINA

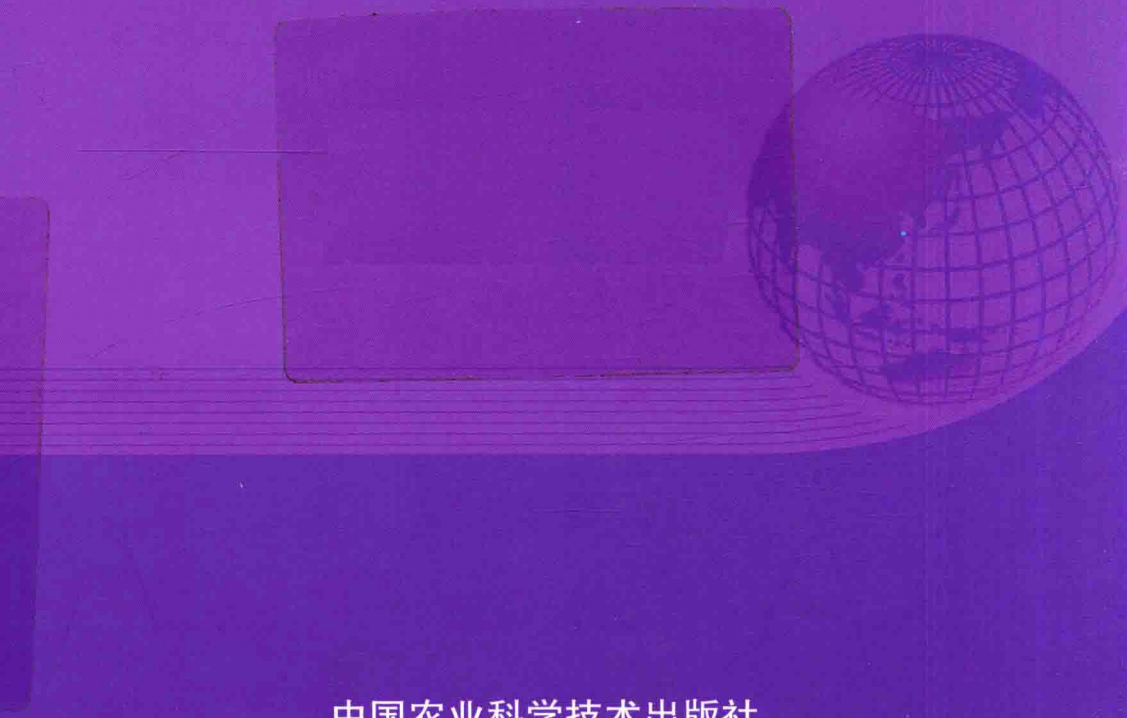
国际马铃薯中心在中国

——30年友谊、合作与成就

CIP in CHINA

30 YEAR FRIENDSHIP, COOPERATION, SUCCESS

◎ 卢肖平　谢开云　著



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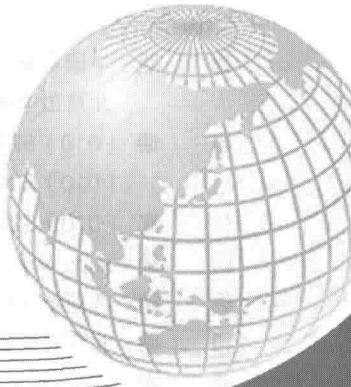

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序

自担任国际马铃薯中心主任伊始，推动亚太中心建设、使之梦想成真业已成为我的首要工作之一。中国马铃薯、甘薯面积和产量均居世界首位，而国际马铃薯中心与中国的合作也有多年且成果丰硕。正当我亟需有所了解之际，我的同事卢肖平和谢开云向我介绍了他们的新书——《国际马铃薯中心在中国——30 年友谊、合作与成就》，并邀请我为之作序，我欣然同意。

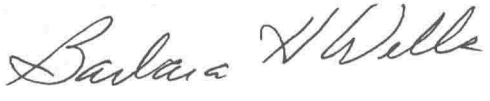
该书对国际马铃薯中心与中国过去 30 多年来的合作进行了系统地回顾，归纳总结了合作所取得的主要成果与成效，以及双方主要参与者的积极贡献。作者运用经济学原理，量化了薯类作物研发成果和应用推广的意义与效益。该书还分析了大力发展薯类作物以及建设国际马铃薯中心亚太中心的重要战略意义，提出了粮食安全潜在威胁之警示以及扩大视野与思路的应对之策。我认为其分析颇有道理并具有相当的前瞻性。作为国际马铃薯中心的新任主任，我很荣幸能为本书的付梓略尽绵力，同时我为国际马铃薯中心在中国取得的成就而感到自豪和骄傲。

