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Rodomiro Ortiz

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Volume 36

edited by
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Rodomiro Ortiz

Dedication: Rodomiro Ortiz

Plant Breeder, Catalyst for Agricultural Development

Jonathan H. Crouch
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- III. RESEARCH CAREER
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 - B. Potato Research at the University of Wisconsin-Madison
 - C. Vaccinium Research at Rutgers University
 - D. *Musa* Research at the International Institute of Tropical Agriculture (IITA)
 - E. Nordic Professor of Plant Genetic Resources
 - F. Director of Genetic Resources and Enhancement at the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)
 - G. Director of Crop Improvement to Executive Management at IITA
 - H. Research Director to Executive Advisor at the International Maize and Wheat Improvement Center (CIMMYT)
 - I. Freelance Executive Advisor to National Opinion Leader in Peru
- IV. THE MAN
- V. THE SCIENTIST
- VI. THE MENTOR, INSPIRER, MANAGER, AND MULTIPLIER
- VII. THE FUTURE
- ACKNOWLEDGMENTS
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I. PREAMBLE

Rodomiro Ortiz stands in a field of plantains in the Niger delta surrounded by a small group of young Nigerian technicians and the air is charged with excitement. His face drips with sweat in the heavy humidity and his legs are spread wide to ensure nothing unsettles his decisiveness. This is selection time, Ortiz-style!

He is armed with a clipboard, pencil, and the all important short ruler while Josephine Okoro and Boniface Dumpe each shout out their designated data classes in rapid succession. And to one side, Mark Yamah waits to deliver the single swing of his machete that would mark the end of yet another genotype based on just one word from the boss: “cut”! And woe betide any one who gave the wrong data or if Mark misheard that heavy Spanglish pronunciation of the alternative command: “keep”! For there was no turning back once the machete was in flight, just a split second pause while gravity took hold and the 10 ft tall giant crashed to the ground. Not pausing for breath, they move straight on to the next, for they have at least another 200 genotypes to get through that day. Ortiz would drive his team through that field with the precision and timing of a military operation: at the end of it all, you could be forgiven for thinking that a hurricane had passed through. For breeding is a numbers game and Rodomiro was not about to compromise his experimental designs just because of the size of the plantain crop.

These were the early days of the Ortiz era in the Plantain and Banana Improvement Program (PBIP) of the International Institute of Tropical Agriculture (IITA) at Onne Station, southeast Nigeria. From this scene, anyone would have thought Rodomiro had been doing this all his life, but in fact this was the first season he had done selections on his own. And like so many of his reincarnations to come, he had hit the ground running, and the seismic waves of change were not far behind. I too was in that crowd alongside Josephine and Boniface, a fresh postdoc just landed in Africa looking for the impossible: a rigorous scientific environment, meaningful impacts for the poor, and a bit of adventure. For my luck, Rodomiro was dispensing it all by the truckload, and from the very first moment we met I was in awe of this intellectual giant and his swashbuckling taming of *Musa* breeding and genetics. Southeast Nigeria was a tough posting by anyone’s standards but for me this baptism by fire into the world of international agriculture and tropical crop breeding could not have been more exhilarating. And Rodomiro’s relentless night and day toil in that humid rain forest would soon bring him global recognition through his role in the team winning the King Baudouin Award in 1994 and through reaching the finals of the Prince Asturias Award in 1997 for his personal achievements.

So how did a Peruvian son of a civil servant, brother of two lawyers and an accountant find himself in a field of plantains in Nigeria? The story of how he got there is almost as incredible as the man himself, only surpassed by the career he carved for himself over the following two decades. Rodomiro was fascinated by mathematics, logic, and perfection from a very early age but drawn to the field of biology as a teenager and from there into genetics, statistics, and plant breeding. Driven to fight for his political ideology at university in ways few of us can imagine yet then motivated to spend the rest of his life trying to help resource-poor small-scale farmers across the developing world, especially in Africa. What Rodomiro has achieved in the last 20 years since finishing his Ph.D., few of us dare dream of achieving in our entire lifetime. And thus, it is fitting that he should receive the accolade of a dedicatory chapter at a time when we fully expect to see at least another 20 years of reaching ever new heights of achievement.

Rodomiro Ortiz is well known by so many across such a broad range of research topics, that his area of expertise almost defies definition. He has been involved in basic, strategic and applied research in 27 species although a large proportion of his publications have been associated with his primary passion for genetics, genetic resources, and crop improvement. Rodomiro has worked on cereals (maize, barley, wheat, sorghum, pearl millet), legumes (chickpea, groundnut, cowpea, soybean, pigeonpea, white lupin), Solanaceae (*Capsicum* pepper, potato, tomato), clonal crops (sweetpotato, cassava, yam, plantain, banana), fruits (blueberry, cranberry, lingonberry, sweet cherry), as well as *Brassica*, Napier grass, annatto, and quinoa.

Rodomiro's major research achievements range from the definition of core collections of genetic resources for eight different crop species, elucidating the genetic basis of more than 20 agronomic traits in *Musa*, determining meiotic behavior during interploidy crosses in three different genera, and, introgression of pest and disease resistance from wild species to cultivated germplasm in two different crop groups. In addition, he has developed biometrical models to dissect quantitative trait variation in polyploid species and evaluated the gene action underlying economically important traits in order to develop new techniques to improve breeding efficiency. Finally, he has formulated evolutionary crop breeding approaches using landraces and wild species for the genetic betterment of cultivated gene pools of *Musa* and tuber-bearing *Solanum*. These research activities have led to over 250 journal papers, including over 100 as first author and nearly 30 in *Theoretical and Applied Genetics*. In addition, he has authored over 100 book chapters, monographs and policy briefs, over 200 conference

proceedings papers and abstracts, and over 150 newsletter and technical articles (including manuals and bulletins).

Rodomiro's breeding efforts have concentrated on the utilization of wild species and landraces for the development of elite progenitors and cultivars adapted to the environmental conditions in which they would be grown. This included selection for quality traits, disease and pest resistance, and efficient mineral nutrient uptake in addition to yield parameters. He has employed conventional, modified, and novel techniques for germplasm enhancement. Throughout the last decade he has pursued an active interest in the application of molecular biology and genetic transformation in crop improvement. This has led him to author many reviews on modern plant breeding techniques and to appear in many newspaper, radio, and television reports and interviews on the subject. He has become especially renowned for his simple and unbiased perspectives on the pros and cons of genetically modified (GM) food.

Alongside his research and breeding activities, he has held a range of senior management positions where he directed a diverse range of research programs focused on sexually and vegetatively propagated crops, in annual and perennial production systems including many of the most important food crops of the developing world: wheat, maize, sorghum, millet, cassava, yams, plantains, bananas, cowpea, soybean, chickpea, groundnut, and pigeonpea. This has led him to visit no less than 90 countries, managing projects in a large proportion, while developing strong collaborators and loyal friends in many. More recently he has also become a leading voice in systems-based agricultural research, particularly related to climate change and biofuels.

This deep and extensive firsthand experience of research and breeding across the developing world combined with his rigorous scientific process and dedication to institutional improvement, together with his huge global professional network has led to him being widely considered as one of the most important thought leaders and catalysts in international agricultural development for resource-poor small-scale farmers.

II. EARLY YEARS

A. Formative Experiences

Rodomiro Octavio Ortiz Ríos was born on 28 July 1958 in Lima, Peru, the first son of Juan Rodomiro Ortiz Bernardini and Otilia Soledad Ríos Higginson. Rodomiro grew up alongside two older sisters and a younger brother, all overachievers. San Antonio de Padua, a private Canadian primary school in Lima run by nuns and priests, was to put Rodomiro on

a critically important path. He became fluent in English and was quickly attracted to mathematics. Rodomiro recalls “I enjoyed math at school because it was so logical, there was no way of making a mistake if you followed the right procedure.” The same sense of logic, precision, process, and order was also the appeal when he later discovered the field of genetics, and was to become a fundamental part of the Ortiz brand throughout his research and management careers.

At the age of 11, Rodomiro moved to “San Andres” secondary school established in Lima under the auspices of the Free Church of Scotland. The school had a partnership with a Scottish textile company that had expanded its operation into Peru. The school was founded by a Scottish missionary, John Mackay, with a reputation for almost military discipline but also for promoting the principles of democracy that appealed to his father. In addition, this was a school that produced leaders, former pupils going on to become famous intellectuals, scientists, artists, and investment bankers but also high-level ranking officers of the armed forces and even the 84th President of Peru.