国际马铃薯中心成立于 1971 年，在全球近 30 个国家设有办事处，与众多发展中国家进行着广泛的合作。通过应用和推广国际马铃薯中心的优良种质资源和先进的种植技术，可以大幅度地提高薯类作物的产量，仅在中国就可使农民每年增收 10 亿美元以上，使许多饥饿和贫困人群，特别是营养不良的妇女和儿童的生活得以改善。国际马铃薯中心与中国

的合作堪称此类合作之典范，诸多方面可作楷模，所以我们在中国建立亚太中心，以加强对薯类作物的研究，促进新品种和新技术的推广与应用，使薯类作物能在提升全球粮食安全和消除贫困中发挥更大的作用。

我坚信，随着科技的进步，薯类作物的发展能够对社会产生更大的影响力，也能够备受关注。薯类产业发展潜力巨大，因此我们将继续推进亚太中心的建设，使之成为全球薯类作物研发成果的推广和展示平台，为更多民众带来福祉。

我期待着本书英译本的发行，以便让更多的人们了解我们的工作，了解薯类作物对提升粮食安全与营养水平的贡献和作用。



国际马铃薯中心主任

2014 年 7 月

Preface

Since I became Director–General of the International Potato Center (CIP), establishing CIP–China Center for Asia Pacific (CCCAP) and moving it from a vision to a reality has been one of my top priorities. China boasts the largest potato and sweetpotato acreage and production volume in the world and there has been a very important history of significant achievements resulting from the multi–decade CIP–China cooperation. In the first briefings of our program in China, my colleagues Lu Xiaoping and Xie Kaiyun told me about the book they recently completed – *CIP in China*: *30 Year Friendship, Cooperation, Success*, and asked if I would write this preface. I readily agreed.

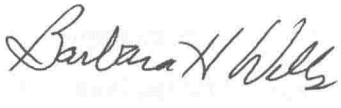
CIP in China chronicles and reviews the history of cooperation between China and CIP over the past 30–plus years and the many achievements resulting from the fore–thought and dedication of many key players on both sides. Analytic economic tools are used to produce quantifiable results of our work in roots and tubers in China. The book analyzes the strategic significance of these crops and how establishing CCCAP, amid the looming threat of food insecurity, offers a prime example of thinking 'big' to produce game–changing results. I find the book's arguments sound, even visionary. Therefore, as CIP's new Director–General, I am honored to be a part of this endeavor as a means of expressing and sharing my pride in what CIP has accomplished in China.

CIP was established in 1971 and now has offices in nearly

30 countries around the globe and cooperates extensively with the developing world. CIP's superior germplasm and advanced cultivation techniques have lead to yield increases of root and tuber crops (RTCs), bringing over USD 1 billion of additional income annually to the farmers in China and improving the lives of the hungry and impoverished and in particular, malnourished women and children. CIP's collaboration with China is an important example of such cooperation and, in many ways, can serve as a model. That is why we CCCAP was established; in a bid to strengthen RTC research and promote new varieties and technologies, enabling RTCs to play a bigger role in enhancing global food security and poverty alleviation.

I have no doubt the development of RTCs, supported by scientific and technological advances, will have enormous impact, and receive greater attention from all quarters of society. The potential clearly exists so we will continue pushing forward the establishment of CCCAP as one means of spreading our R&D results throughout the world, providing benefits to more and more people.

I look forward to the English translation of this book, so even more people will come to know and understand our work and its contribution to a more secure future for food and nutrition.



Barbara Wells
Director General
International Potato Center (CIP)
July 2014

内容简介

自从1978年中国第一个专业技术考察团访问国际马铃薯中心以来，至今已经整整过去了35年，而中国政府1984年正式加入国际农业研究磋商组织至今也正好30周年。在过去的岁月中，国际马铃薯中心与中国政府以及学术各界开展了大量的科学研究与生产实践的合作项目与相关活动，中国政府也每年向国际农业研究磋商组织及国际马铃薯中心持续捐赠，那么政府的持续投入与双方合作的意义和成果如何，都是各方十分关注的问题，而本书正试图回答这些问题。

《国际马铃薯中心在中国》一书比较全面、系统地总结和回顾了国际马铃薯中心（CIP）自20世纪70年代以来在中国开展的各种交流活动与合作项目的基本史实和主要成果，并对部分重要成果采用了一些经济学定量分析的方法，以量化的结果，解析和展现了这些合作成果在促进中国薯类作物发展中的重要作用和影响，以及其所产生的社会与经济效益。