A discussion of Rodomiro’s formative years would not be complete without tracing the origin of his tendency to write using a small ruler. His mother recounts that Rodomiro’s fixation with tidiness started when he was very young. This is clearly the origin of his infamous clean-desk policy but the straight writing habit had an additional driver. It stems from his desire to be the best student at junior school and his decision to adopt the approaches of the leading contenders. This epitomizes Rodomiro’s approach to life; constantly on the lookout for ideas and new approaches for improvement of his own performance, which he would subsequently apply to helping those around him.

Mathematics and the competitive spirit were dominant themes in the Ortiz household. By the time he had started secondary school, his father was practicing math with him from 5 o’clock in the morning. Young Rodomiro also became interested in researching topics to feed his inquisitiveness through reading, often into the early hours. Thus, a pattern of late night and early morning studying was to emerge as a defining way of life.

On Easter Sunday 1971 shortly before his 13th birthday, Rodomiro made an unexpected yet emphatic decision that was to have a significant impact on his next decade. On the way to church that day, he had what he describes as his “religious crisis” and announced to his strongly Catholic family that he was going to stop attending church from that day. Rodomiro recounts that the next day his father took him aside and said “If you have decided not to follow any religion, then its important that you read the teachings of other great schools of thought.” And from

that point began to feed him books from the great thinkers of philosophy, psychology, and politics, from Plato to Marx and Engels, and Freud to Gramsci. Much of this was highly topical in Peru at this time as the country was undergoing dramatic political changes throughout Rodomiro's teenage years. The coup of the late 1960s had delivered a military dictatorship with left-leaning policies that were leading to substantial changes across the country including nationalizing companies, driving land reform and giving rights to the workers. And thus was born Rodomiro's fascination with history and current affairs, something that would lead him into profound experiences during his university years and ultimately drive him to move to Africa.

Although Rodomiro's parents put no pressure on him regarding his choice of career, nevertheless, he seemed preoccupied during his early teenage years with what he was going to do with his life. However, once he had made the decision in his late teens to pursue a career in biology, his mother noticed that he became dramatically more committed to studying. Sadly at the end of his school years, his father had a major heart attack and Rodomiro spent many hours with him daily while he was recovering in hospital. His mother recalls from this time that Rodomiro always had two things with him in the hospital; a biology textbook (studying for the university entrance exam) and a football (soccer) magazine.

B. University in Peru

In April 1975, Rodomiro joined the Universidad Nacional Agraria at La Molina (UNALM) in Lima to study biology having recorded the second highest entrance exam mark from over 200 candidates. This feat is all the more impressive given that Rodomiro refused to attend special classes to prepare for the university entrance exam, preferring to do it his own way. This strong self-confidence in his ability to work things out himself has never deserted him since.

Two individuals had a particularly important role in his decision to specialize in genetics at university. First, Prof. Francisco Delgado de la Flor, an agronomist by training who had become the chancellor of another university in his early thirties and later returned to UNALM in the 1970s as Professor of Genetics and Horticulture and Head of the Vegetable Research Program (he was also twice elected in the 1990s as Chancellor of the university). Second, Prof. Emma Loza, Rodomiro's undergraduate advisor and cytogenetics lecturer, who had taken the cytogenetics course with Prof. Peloquin at the University of Wisconsin (UW), where Rodomiro would ultimately carry out his own Ph.D. research.

Throughout most of his undergraduate years, Rodomiro was President of the Centro de Desarrollo Social (CEDES) and a member of the Peruvian Local Committee of the World University Service (WUS, SUM), which were both nongovernment organizations (NGOs) mobilizing students to do social work. During this time, Rodomiro was also a member of the Coordinating Committee for International Voluntary Service (CCSVI) associated at that time with the United Nations Education, Science and Culture Organization (UNESCO). His role as CEDES president gave him his first international trip in November 1980, traveling to India for a youth congress of voluntary organizations and the annual meeting of CEDES umbrella organization. During this trip, Rodomiro also took the opportunity to stop in Paris to visit other NGOs and UNESCO headquarters. These activities gave him an important early insight into the international community, that he would soon become part of himself.

During his transition year between undergraduate and postgraduate studies, Rodomiro experimented as a journalist for the magazine *Hermano Lobo* publishing from Lima with unconventional perspectives on politics, society, and the arts. His love of reading was evolving into a passion for writing, an outlet that would become an incredibly important component of his life.

During the late 1970s there was a growing resentment in Peru against the 10-year rein of the so-called “Revolutionary Government of the Armed Forces.” The university campuses, which were outside the jurisdiction of the police, became a breeding ground for prodemocracy activists. At this time, Rodomiro was becoming heavily involved in students’ affairs through his elected role as organizational manager of the UNALM Student Association (FEUA). And he joined the student’s opposition to the military government, campaigning alongside many fellow students for the return to democracy. When the dictatorship changed and started implementing right-leaning policies, the opposition movement gained pace and their demonstrations shifted to the streets often resulting in violent clashes between students and police. Although his parents respected Rodomiro’s wish to express his political ideals, they were concerned for his safety as the shootings, kidnappings, interrogations, and jailing’s of students increased. Fortunately, constitutional elections were carried in 1980 and a newly elected government came into power on an auspicious day; Rodomiro’s 22nd birthday. However, amidst the euphoria of the transition to democracy and the politicking during the creation of the new government, Rodomiro made an astute differentiation regarding his own personal motivations: political ideals versus political power.

Rodomiro's continued interactions with Prof. Delgado de la Flor had opened his eyes to the opportunities in agriculture and led him to carry out his B.Sc. research project on chilli peppers and from there his M.Sc. research in plant breeding and statistics. And it was discussions with Prof. Delgado de la Flor that finally convinced Rodomiro to move away from politics and focus on a career in agricultural research. Although Delgado himself would subsequently pursue his own political aspirations; initially being elected to the National Magistrate Council, of which he later became the president, and then unsuccessfully running for congressman of Lima.

During 1984–1985, Rodomiro carried out his M.Sc. research under the supervision of Prof. Ricardo Sevilla. His thesis focused on the classification of maize landraces from the highlands of Peru, one of the world's greatest centers of diversity for maize. The purpose of the work was to devise a system that would enable more effective use of this germplasm in maize breeding. However, this was far from what Rodomiro had originally planned when he first registered for his M.Sc. with Prof. Delgado de la Flor. He was initially pursuing research on mutation breeding of *Capsicum baccatum* (a chilli pepper species indigenous to Peru). Unfortunately, his field trial was affected by drought and did not provide useful data. Thus, Rodomiro was hunting for an alternative data set to analyze for his thesis. Luckily, Prof. Sevilla had a huge amount of field data from his maize germplasm characterization trials, which he shared with Rodomiro to analyze. Prof. Sevilla recounts: "I never did a better deal in my life" as Rodomiro set about subjecting the data set to what we now consider as his usual exhaustive and elegant analysis. However, that was just the beginning, as he continued to write up the journal papers from this analysis during his spare time while subsequently working at CIP, University of Wisconsin, IITA and beyond—the latest one published in 2008. At each stop in his global professional tour, he would come across further mega-data sets waiting for attention. And thus continued the trend of ever accumulating rounds of analysis and publication.

Despite the shift of supervisor for this M.Sc. thesis research, Rodomiro continued to be mentored by Prof. Delgado de la Flor, who encouraged him to follow many courses in agronomy despite his specialization in breeding and statistics. This was a very prudent move that maintained his broad-based perspectives, which proved invaluable both for his later research activities in the Consultative Group on International Agricultural Research (CGIAR) but also when Rodomiro subsequently became a research manager across diverse crop science disciplines. His ability to effortlessly shift across disciplines

and to automatically zoom in and out on specific topics continues to be one of his great strengths in research and management.

Incredibly, even at this earliest stage of his research training, Rodomiro was able to turn an M.Sc. taught course into a publication opportunity. Prof. Marco Nevado at UNALM was teaching the graduate course in genetic analysis. Interactions with Rodomiro during this course led to a statistical analysis paper (Nevado and Ortiz 1985) that would form the foundation of the analysis for his M.Sc. thesis research (Ortiz and Sevilla 1997) and a subsequent collaboration with the Food and Agriculture Organization (FAO) (Ortiz and Izquierdo 1992). A remarkable achievement for an M.Sc. student but for Rodomiro just a small indication of what was to come.