该书着重介绍了双方合作的三大贡献，即新品种的贡献、新技术的贡献和杰出人才的贡献。书中描述，在过去的30多年里，中国共从国际马铃薯中心引进了7 000多份薯类种质资源，大大丰富了国内薯类种质资源的基础，极大地拓宽了薯类作物的遗传背景。以此为基础，中国的薯类科学家选育出了100多个薯类新品种。以马铃薯品种为例，在当今中国国内常用的100多个品种中，约有30%的品种有着国际马铃薯中心的亲缘背景，而这些品种在全国每年的生产种植面积中又占到20%左右。其中，“中心24”和“合作88”是最具代

表性的两个品种。“中心 24”是 1978 年以试管苗形式引入中国，因其抗旱性强、适应性广，20 世纪 90 年代以来，该品种在西北和华北地区广泛种植。据估计，目前其年种植面积仍在 7 万公顷左右。“合作 88”是云南师范大学和会泽农技中心从 1990 年引进的 42 个杂交组合中选育出的新品种，1995 年通过云南省审定。由于该品种晚疫病抗性强、产量高、商品性好，因而在西南地区广泛种植，并传播到相邻的越南和缅甸等国家。据估计，该品种目前在国内年种植面积在 40 万公顷左右。在甘薯品种方面，双方合作育成的优良品种也有 10 多个，约占全国常年主栽品种的 10%。其中“西成薯 007”是最具代表性的品种之一。该品种是四川省南充市农业科学院以国际马铃薯中心实生种子 (BB18–152) 为母本，自育品系 9014–3 为父本，通过有性杂交后选育的甘薯新品种，2008 年通过四川省品种审定。该品种因其抗病和抗逆性强、产量和淀粉含量高，已成为淀粉加工专用型品种。2013 年，该品种种植面积达到了 13 万公顷。

30 多年间，国际马铃薯中心在中国共开展了 50 多项薯类科研合作项目，提供了不低于 500 万美元的科研经费，引进了大约 15 项新技术或技术组合，例如甘薯、马铃薯类病毒检测技术的引进和应用，加速了国内相关技术水平的提升，极大地促进了中国马铃薯和甘薯种薯质量的提高。又如在山东实施和推广的甘薯脱毒技术，在生产上应用后增产十分显著，一般增幅都在 30% 以上，在项目区测算，其内部回报率均在 200% 上下，折算净现值约为 5 亿美元 / 年，因此深得广大农户和当地政府的认可和欢迎。又如通过马铃薯晚疫病预测预报项目的实施，减少了发病损失，使产量比发病的田块增产 60% 以上，确保了农民的较好收益。简言之，引进的技术对

中国薯类产业的可持续发展及当地经济的增长起到了十分积极的作用。

国际马铃薯中心为中国培养了大批薯类方面的专业人才。20 世纪 80 年代初期，中国专门从事薯类作物的科研与推广人员很少。仅以马铃薯生产大省——云南省为例，全省马铃薯种植面积有 300 多万亩（1 亩≈667 平方米，全书同），而专业科研人员只有 3 人，人均面对 100 多万亩！ 30 多年过去了，随着中国经济与产业的快速发展，中国马铃薯研究人员也已过 500 人，几乎是当年人数的 20 倍。在 2008 年中华人民共和国农业部成立的国家马铃薯产业体系的 24 名岗位科学家中，有 6 人得到过国际马铃薯中心的资助出国学习，有 11 人参与过国际马铃薯中心的项目工作；在甘薯产业体系的 16 名岗位科学家中，有 6 人接受过国际马铃薯中心的资助出国学习，有 10 人参与过相关的项目工作。可以说，他们现在多已成为国内薯类科研或产业界的领军人物。

总而言之，在国际马铃薯中心与中国合作的 30 多年间，中国的薯类作物生产发生了巨大的变化。在一定程度上可以说，双方的合作及其成果发挥了重要作用。与 1978 年相比，2012 年中国马铃薯单产从 12.70 吨 / 公顷增加到了 15.81 吨 / 公顷，增长了 24.5%；甘薯单产则从 13.66 吨 / 公顷增加到了 21.07 吨 / 公顷，提高了 54.2%。

本书也介绍了中国薯类作物的发展现状以及相关意义。中国是马铃薯和甘薯生产的第一大国，薯类作物在全国粮食安全中占有重要地位，仅次于水稻、小麦和玉米，全国以 8% 的粮食作物种植面积生产了将近 6%（按照 5:1 折合）的产品。因此，应力争进一步提高马铃薯单产，尽快赶上和超过国际平均单产水平，使薯类作物的总产在种植面积维持在当前情