While following his M.Sc. studies, Rodomiro managed to secure a place on the mutation breeding course run by International Atomic Energy Agency (IAEA)/Food and Agriculture Organization at their laboratory in Seisberdorf outside Vienna in Austria (March–May 1984). During the evenings he busied himself with homework from the course so as to free-up his weekends for trips to neighboring countries to the east through the “Iron Curtain”; Budapest (Hungary), Prague (in today’s Czech Republic), the former Yugoslavia, and Croatia as well as to various cities in Austria. On the way back from the course Rodomiro also visited Madrid and the Toledo province of Spain. This was to be the beginning of his great journey in international agricultural research that would ultimately take him to nearly a hundred countries and the senior management teams of international agricultural research centers on three continents.

After completing his M.Sc., Rodomiro briefly worked as an assistant plant breeder in the cereals program at UNALM. However, the pull of bigger challenges was too strong to resist for long and Rodomiro was soon planning his departure from the university to join the International Potato Center (CIP). Upon hearing this, Professor Delgado de la Flor took him to Professor Alberto Fujimori, who was the Chancellor of UNALM at this time, in an attempt to change his mind. Fujimori had lectured Rodomiro in mathematics during his first year at the university. Rodomiro recalls that Fujimori remembered him, reflecting on his 100% score in one of his final mathematics exams. However, Rodomiro’s mind was made up and not even Fujimori’s attention was going to change that. By 1990, Fujimori was elected President of Peru and Rodomiro was in the United States finishing his Ph.D. research. It is incredible to think of the role that this agricultural university played in the emerging national politics of Peru at this time. That Rodomiro was intensely involved in this political evolution enabled him to develop a strong

leadership style that would be invaluable just a few years later when he made the transition from a young researcher in the United States to a program leader at the IITA in Africa in the early 1990s.

Most recently, Rodomiro has gone full circle while being back in Lima (especially during 2010–2011), picking up on old collaborations at UNALM and representing the “biotechnology—plant breeding—genetic resources” debate in university seminars, newspaper articles, and television interviews. Prof. Sevilla reflects: “Everybody recognizes Rodomiro’s great capacity and brilliance in this area, he has become a national opinion leader during these traumatic times for the biodiversity community”—a great legacy in itself but meanwhile a much greater legacy was to be created when he turned his attention to international agricultural research for development.

III. RESEARCH CAREER

A. Potato Research at the International Potato Center (CIP)

Although Rodomiro’s outstanding capabilities were already well recognized during his time at UNALM, his move to the CIP was to unleash a tidal wave of publications that no one, not even Rodomiro himself, could have predicted. From the data he generated during the 4 years (1984–1988) that he worked at CIP as an associate geneticist in the Breeding and Genetics Department, he would eventually publish 27 journal papers, 13 of those as first author. Incredibly, the last of these papers would not appear in print until nearly two decades later by which time Rodomiro had already moved job and country six times. This never ending squeezing of new research findings (and related publications) from old data sets was to become the hallmark of Rodomiro’s career.

Rodomiro’s first paper from his potato research at CIP reported analysis of morphological variation in heat tolerant and susceptible germplasm grown under a range of glasshouse and field conditions (Morpurgo and Ortiz 1988). The paper concluded that controlled environment screening was not a good surrogate for selection of heat tolerant germplasm for field production. And thus began Rodomiro’s lifelong dedication to carrying out rigorous science for practical outcomes, particular for crop improvement.

The same year, Rodomiro published his first journal paper as lead author and his first paper on a topic that would become a lifelong theme in his research career across a number of crops: ploidy manipulation. The paper was based on evaluation of germplasm generated from

a line \times tester crossing program using $2n$ gametes from a range of male parents crossed with a range of female parent tester lines (Ortiz et al. 1988). This report epitomized the large-scale data collection combined with intensive and elegant statistical analysis, which has become the trademark of the massive body of publications he has subsequently generated over the following quarter of a century. The paper concludes that for a range of agronomic traits, the direction of the cross was highly important when using ploidy manipulation in potato breeding. This is due to the relatively stronger influence of the $2x$ parent in progeny from such crosses. The paper also confirmed that progeny testing was essential for selection of parental genotypes for such a breeding scheme. This work launched what was to become a lifelong professional partnership and friendship with Dr. Masa Iwanaga (now President of the Japan International Research Center for Agricultural Sciences (JIRCAS)), which was to endure across three continents and seven research organizations.

Dr. Iwanaga was cytogeneticist at CIP at the time and was just about to make a career progression move to the IITA, when a counteroffer from Dr. Richard “Dick” Sawyer (the then Director General of CIP) managed to keep him at this international center. Part of that deal was the provision of funding to hire his first research associate. It was the recruitment process for that position that then enticed Rodomiro to leave UNALM. In particular, it was Masa’s research on ploidy manipulation with haploids, $2n$ gametes and wild species for potato and sweetpotato germplasm enhancement that captured his attention. Dr. Iwanaga recalls that during his time at CIP, Rodomiro surprised him many times by arriving at his office early in the morning with the full statistical analysis of results that had only just been collected through a long hard day of harvesting in the field the previous day. It was clear from this earliest of times that Rodomiro’s inquisitiveness could not allow him to sleep before finding out what a new data set could tell him.

During his early days at CIP, Rodomiro also established a particularly productive friendship with Dr. Ali Golmirzaie who was a new postdoc. Despite working in completely different research groups, Rodomiro happily helped Ali with experimental design and analysis while he was at CIP, and continued to collaborate remotely for many years thereafter. This epitomizes Rodomiro’s interaction with every scientific community he has passed through. His personal interest drives him to want to understand the work of everyone around him, and those doing interesting research with an open-minded approach can expect that it will not be long before Rodomiro engages them in a challenging dialogue about their work. Where intellectual synergy prevails, he will freely

share his conclusions and recommendations without reticence, and if you really catch his interest he may offer to work his analytical magic on your data. Ali and Rodomiro would go on to publish 14 papers together over the following 15 years during which time Rodomiro would have moved job and country seven times.

Soon after joining CIP, Rodomiro was involved in work that would lead to a major publication on the successful transfer of nematode resistance from diploid wild tuber-bearing *Solanum* species to cultivated tetraploid potatoes (Iwanaga et al. 1989). This paper included the demonstration that the direction of the cross (and thus the diploid species cytoplasmic genome) was not important for this trait. The transfer of sources of resistance from wild relatives was a tremendous step forward for potato breeders at the time and a practical success that influenced a large number of Rodomiro's breeding schemes across several diverse crops through the following two decades.

By the time the nematode resistance paper was published, Rodomiro had left CIP and started his Ph.D. research at the University of Wisconsin with Professor Stanley J. Peloquin. A shift that was to see an exponential increase in his rate of publication, not least for papers from his work at CIP, and the beginnings of his tremendous ascent in the crop genetics and breeding literature. Most of the papers based on data he had been involved in generating at CIP were written after he had left Peru. Some during the time he was in Wisconsin, but most spread over the following decade while he was in Nigeria, Denmark, and beyond. Thus began a lifelong habit of returning to old data sets with a fresh mind to create new insights, which of course, he would share with the world through new journal papers. This reflects his incredible determination to take everything he starts through to completion and to constantly re-evaluate his own ideas as new findings appear in the literature or are shared with him. This way of working is highly dependent on his encyclopedic memory and meticulously organized archive. For example, it would not be unusual for him to be reading a new research finding or engaging in an e-mail dialogue that would trigger a new question about an old unutilized data set (generated perhaps a decade earlier), which he would then instantly find in his archive, and more often than not, analyze that evening and generate a first draft of the resultant manuscript over the following weekend. For the mere mortals around him, this has been an aware-inspiring process to experience firsthand, that he has routinely repeated countless times where ever he has worked.

Between 1990 and 2004, Rodomiro was involved in 24 journal publications based on his 4 years research activities at CIP (1984–1988). These

papers covered a wide range of areas including the inheritance and breeding of resistance to potato tuber moth (Ortiz et al. 1990b) and early blight (Ortiz et al. 1993d), the development of diverse genetic stocks with high levels of pest resistance (Watanabe et al. 1994), the transfer of nematode resistance from wild species using ploidy manipulation (Ortiz et al. 1997c), and, the effect of inbreeding on the use of true potato seed from Andean landraces (Golmirzaie et al. 1998a) and heterogeneous hybrid populations (Golmirzaie et al. 1998b). His work at CIP also resulted in several papers published in Spanish on true potato seed (Golmirzaie et al. 1990a,b) as well as on the genetics of $2n$ pollen production (Camadro et al. 1993) and ploidy manipulation in potato breeding (Ortiz et al. 1993b).