况下提高产出 2 ～ 4 个百分点，以减缓国家对谷物产品的巨大需求压力。此外，由于薯类作物具有耐土地瘠薄，耐气候干旱等特性，其他作物在这些地区难以生长和生产，所以薯类作物的生长区域与贫困地区高度重合。全国 592 个国家级贫困县，有 549 个县种植马铃薯，426 个县种植甘薯，因此做大做强薯类产业，是减贫致富、发展小城镇的支柱产业。在中国已经公布的“十二五”规划中，曾为马铃薯产业的发展设定过较为明确的发展目标，即到 2015 年，全国马铃薯生产量要从 2010 年的 8 000 多万吨增加到 1.5 亿吨，但在实践过程中遇到了很大的挑战。为此，本书建议要改变传统的粮食安全概念，加大发展薯类产业力度，增加消费比重，使之成为主粮化生产与消费的组成部分，在改善人们膳食结构的同时，也改变粮食作物种植与生产结构，使社会与经济效益都实现最大化，并逐步建立起生态友好型的农业生产体系。

本书还比较详实地描述了双方友谊与合作的最大成果——国际马铃薯中心亚太中心。经过 30 多年的交流与合作，中国政府与国际马铃薯中心于 2010 年取得了重要共识，双方共同签署了《在中国共同组建国际马铃薯中心亚太中心的东道国协议》。双方希望，通过这个区域性合作平台，将合力推进薯类作物在中国与亚太地区的发展，力争使其在进一步全面改善粮食安全状况、加快中西部的经济发展与减贫步伐、提高健康与营养水平以及促进农业与环境的可持续发展等方面做出新的更大贡献。

本书的最后，还比较详细地介绍了国际马铃薯中心和国际农业研究磋商组织最新的发展与改革情况，希望让更多的人了解这些全球的公益性国际农业科研机构的状况，以期给予他们更多的支持和帮助。

Abstract

Thirty-five years have passed since China's first technical delegation visited the International Potato Center (CIP) in 1978. This year also marks the 30th anniversary of the Chinese government's accession to the Consultative Group of International Agricultural Research (CGIAR) which took place in 1984. Over the years, CIP has carried out a large number of research and production projects in collaboration with the Chinese government and academic community. The Chinese government, for its part, has made annual donations to CIP and CGIAR. What is the motivation behind its sustained commitment? And what are the results of CIP-China cooperation? These are questions of great interest and also ones which this book seeks to answer.

CIP in China chronicles and reviews the exchange and cooperation process and achievements between China and CIP since the 1970s. For the most important achievements, economic analysis tools are used to examine and demonstrate, with quantified results, their role and impact in boosting the development of root and tuber crops (RTCs) in China as well as their social and economic benefits.

This book focuses on the three major contributions of the bilateral cooperation, i.e. new varieties, new technologies and talent development and capacity building. Over the past 30 years, China has imported over 8 000 accessions of RTC germplasm from

CIP, enriching its domestic germplasm base and broadening the genetic background of its RTCs. On the basis of such diversity, Chinese scientists have been able to breed more than 100 new RTC varieties. Take potatoes for example. Among the approximately 100 common varieties currently in use in China, about 30% are related to CIP germplasm, representing roughly 20% of China's annual cultivation area and production volume. CIP-24 and Cooperation 88 are the most typical representatives among the new varieties. China received a disease-resistant potato clone known as CIP-24 in 1978, the year CIP's work started in China. The variety was highly successful and continues to be grown today on 70 000 hectares of land per year, principally in the country's drought-prone Northern provinces. Since then there have been many such successful collaborations. In 1995, a potato variety, known as Cooperation 88, was released by the Root and Tuber Crop Research Institute of Yunnan Normal University in Kunming. Thanks to its strong late blight resistance, high yield and good marketability, in less than seven years after its release, this potato variety covered 20 percent of the cultivated potato area in the province. Its use spilled over to other Southwest provinces, such as Sichuan Province and Chongqing city and beyond China's borders into Vietnam and Myanmar (Burma). Up till now, the variety is still widely planted in the region with annual planting area of about 400 000 ha.

As to sweetpotatoes, a dozen new CIP-related varieties have been bred, accounting for about 10% of China's dominant sweetpotato varieties. For example, sweetpotato variety Xichengshu 007 was released in 2008 by CIP and Nanchong

Academy of Agricultural Sciences, Sichuan Province. A sexual cross between CIP's true seed BB18–152 (female parent) and the academy's own line 9014–3 (male parent), its acreage has reached 130 000 ha in 2013, owing to its disease and stress resistance, high yield and high starch content. It has become a variety dedicated to starch processing.