B. Potato Research at the University of Wisconsin-Madison

At the end of July 1988 on the eve of his 30th birthday Rodomiro left his job at CIP and his family in Lima and moved to the University of Wisconsin at Madison on the edge of Lake Mendota. Founded in the late 1840s, the University of Wisconsin has grown to become one of the top 10 public universities in the United States with an annual research budget of over 1 billion dollars (second only in the United States to John Hopkins University). This scale-up of his environment seems to have turbo charged Rodomiro's productivity. The inspirational mentoring from his supervisor, Campbell-Bascom Professor Stanley J. Peloquin, was surely a significant part of this. When Rodomiro joined him, Prof. Peloquin had already been elected a few years earlier to the National Academy of Science for his contributions to understanding mechanisms of chromosome manipulation and behavior. They would eventually write 20 journal papers from their 3 years of research together (1988–1991), although Rodomiro was also busy during this time writing papers from his potato research at CIP and from his research at UNALM on hot *Capsicum* pepper.

Incredibly, Rodomiro also took on a data analysis consultancy project during his first months at Wisconsin, working on regional tomato trial data for the FAO of the United Nation. Juan Izquierdo had been a fellow student with Rodomiro during the annual IAEA training course on mutation breeding in Vienna/Seibersdorf (Austria) from March to May 1984. Juan witnessed how Rodomiro challenged some of the lecturers on that training course, especially those in genetics, cytogenetics and biometrics classes, and thought they might make good research partners. A few years later when Juan was working for FAO's Technical Cooperation Network on Plant Biotechnology for Latin America and the

Caribbean, he finally had the opportunity to collaborate with Rodomiro. This is so indicative of the impact that Rodomiro has on so many people, that has led to an ever-increasing line of scientists waiting to have the opportunity to build a research partnership with him. And as in so many other cases, this collaboration continued for decades. Rodomiro had already published on analysis of variances across environments in tomato before meeting Juan, and this paper had described exactly the type of analysis that Juan needed for his current data (Nevado and Ortiz 1985). And thus Rodomiro was contracted during his first months at UW to carry out the necessary analysis of GE interactions, stability analysis, and correlations between environment, traits and tomato yields, although he would not write the paper until he had moved to IITA in Nigeria (Ortiz and Izquierdo 1992). Rodomiro would subsequently write two more papers from this data set; one comparing performance of clusters of locations (ranging from high-to-low yielding environments) and determining where selection for yield could be most effective (Ortiz and Izquierdo 1994); and the other, many years later when he was at CIMMYT in Mexico, following discussions with the head of the biometrics unit, Dr. José “Pancho” Crossa, on models for analyzing GE data (Ortiz et al. 2007a). Rodomiro constantly amazes his colleagues with the effortless way that he connects new research findings with long since buried data sets, in ways that not only extract new perspectives but usually also new papers.

Rodomiro credits his dramatic increase in publication rate while at UW to the academically competitive environment and mentoring from Stan Peloquin who always encouraged his students to publish their research results as he considered that the job was not done until the paper was published. A tenet that Rodomiro still holds strongly to this day, although something that seems to have come naturally to him without too much encouragement. In fact, there was also a strong internal driver based on Rodomiro’s wish to share what he had learned and improve the overall efficiency of the research system, as he explains “I have always felt frustrated that some scientists were repeating experiments that others had carried out previously because the original work had not been published.”

A fellow student from Peru, Félix Serquén (now a tomato breeder at Syngenta, USA), who overlapped with Rodomiro through the same path from UNALM to CIP to UW, reflects “He was passionate about plant breeding, genetics and biometrics, which he combined with a great capacity for writing—he had the ability to analyze any data and convert them into publications.” Domenico Carputo who joined Peloquin’s group after Rodomiro had left Wisconsin, recalls that “Prof. Peloquin

often mentioned the great capacity of Rodomiro to efficiently and quickly write papers. He told students that the day after planning a manuscript, Rodomiro had the paper ready.” Although this was not the only thing he was renowned for at that time. Fellow UW student Mario Mera Krieger (now a bean breeder at Instituto Nacional de Innovación Agraria (INIA) in Chile) remembers that Rodomiro was such an affable and loquacious person, they became friends within a matter of minutes of meeting each other. Mario recounts “Rodo was known for turning nights into days chatting with friends, usually in front of rather unhealthy beverages, and remarkably, the day after he was as fresh as a lettuce.” Anyone who has been fortunate enough to enjoy a similar long evening with Rodomiro will vouch that the same is still true to this day.

Prof. Stan Peloquin would ultimately supervise 98 graduate students from 34 countries, many of them going on to build great careers in national or international research systems. Stan gained tremendous satisfaction from the successes of all his students but he had a special place in his heart for Rodomiro, as Mario Mera Krieger recalls “Every time Prof. Peloquin mentioned Rodo his throaty voice became even more hoarse, and you could feel the admiration he had for his disciple.” They also had something very important in common: a dedication to hard work, as Prof. Peloquin was renowned for saying “hard work always pays off.” Rodomiro’s first journal paper with Prof. Peloquin resulted from a three-way collaboration including Masa Iwanaga who had been a Ph.D. student with Peloquin some years earlier, before moving onto CIP and subsequently recruiting Rodomiro into his group. The underlying data had been generated by Masa when he was at UW but had not had time to analyze them for his Ph.D. dissertation. So about a decade later, Peloquin decided that it should be Rodomiro who completed the analysis. What resulted was the first report on a male fertility restorer gene in potato based on large-scale comprehensive genetic analysis (Iwanaga et al. 1991). Rodomiro subsequently went on to publish a further paper from his own research at UW potato farm Rhineland describing male sterility and $2n$ pollen in $4x$ progeny from interploidy crosses (Ortiz et al. 1993c). Thus, it seems that Prof. Peloquin shared the same quality as Rodomiro, in never forgetting a data set.

During the 4 years after completing his Ph.D., Rodomiro published a further 15 journal papers with Prof. Peloquin covering an incredibly wide range of topics including true potato seed (Ortiz and Peloquin 1991a), $2n$ egg production (Ortiz and Peloquin 1991b), genetic analysis using haploids (Kotch et al. 1992), recurrent selection (Ortiz and Peloquin 1992a), population improvement (Ortiz and Peloquin 1993a), adaptation to and performance of $4x-2x$ and $4x-4x$ offspring

to contrasting day length environments (Ortiz et al. 1991a, 1997d), use of isozymes and other genetic markers for analyzing quantitative trait variation in potato (Ortiz and Peloquin 1992b; Ortiz et al. 1993a), genetic analysis of flower color (Ortiz and Peloquin 1993b), pollen fertility in $4x \times 4x$ and $4x \times 2x$ families (Ortiz et al. 1993c), and sporophytic heterozygosity of the male gametophyte in tetraploid potato (Ortiz and Peloquin 1994a). It seems that however advanced or well populated a research area may be, Rodomiro has the capability to enter it and quickly saturate the literature with new findings and perspectives.

During this time, Rodomiro also published the first of many papers in the high impact journal *Theoretical and Applied Genetics*. The first one was from his Ph.D. research and used crosses from CIP where the progeny were tested at locations in Peru and United States. The study compared ploidy manipulation breeding schemes with conventional approaches to potato improvement (Ortiz et al. 1991b). This novel approach took advantage of $2n$ pollen produced by $2x$ genotypes by virtue of parallel spindle formation at anaphase II, which is genetically equivalent to a first division restitution (FDR) mechanism. These $2x$ parental lines were then crossed with $4x$ parental genotypes. In the reported study, using 32 families evaluated over 2 years at four locations, the $4x \times 2x$ breeding scheme was found to be better than the traditional $4x \times 4x$ method since fewer replications and locations were required to evaluate tuber yield. This is probably due to the greater homogeneity of genotypes generated from $4x \times 2x$ crosses.

Never to miss a publication opportunity, during this period Rodomiro also wrote the first of what was to become an extensive range of review papers (Ortiz et al. 1994a). However, this first one originated from the introduction chapter of his Ph.D. dissertation, which in turn was largely derived from Prof. Peloquin's teachings. For many years, Prof. Peloquin had been developing an experimental breeding program based on ploidy manipulations that he ran in parallel with a conventional breeding program, providing superb teaching tools for students. Now Rodomiro was to write-up all his teacher's lessons from these populations, in one place for a global audience while also summarizing how some potato breeders at CIP were using haploids, wild species $2n$ gametes and endosperm balance number for breeding potatoes for developing countries. This was very much Rodomiro's manifesto for what Prof. Peloquin used to call "putting genes into a usable form." The ease with which sets of chromosomes can be manipulated in potato allows potato breeders to routinely use traits from wild species. The only laborious part of the process is that progeny testing must be carried