Over the past 30 years, CIP implemented more than 50 RTC research projects, providing no less than US$ 5 million in funding and bringing 15 new technologies or technology combinations to China. For example, the application and dissemination of virus–free sweetpotato production technology in Shandong yielded remarkable results, increasing output by at least 30%. Shandong Province produces about 17 million metric tons of sweetpotatoes annually or about 12% of global production. Between 1994 and 1998, stimulated by collaboration between CIP and Chinese scientists, virus–free seed was extended to about 80% of the area planted in the province. It is calculated that the internal rate of returns in all the project areas amounted to about 200%, with net present value of US$ 500 million/year, winning recognition and popularity among both farmers and government officials. Moreover, the potato late blight forecasting project raised output by over 60% by taking preproduction preventative measures and thus reducing losses, ensuring increased farmer profitability. In short, these technologies have improved local farmers' traditional methods and practices, thus contributing to the development of China's RTC industry and local economies.

CIP has also provided many opportunities of capacity building

for young Chinese scholars. In the early 1980s, there were very few personnel dedicated to RTC research and extension. For instance, in Yunnan Province — a big potato producer — potato acreage was above 200 000 ha, but There were only 3 professional research personnel. In essence, each one was responsible for nearly 70 000 ha of potatoes. With China's fast economic and industrial development, the number of potato research personnel today has surpassed 500, an almost 20-time increase since the 1980s. In 2008, China's Ministry of Agriculture established the national potato and sweetpotato research systems, bringing together the best potato and sweetpotato scientists in the country. Among the 24 leading scientists appointed to the national potato research system, 6 were sponsored by CIP to study abroad and 11 worked on CIP projects. Among the 16 leading scientists appointed to the national sweetpotato research system, the numbers are 6 and 10 respectively. Such CIP-offered learning and working opportunities have placed these scientists at the forefront of their respective fields in China's RTC research or industry.

In short, over the course of the 30-year cooperation between CIP and China, China's RTC production has undergone tremendous changes. It is safe to say that the bilateral collaboration has made a remarkable difference. Compared with 1978, potato yield in China in 2012 rose by 24.5%, from 12.70 t/ha to 15.81 t/ha, and sweetpotato yield grew by 54.2%, from 13.66 t/ha to 21.07 t/ha.

Importantly, this book presents an overview of the current development of RTCs in China and its significance. As China is the

largest potato and sweetpotato producer in the world, RTCs occupy an important position in national food security, after rice, wheat and corn. Cultivation areas of potatoes and sweetpotatoes make up 8% of the total acreage of food crops, while their production volume only accounts for 6% of total food crop output (when compiling such statistics in China, due to their high water content, 5kg of fresh potatoes and sweetpotatoes are considered equivalent to 1kg of grains). Opportunity exists to increase potato yields in China to catch up and exceed the global average, to the point that total RTC output grows by 2～4 percentage points without increasing their cultivation areas. This would ease the pressure arising from the huge demand for grain crops.

Moreover, thanks to RTCs' tolerance of barren soil and dry climate which make it impossible for other crops to survive and be productive, they are mostly planted in poor regions with marginal natural conditions, overlapping with the poverty counties in China. Among the 592 national-level poverty counties, 549 grow potatoes and 426 grow sweetpotatoes. The RTC sector is therefore instrumental in addressing poverty alleviation and the development of small towns. China has set a goal in its 12th five-year plan (2010-2015) to increase potato production to 150 million by 2015 from slightly over 80 million in 2010, but so far has encountered enormous challenges in accomplishing this goal. Therefore, it is for this reason that this book suggests that we change our traditional concept of food security, strengthen the RTC sector and boost RTC consumption. To some extent, the improvement of people's dietary pattern would lead to the change in the cropping

and production structure of food crops, thus not only maximizing RTCs' social and economic benefits, but also building up a more environmentally-friendly RTC production system.

This book also describes perhaps the biggest achievement born of CIP-China friendship and cooperation. After over 30 years of exchanges and collaboration, the Chinese government and CIP reached an important milestone and signed the *Host Country Agreement regarding the Establishment of CIP-China Center for Asia Pacific* (*CCCAP*). The two parties hope that through this platform of regional cooperation, they could jointly push forward the development of RTCs in China and Asia Pacific, thus enabling CIP to make even bigger contributions to safeguarding food security, accelerating economic growth and poverty alleviation in central and western China, improving health and nutrition, and promoting sustainable agricultural and environmental development.

The appendix of this book provides a summary of the development and reform of CIP and CGIAR, to help in understanding the history and direction of these non-profit international agricultural research institutions and to encourage their stakeholders to build on their legacy and impact.